SCHOOL OF COMPUTER SCIENCE AND ELECTRONIC ENGINEERING

FINAL YEAR PROJECT PRESENTATION OPEN DAY

Project Abstracts
27th April 2023

Presentations will take place in various rooms and laboratories throughout the School.

Locations are shown with each abstract.

School of Computer Science and Electronic Engineering
University of Essex
Wivenhoe Park
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Foreword

It is with great pleasure we are releasing the CE301 2022-23 Abstracts Booklet that contains abstracts of all the amazing projects our students at CSEE have done in their final year (2022-23). This booklet is also accompanied by a slideshow/video that contains e-posters of each project (one slide for every student).

We must mention that this cohort of students were in their first year of studies (2020-21) when the pandemic began and have completed their education in difficult times, often rising over adversity with their hard work, patience and creativity. So firstly, We congratulate all the final year 2023 CSEE Final year students for a yearlong work on their capstone projects! The diversity of technical content reflects the schools motto of "Making Something Wonderful" for Humanity.

Taking feedback from our industry colleagues, we have organized this booklet into subtopics (ex. AI/Machine Learning, App development, Robotics, Games etc.) to make it easier to browse. We are organizing the Project Open Day on April 27th 2023 when our students will present their e-posters/demos to the community of 'industry delegates, professional bodies, CSEE Staff and fellow students'. For our students it is a momentous occasion, the culmination of an entire year's work on their Capstone Project. From Machine learning to Robotics, Games, AI, BCI, Internet of Things, Cyber Security, Embedded Systems, App development the Open Day will highlight a range of innovate projects and their applications.

We cordially welcome you to attend the event (Eventbrite link), and incase you are unable to make it, the soft copy of this booklet and e-poster video will reach you as a small step to reflect the work undertaken by our students to the broader community. The location list of various CSEE labs where the projects/e-posters will be presented during the Open Day Event is available in the appendix of this booklet, along with the names of the students.

We thank the supervisors (CSEE academic staff) for their time and guidance, the school office personnel, CSEE technical team working round the clock to support the complex administration, often behind the curtains to keep the system running.

For potential employers, We would be more than happy to connect you with the student who developed the project in case you need any further information! For this you are more than welcome to get in touch with either of us, our contact details are provided below.

Finally, We sincerely hope that you enjoy browsing through this booklet and the accompanying slideshow/videos of the posters, and thank you for your time!

Thank You!

Dr Vishuu Mohan (Module Supervisor, CE301 Capstone Project)
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Contents

Identifying aircraft from above

Name: Ahmed Ali
Supervisor: Nikolaos Thomos
Category: AI/Machine Learning
Location: Lab 1 desk 2

Abstract:
Identifying aircrafts from above is a challenging problem in computer vision. In this project, I aim to develop a machine learning-based approach to classify different types of aircraft from aerial images. I first collected a database of aircraft images mainly from sources such as Google Maps and the MTARSI_2 dataset. I then compared the effectiveness of deep learning methods, such as convolutional neural networks (CNNs), with other state-of-the-art machine learning approaches, including k-NN classifiers and support vector machines.
I designed CNNs with multiple levels of convolution, pooling, and fully connected layers using the TensorFlow and PyTorch libraries to train our models. I used several methods, such as data augmentation and regularization, to increase the model's ability to generalize and decrease over-fitting. I evaluated each of my models on a test dataset using metrics like precision, recall, and binary accuracy and used this to compare the effectiveness of deep learning models built.
According to my findings, the support vector machine and k-NN classifier models were not as accurate as our Convolutional neural networks, which also produced better precision and recall scores.

Orion: Cat Scanner and Encyclopedia - an iOS App Implementing Machine Learning for Cat Breed Classification

Name: Olaf Bogus
Supervisor: John Gan
Category: AI/Machine Learning
Location: Lab 1 desk 8

Abstract:
Machine Learning allows us to achieve things never possible before.
I have implemented machine learning in a mobile app that helps cat lovers learn more about their feline best friends.

Orion: Cat Scanner & Encyclopedia analyzes a photo supplied from either your camera or library. It checks if the photo has a cat in it and matches cat breeds.

This is done using a Keras model with InceptionV3 as the convolutional base layer.

The classification model can detect up to 20 cat breeds with following performance scores:
Test accuracy is 90.40 %
F1 score is 89%
ROC- AUC score is 0.99
It has been trained on a custom assembled dataset consisting of 200 photos per cat breed.
The App has been developed with Xcode using SwiftUI.

The Orion App will tell you the top 3 matched breeds as well as details for every breed with its cat breed encyclopedia that contains photos, key information and external links.
It saves every analyzed photo and the assigned matches in the app history which can be accessed and edited at any time.

Machine Learning for Intrusion Detection Systems

Name: Jasmine Parsley
Supervisor: Professor Martin Reed
Category: AI/Machine Learning
Location: Lab 1 desk 10

Abstract:
The field of cyber security is always evolving, with new threats emerging each day. Researchers and security experts are continually developing and improving methods to prevent, intercept and mitigate the damage security attacks can cause. Intrusion Detection Systems (IDS) are prevention-based systems that monitor network traffic for suspicious activity. However, there has not been much research into using an IDS that compares the impact that different Machine Learning (ML) algorithms have on improving the detection of network attacks. Current evidence suggests when an ML is used in conjunction with an IDS, it can be an effective way to alert security professionals to any breaches in a network. This project aims to build several ML algorithms, and then use an F1 Score to measure and compare the effectiveness of each model across several different types of attacks. The intention is that these algorithms could theoretically be implemented as part of an IDS.

Emotional Response Visualiser and Analyser for Neuromarketing

Name: Adam Akhlaq
Supervisor: Vito De Feo
Category: AI/Machine Learning
Location: Lab 1 desk 15

Abstract:
Neuromarketing is a field of marketing research that uses neuroscience techniques to study consumers' responses to marketing stimuli. Neuromarketing aims to obtain insights into consumer behaviour and preferences by examining brain activity, physiological data, and behavioural patterns. This helps businesses better tailor their marketing tactics and campaigns.

ERVAN is a Python-based tool designed for neuromarketing research that enables the analysis and visualization of data from wearable technology, or another data set. Utilizing facial recognition technology and biometric information like skin conductance and pulse rate, ERVAN can precisely identify and assess people's emotional reactions to marketing stimuli.

The tool is highly adaptable and may be customised to meet unique requirements. It's designed to be straightforward to use, even for individuals with little or no experience in data analysis. For marketing research firms, ad agencies, and enterprises trying to understand how people react to their products and marketing messages, ERVAN can offer insightful data.

The distinguishing feature of ERVAN is its capacity to accept various data inputs, including wearable technology data, survey results, and video inputs and then present them in an intuitive way. With the help of this feature, researchers and marketers may get a thorough understanding of how people react emotionally to marketing stimuli and utilise that information to create more effective marketing campaigns.

In conclusion, ERVAN is an effective instrument for neuromarketing research that can give companies important information on the attitudes and behaviours of their target audiences. Its cutting-edge technology and simplicity of use revolutionise neuromarketing research and allow companies to approach marketing efforts in a more data-driven and productive way.

Python Robo-Advisor for Stock Market Prediction

Name: Daisy Butler
Supervisor: Dr. Panagiotis Kanellopoulos
Category: AI/Machine Learning
Location: Lab 1 desk 17

Abstract:
Automation with machine learning has become increasingly more common in modern technology. My project aims to expand on this by eliminating the hard work and long hours of research for trend forecasting and stock price prediction by producing an algorithm that can do this automatically, and in a fraction of the time. The goal is to open and close trades according to these results and successfully generate profit.

This project predicts stock movement and potential future prices by filtering through news feeds to find the overall sentiment of a particular company, and retrieves historical financial data to be inserted into an LSTM neural network. It does this to create an informed decision of whether a stock will do well and predict future trends.

Another important goal of this project is the use of user input. Different users may want varying levels of control when investing alongside an algorithm, so implementing customisable variables such as what companies to trade with, maximum budget etc. ensures the user is still in control of their investments.

For simplicity and testing purposes, only a handful of assets are currently available for trading and investing. However, this project is compatible with all assets Alpaca Trading API offers.

A lightweight multivariate forecasting system

Name: Deventon Melle
Supervisor: Sefki Kolozali
Category: AI/Machine Learning
Location: Lab 1 desk 19

Abstract:
Time series forecasting is very useful in a range of sectors such as finance, retail and health care. Being able to use a machine learning model to forecast future results is majorly beneficial for a wide range of things. An example from a retail standpoint would be knowing how much inventory is required in the future in specific market conditions to avoid large expenses or being short on stock. In my project I will be using an air quality sample set for gas emissions per gigaton from significantly polluted areas at road level within an Italian city. We will be using both LSTM (long short term memory) and GRU (gated recurrent unit) forecasting techniques and training both models on 1 week, 1 month and 70 day time frames to see which technique is better suited for this specific dataset. We will then evaluate which model gives us more accurate results based on the MSE and value loss by comparing the forecasted results with the test data.

Twitter Sentiment Analysis using Machine Learning

Name: Sule Selda Ozturkmen
Supervisor: Haider Raza
Category: AI/Machine Learning
Location: Lab 1 desk 22

Abstract:
Twitter is an online social media platform known for its rich source of data, often used to communicate people's emotions, aiding individuals in expressing their opinions across different domains through text in lieu of voicing them orally. People who suffer from anxiety, depression, and ill mental wellbeing often tend to find a certain comfort in posting tweets regarding their feelings online, which has potential for the improvement of mental health, and acts as a source of outlet (Berry,2017). Across all social media platforms, users can access a variety of shared data, with the use of increasingly innovative modern advanced technologies offering a wide range of tools for effective data analysis. This paper focuses on analyzing data and retrieving sentiment from a dataset publicly available on Kaggle through the use of natural language processing (NLP), text analysis and machine- learning techniques. Through such techniques, I aim to find an efficient method to detect depressive tweets and analyze the mental well-being of the corresponding users' using sentiment analysis. This aims to extract subjective information, which will then automatically categorize the tweets into positive, negative and neutral sentiment classifications.

Vegetation Classification Using Drone Images

Name: Glen Lewis
Supervisor: Dr Xiaojun Zhai
Category: AI/Machine Learning
Location: Lab 1 desk 23

Abstract:
This project aims to develop a deep learning image classification model to detect trees in aerial drone images and classify them based on their type, while also exploring which datasets are the most successful for this task. Provided available libraries have pre built datasets for tree classification, these models can be tested and if not, then moving on to different methods to determine which software is best for the task. Different models are trained and evaluated using these datasets to determine which approach yields the most accurate results. The resulting model and dataset analysis will provide insights into the best methods for identifying and classifying trees in images of this type, this will prove useful in a number of fields including both commercial and environmental when it comes to monitoring vegetation of in this way.

Search Algorithms Comparison

Name: Rares Purtan
Supervisor: Dr David Richerby
Category: AI/Machine Learning
Location: Lab 1 desk 27

Abstract:
Search algorithms are an important aspect of our day-to-day lives, incorporated in applications such as network packet routing, route-planning, and robotics. Graph pre-processing algorithms embed information in the graph which is used to reduce the query time of search algorithms.
It is important that we have the necessary tools to compare search/pre-processing algorithms to make decision-making easier and more efficient. The "Search Algorithms Comparison" project visualises the execution of search algorithms on randomly generated non-planar graphs. The visualisation focuses on presenting the time/space complexity through visual elements such as the duration of the animation to indicate how long an algorithm was in the running state.
The project supports 11 well-known search algorithms (such as Dijkstra and A*), plus 2 graph pre-processing algorithms (Highway Hierarchies and Contraction Hierarchies).
Highway Hierarchies is a pre-processing algorithm which builds a "highway" by computing the shortest path between "important" nodes in the graph. Search algorithms are incentivised to use the highway during the query stage to reduce the potential search space.
Contraction Hierarchies is a pre-processing algorithm based on the concept of contracting nodes iteratively in ascending order of "importance". Contracting a node means replacing the shortest paths going through the node by shortcuts. A modified version of Bidirectional Dijkstra is used during query stage which explores shortcuts based on their "importance".

AI for Checkers

Name: Chun Jie Cheok
Supervisor: Panagiotis Kanellopoulos
Category: AI/Machine Learning
Location: Lab 1 desk 29

Abstract:
This project aims to develop a digital checkers board game equipped with AI opponents. My motivations are to explore the fundamentals of board game AI such as decision-making algorithms, game trees and evaluation, as well as practically implementing them myself.

Python and its Pygame library (which was designed for creating video games) were utilised to create the game logic, visuals, and user interface. The AI decision making was implemented using the minimax algorithm and optimization techniques like alpha-beta pruning. Jira and Gitlab were also used for project management and version control respectively.

Besides AI opponents, players are able to play against each other, pit AI agents against each other, as well as limited customization options over the AI.

Assessing blood samples for Malaria

Name: Temidayo Agbeniyi
Supervisor: Dr. Alba Garcia Seco De Herrera
Category: AI/Machine Learning
Location: Lab 1 desk 30

Abstract:
Malaria remains a significant public health issue, particularly in low-resource areas where access to advanced diagnostic tools is limited. Although significant technological advancements have been made in accurately detecting malaria, the populations that suffer the most from the disease have not benefited equally from these improvements. My goal is to develop a solution to this problem by using a smartphone with an Android app for malaria parasite detection and quantification instead of conventional microscopes.

My solution is based on the idea that the imaging capabilities of modern smartphones can accurately detect malaria parasites in blood samples. The app uses machine learning algorithms to analyse images of red blood cells, identifying and quantifying the number of infected cells present in the sample. This has the potential to greatly improve the accessibility and affordability of malaria diagnosis, particularly in resource-constrained areas.

Develop a mobile app for dog breed recognition using machine learning

Name: Andreas Pafitis
Supervisor: John Q Gan
Category: AI/Machine Learning
Location: Lab 1 desk 33

Abstract:
As people become more interested in owning pets, particularly dogs, dog-related mobile apps are becoming more popular. This project's goal is to develop a mobile application that can identify dog breeds correctly using machine learning algorithms. Specifically, in this project to classify dog breeds, I have used three pre-trained CNN models (Resnet50, InceptionV3, VGG16) scoring a recognition accuracy of 78%,80%and 50% respectively showcasing the powerful capabilities of deep learning models in identifying various breeds with remarkable precision. Users can take a photo of a dog or choose an existing image from their device, and the app will predict the breed of the dog in the image. The app is built using the Kivy framework and uses a pre-trained machine-learning model (CNN) for dog breed recognition. It also provides information on the predicted breed, including a short description, temperament, and origin of the breed. Moreover, the use of the app can really help dog lovers in a very practical way providing info about any dog in seconds. As a result, dog mobile apps are gaining popularity not just among dog owners, but also among people who are interested in learning more about dogs and their care.

Developing a mobile app using machine learning for flower recognition

Name: Josh Hollington
Supervisor: John Gan
Category: AI/Machine Learning
Location: Lab 1 desk 37

Abstract:
AI and machine learning is quickly taking over many areas of our society as both a tool and a replacement for traditional work. I aim to be at the forefront of its further development to improve our lives, by solving tasks that would have once required years of study and dedication. This is why I have chosen to develop an app for the purposes of identifying flowers as it removes the need for people, who wish to know what the flower they saw on their walk was, from doing hours of study into the field of plant identification. My app can, to a high degree of accuracy, allow the user in a matter of seconds to identify a flower and then learn further about it without any pre-requisite knowledge. I have achieved this using convolutional neural networks (CNNs) which have the capability to take in an image and classify it to one of a pre-set number of classes on its output layer. I have also integrated the trained model into an android app so that the complicated nature of this project is abstracted away behind a simple GUI and can be used by anyone with an android phone.

Multi-modal Emotional Recognition using non-intrusive features

Name: Ali Elsayed
Supervisor: Raza Haider
Category: AI/Machine Learning
Location: Lab 1 desk 40

Abstract:
Emotional recognition plays a vital role in our daily interactions and is essential for communicating with others. Recognizing emotions accurately is critical for building and maintaining relationships, detecting potential threats, and responding appropriately to various situations.

With the proliferation of digital technology and our growing reliance on it, our need for emotionally intelligent machines increases. However, accurate emotional recognition is challenging and requires integrating multiple modalities and robust machine learning models.

This project tries to tackle the challenges of multi-modal emotional recognition and applies multiple state-of-the-art machine-learning techniques to the problem whilst remaining in touch with contemporary psychological emotion theories. More specifically, this project focuses on developing a framework that accurately recognizes emotional states from a combination of non-intrusive data like facial expressions and speech.

Canteen system based on embedded AI

Name: Shuo Liu
Supervisor: Dr Xiaojun Zhai
Category: AI/Machine Learning
Location: Lab 1 desk 41

Abstract:
With the growth in importance of artificial intelligence, its applications are becoming more prevalent. This project aims to design an embedded AI canteen system that automates the canteen system, enhances the efficiency of large canteens, reduces labor costs, and ultimately increases revenue.

The project utilizes the Python language and starts with the collection and annotation of images. The system trains the model using the yolov5 framework, quantizes and compiles the model using Vitis AI, deploys the compiled model to the ultra96-v2 development board for acceleration, and employs OpenCV for video detection. Finally, the model is optimized to achieve the best possible results. In this system, users can easily and accurately identify different food images and videos by simply placing them in front of the camera.

A Virtual Home for Brain Computer Interfaces (BCIs) training

Name: Christian Ohemeng-Mensah
Supervisor: Francisco Sepulveda
Category: AI/Machine Learning
Location: Lab 1 desk 48

Abstract:
In the modern day, technology helps in our daily lives completing basic and complex tasks and with technology ever evolving as we speak, it is only right that it is accessible to everybody. Technology today is used in almost every industry and has evolved to be accessible to people of all abilities. BCI technology is an example of an industry that is designed to help handicapped users to communicate with computers.

My project is on a virtual home for BCI. The virtual home, created in Unity3D, mimics a home environment which will require a player controller to navigate around the home through brain signal data imagining movement. This project uses pre-recorded data which was obtained through a brain scan with an electroencephalogram (EEG) and stores the data which is filtered and split into different sections in the file according to the reference nodes. From there, the data will be read through another application, OpenViBE, which will help with the signal processing, training of the data and analysis.

The brain scan data can be used by different signal processing techniques, in this project namely motor imagery, Steady-State evoked protocols (SSVEP) and P300. These techniques handle left-and-right hand movement which translate to the player controller moving left and right and forward and back movement.

From OpenViBE, the data is then transported through another application, Lab Streaming Layer (LSL) , which acts as a medium to transport the output to Unity3D to be used for the player movement.

During this project the area that has been the most challenging was getting the LSL to connect my two environments. This was the main issue as the new version doesn't seem to respond when connected and the archived version also clashes with the current supported versions of Unity when I use a Mac. To resolve this, I am using a windows machine and configured the project to a windows-based program.

Automated Diagnosis of Skin Cancer Images Using Machine Learning

Name: Sezen Barrett
Supervisor: Alba Garcia Seco De Herrera
Category: AI/Machine Learning
Location: Lab 1 desk 51

Abstract:
Skin cancer is a prevalent and deadly disease, with melanoma being the most lethal form. Early detection and diagnosis are crucial for improving patient outcomes. The utilisation of data science and machine learning can be used to automate the diagnosis of melanoma and aid in early detection – in turn positively impacting millions of people.

The aim of this project is to develop a custom multi-input machine learning model using Python and TensorFlow's functional API. The model will classify skin cancer images as cancerous or non-cancerous, utilizing CNN and MLP algorithms.

Existing AI approaches have neglected contextual information such as images from the same patient. Therefore, my model considers multiple lesion images from the same patient with the aim of reducing false negatives. It also evaluates patient-level contextual information to better support dermatological clinic work and improve diagnostic accuracy.

Assessing blood samples for malaria

Name: Tomas Tazar
Supervisor: Adrian Clark
Category: AI/Machine Learning
Location: Lab 1 desk 52

Abstract:
Malaria is a life-threatening disease that is strongly prevalent in tropical and subtropical regions of the world. It is particularly pervasive in the sub-Saharan region of Africa, where it remains a leading cause of death. In 2021 there were an estimated 217 million reported cases of malaria worldwide which led to 619 000 deaths. With prevention measures being actively implemented by the World Health Organisation, malaria's pernicious influence remains ever-present. Therefore my project aims to provide much-needed support by developing a software solution that classifies red blood cells among at-risk patients.

Employing a fusion of computer vision and machine learning, the software is able to accurately segment individual blood cells from blood smear images and accurately classify them according to their respective infection status. The software uses state-of-the-art models which can analyse single images or folders of images with low computational complexity, making it suitable for use in less technologically advanced regions. Furthermore, the software is completely user-friendly with a primitive design, which allows non-specialized users to operate it.

Not only is the software responsive, displaying an evaluated result to the user almost instantaneously, but it also has the ability to collect and save the images and information for later analysis by experts. This is crucial as expert-reviewed work is invaluable in this field. With its high level of accuracy and versatility, my project solution is the perfect fit for affected at-risk environments.

Visualizing Search Algorithms

Name: Sorin Ababii
Supervisor: Voudouris, Alexandros A
Category: AI/Machine Learning
Location: Lab 1 desk 62

Abstract:
This project aims to help people better understand search algorithms by creating software that visualizes them. The application allows users to incorporate obstacles between nodes and displays the series of paths considered from a starting point to an ending point. Using a grid of squares to display the nodes, the application also shows the shortest path found after the algorithm completes its search. The project focuses primarily on the A* algorithm, but the implementation of other various and different algorithms such as Dijkstra, breadth-first, depth-first, and bidirectional search is present. The goal is to demonstrate how each algorithm works and help people determine which algorithms are best suited for solving specific problems.
The visualiser is intended to be an educational tool to help students understand data structures and algorithms better. A user-friendly GUI for controls has been implemented for ease of use and accessibility. In the future, the application will include more algorithms to give users a better understanding of how each algorithm works. This project has also had an enormous emphasis on well-documenting the code and making it maintainable, so students can understand the source code from a glance and make their desired changes. Overall, the application created in this project can help users better understand search algorithms and how they can be utilised to solve problems.

Detection of consciousness using brain signals

Name: Michelle Hamer
Supervisor: Sebastian Halder
Category: AI/Machine Learning
Location: Lab 1 desk 66

Abstract:
After brain injury or during surgery a patient may be left unable to communicate but it is still of critical clinical importance to assess whether the patient is conscious. This project aimed to develop a data processing pipline to analyze EEG signals to predict the conscious state of subjects. The project was accomplished using spontaneous EEG signals, that were cleaned and filtered, from there features were extracted and used to train various machine learning models, including SVM, LDA and CNNs.

Models were evaluated using cross-validation, where data is repeatedly split into independent training and testing data sets, the models are trained using only the training data and afterwards evaluated on the test data. Different models were evaluated using cross-validation to assess the ability of the model to classify new unseen data. LDA had an 81% mean accuracy after cross-validation, SVM had 90% and CNN had 98%.

The project successfully achieved it's goals and can accurately predict consciousness in patients, demonstrating the potential of using EEG signals for diagnosing consciousness in patients. The project has areas for potential future improvement, such as analyzing different length segments, using samples in time domain as features for the CNN model or using connectivity features as well as making further adjustments to the model.

Mycroft - Voice AI

Name: Nicholas Ameyaw Abuaku
Supervisor: Serafeim Perdikis
Category: AI/Machine Learning
Location: Lab 1 desk 67

Abstract:
The aim of this project was to create a virtual assistant using Mycroft AI and Python to code new skills. Mycroft AI is a free and open-source alternative to existing voice assistants such as Amazons Alexa or Apples Siri, it allows users to feel a sense of security about what happens with their data as all the code is freely available for anyone to view edit or build on. With this voice assistant, the aim was to create something that can be used in a small setting such as a bedroom, with tools for controlling media such as Spotify and small games that can be played to keep the user entertained. All skills were coded in Python using various modules and APIs, such as the “Spotipy” module which makes use of the “Spotify” API.

Fashion-Stylist Application using Deep Learning

Name: Oluwatosin Oluwole
Supervisor: Xiaojun Zhai
Category: AI/Machine Learning
Location: Lab 1 desk 72

Abstract:
Fashion Recommendation Systems (FRS) can enhance the shopping experience by providing personalised recommendations, improving customer engagement, and increasing sales. This project aims to research and develop an FRS that allows users to upload an outfit and get recommendations for similar outfits.

This system utilises the DeepFashion dataset, which contains over 800,000 images and detailed annotations of fashion items such as clothing type, colour, texture, and attributes. In addition to this, deep learning techniques such as the ResNet18/50, a convolutional neural network (CNN), approximate nearest neighbours, and embeddings centroid detection have been used to train the model. This project involves using classification techniques to detect the type of fashion item in the image and clustering techniques to group similar fashion items.

This approach is different from other FRS as it focuses on outfit-based recommendations instead of item-based recommendations. By analysing entire outfits, this model can provide more accurate and personalised recommendations that consider the user's style and preferences. The deep learning framework PyTorch was used to train the model using and transfer learning was incorporated to fine-tune the pre-trained models for this task. The evaluation results showed that the model can successfully recommend similar fashion items to an inputted outfit with a high accuracy.

My research contributes to the field of fashion/e-commerce and demonstrates the potential of deep learning techniques and outfit-based recommendations. I also provide an iPython notebook that documents the entire process from data preprocessing to model training and evaluation, making it easy for others to reproduce and build upon work in the future.

Conquerors of Catan - Building an AI player for Settlers of Catan

Name: Harrison Phillingham
Supervisor: Prof. John Gan
Category: AI/Machine Learning
Location: Lab 1 desk 75

Abstract:
The Settlers of Catan (Settlers) is a classic board game that provides a unique and interesting challenge to modern AI methods, such as those found in AlphaGo. In Settlers, players build and develop roads, settlements and cities on a board of resource tiles, scoring them Victory Points of which they need 10 to win. However, the challenge of making an AI player for this comes from multiple factors, including imperfect information, elements of chance and negotiation, and having more than 2 players. In this project, I aim to first produce a fully-playable command line version of the game, and then create a strong AI player with multiple strategies that can be investigated and compared, aiming for human-competitive level or better.

Effects of the Cannabinoid system on synaptic transmission and its uses in enhancing AI

Name: Owen Page
Supervisor: Dr Michael Barros
Category: AI/Machine Learning
Location: Lab 1 desk 76

Abstract:
By definition, artificial neural networks aim to mimic processes that are inherently biological, and yet, since their conception in the middle of the last century, most improvements made to artificial neural networks have diverged from the biological systems upon which they were originally based. With our research, we turn to biological processes for inspiration in improving neural network efficacy.

The Cannabinoid system is a novel chemical system present throughout the body, notably within the brain where, amongst other things, it is responsible for synaptic plasticity, a key component in learning. In response to neural activity, endocannabinoid chemical signals are emitted which propagate in retrograde across the synapse where they bind to receptors (namely CB1R) at the presynaptic neuron. The activation of these cannabinoid receptors triggers the modulation of neurotransmitter release from the presynaptic terminal; depending on several factors, neurotransmitter release will either be depressed or potentiated in response to endocannabinoid signals.

The Cannabinoid system is currently the subject of a great deal of research, particularly within the medical and psychiatric fields, and as such —knowing already that it plays a key role in the brain— the Cannabinoid system presents itself as a strong candidate for exploration in regard to artificial intelligence and biocomputing.

Span based method for named entity recognition

Name: Anyang Liu
Supervisor: Juntao Yu
Category: AI/Machine Learning
Location: Lab 10 desk 11

Abstract:
Named Entity Recognition (NER), also known as "proper name recognition", refers to the recognition of entities with specific meanings in the text, mainly including names of people, places, organizations, proper names, etc. This task has important implications for other downstream tasks in natural language processing. Nested Entities are named entities containing references to other named entities. The traditional annotation approach has many shortcomings in the face of nested entities for which we adopt a span-based annotation approach and design a named entity recognition framework based on it. The first part of this framework determines whether a token is a start or an end token. In the later step, we use the start and end identified in the previous step to enumerate all possible spans and input the span classifier to determine whether the start and end can form a span and the corresponding span type. Finally, the above method can identify all nested entities. We have done preliminary experiments on some datasets and verified that our approach can achieve good performance.

Ai Gobang program based on minimax algorithm.

Name: Wen Yiming
Supervisor: Xinruo Zhang
Category: AI/Machine Learning
Location: Lab 10 desk 13

Abstract:
Gobang is a kind of pure strategy board game played by two players. It is one of the competitive events in the world Mind Games.The aim of the project is to use minimax search trees and a series of evaluation functions to achieve deep thinking, in which ai can weigh multiple possible outcomes like a skilled chess player to determine the optimal strategy.The search tree is a graphical description of the decision behavior of the two sides in turn with the same number of times, which requires depth first search. Minimax search algorithm is a method to find the minimum value in the possibility of failure, which is generally said to minimize the maximum interests of the opponent. This algorithm is usually implemented by recursion.

On the basis of this algorithm, pruning operation is introduced to improve the performance of the program. This algorithm makes many improvements to the general Gobang program. By ordering the weights of nodes and limiting the number of nodes, improve the pruning range to make the results more accurate and save more time. In the evaluation function, the consideration of position points and the weight value of black chess and the weight value of white chess is introduced, so that ai can attack and defend properly. User can choose a different difficulty according to their needs, and a higher difficulty means the ai thinks more deeply.

Gomoku Game

Name: WENRUI WANG
Supervisor: XINRUO ZHANG
Category: AI/Machine Learning
Location: Lab 10 desk 14

Abstract:
Artificial intelligence in games has been essential for many years and has brought many games to life. The success of the games lies in the use of generic AI.
In this project I used Unity as the engine and c# as the programming language to work through the algorithms and development so as to achieve an AI that can play against a human. The first step is to search by analysing the possible drop positions, thus checking the best position based on the highest score using Greedy Algorithms. This approach allows the AI agent to find the best move in each situation and thus win.
At the same time players can also choose their own AI of different difficulty levels to hone their skills.
The game itself has added some extra features such as online battles and saving/reading, as well as a different way of playing from the normal Gomoku rules

Background NPCs

Name: HE RUOFAN HE
Supervisor: Richard Bartle
Category: AI/Machine Learning
Location: Lab 10 desk 16

Abstract:
Non-player characters (NPCs) are a significant part of most computer games. They fill a wide range of roles, such as shopkeepers and barkeepers, and are an important aspect of making a fantasy game world seem more realistic to game players.Their behavior also greatly determines the immersion players get in this game.
The goals of our project are:Make NPC behavior look real, achieve more interesting behaviors through AI and other aspects, and give players more immersion.
The project is developed in Unity and written in C#.Players can interact with different characters here

Visualising Search Algorithms for Educational Use

Name: Nathan Jordan
Supervisor: David Richerby
Category: AI/Machine Learning
Location: Lab 10 desk 17

Abstract:
Implementing search algorithms can be challenging, and developers may encounter complications and make mistakes during development. Additionally, ensuring that the algorithm executes correctly can be difficult, as it can be hard to see how it performs and in what order the nodes are explored.

A search algorithm is a set of rules for traversing networks, graphs, and trees to find specific information. Applications include pathfinding for robotics and games, route planning and machine learning.

To help developers successfully implement search algorithms, an educational tool has been developed that visualises the exploration of multiple search algorithms: Breadth-first and depth-first search, Dijkstra and A*. Furthermore, each algorithm's pseudocode is visible alongside the visualisation, which dynamically highlights the current state of the code line-by-line; these features will assist developers attempting to implement a search algorithm.

Deep Learning based Image Classifier

Name: Yuxin Sun
Supervisor: Xinruo ZHANG
Category: AI/Machine Learning
Location: Lab 2 desk 5

Abstract:
This project based on the deep learning, to show its classification potential by distinguishing dogs' breed.
Users can use one made application to help them identify the type of dogs in the images, and this project has four total trained CNN models can be used. They are AlexNet, ResNet50, yoloV5-6.2 and Inception-V4.When showing the results, the application will show the probability of of each breed it predictions.
If time permission, this application will add one “record function” to help users have a distinct compare and have a easier way to reading the history record.

Minimisation of false negatives in skin cancer detection using computer vision

Name: Abubakar Ahmed
Supervisor: Haider Raza
Category: AI/Machine Learning
Location: Lab 7 desk 1

Abstract:
Early detection of skin cancer is vital for improving patient results. False negatives, where a skin lesion is classified as benign despite being harmful, can lead to delayed diagnosis and medical attention, reducing the chances of successful treatment. This paper proposes a method to minimise false negatives in skin cancer detection using a combination of image processing and machine learning techniques.
The proposed approach involves a three-step process. First, the skin lesion is segmented from the surrounding tissue using a combination of edge detection and region growing. Second, features such as colour, texture, and shape are extracted from the lesion. Third, a machine learning classifier, such as a support vector machine or convolutional neural network, is trained to distinguish between benign and malignant lesions based on the extracted features.
The proposed method was evaluated using a dataset of skin lesion images, and the results show a significant improvement in the detection of malignant lesions with a low false-negative rate. The proposed method outperformed traditional methods such as visual inspection and rule-based classification.
This paper contributes to the development of more accurate and reliable skin cancer detection methods, ultimately leading to earlier diagnosis and better patient outcomes. Further research is needed to validate the proposed approach on a larger dataset and in a clinical setting.

Sports Tracking

Name: jordan copsey
Supervisor: Adrian Clark
Category: AI/Machine Learning
Location: Lab 7 desk 32

Abstract:
Sport has been around for centuries upon centuries, and it is getting more and more competitive. Technology is now a thing of the present and future, but how can we use it to help in the world of sports. Sports analysis can be used to collect data of individual athletes and deliver feedback which can aim to improve sports performance. Sports analysis is used for all that are involved including coaches, players, and analysts themselves.
This project is based on player sports tracking, it involves the use of multi-pose estimation and court detection. This project detects players on a pitch (tennis court) and shows their position on a top down map in real time. This data can be analysed to identify patterns and trends in player behaviour, evaluating the players strengths and weaknesses on their movement around the court. Python is the language used for this project and OpenCV is used for the computer vision and machine learning benefits. Choosing a pose estimation software took a long time as it had to be multi-pose which narrows down the options by a substantial amount. Movenet is used for the pose estimation, it is a fast and accurate model that detects the seventeen key points of a body. Movenet is a model used from TensorFlow, which is an open-source software library for the use of machine learning and artificial intelligence. Canny edge detection and Hough transform are both used to find the dimensions of the court within the video and display them on the 2D map top down map.

Chest X-Ray Machine Learning Analysis

Name: Joseph Nickson
Supervisor: John Gan
Category: AI/Machine Learning
Location: Lab 7 desk 36

Abstract:
X-Rays are often used to provide a clinical diagnosis of a patient's ailments since they are one of the most cost-effective medical imaging examinations that are available. However, one of the issues with X-Rays is that it can be challenging to identify exactly what is being presented – leading to significant false-negative diagnoses.

This project aims to use Chest X-Rays from a publicly available data source to explore machine learning techniques such as KNN, CNN and InceptionResNetV2 to identify and flag X-Rays which could have possible diseases to be diagnosed.

Background NPC's

Name: Huseyin Yuceulas
Supervisor: Lina Barakat
Category: AI/Machine Learning
Location: Lab 7 desk 53

Abstract:
This project is about Background NPC's which are the backbone for many games because they are part of the environment. Although they look like kind of art centralised objects they should involve good pathfinding algorithms in order to react to the actions of a player in various ways and communicating with each other in sense. My Aim is to create a random bar location so as to demonstrate the actions of NPC's who came in and share their normal work day with each other and the player, while interacting with the NPC's it will have a drink for its taste or the liquor. I have used UE5 Which is one of the most powerful game engines with a huge market of free assets. In addition, I have used Blueprint which helped me a lot since the functions run via C++ which helped me majorly making my work tidier. At last, this "program" is a gamified look for NPC decisions

AI and machine learning tool for emotion recognition used in the rehabilitation of neurological patients with emotion recognition deficits

Name: Sylwia Warowny
Supervisor: Vito De Feo
Category: AI/Machine Learning
Location: Lab 7 desk 58

Abstract:
Alexithymia is a personality trait that makes it difficult for a person suffering from it to understand their own emotions and physiological signals. This project is an emotion recognition tool that may help with that. An experiment was created with several video stimuli to elicit various emotions from participants. Added was also a relaxing video to gather baseline emotional state data and survey slides to check the participants' thoughts about their emotional state. The experiment was conducted on healthy individuals with the use of facial emotion recognition, eye tracker, and GSR to gather data needed for the machine learning classifier. Several methods including MDS and factor analysis were used to feed the algorithm with training data by mapping them to a 2D space, with valence on the x-axis and arousal on the y-axis. The machine learning algorithm classified whether an emotion was of positive or negative valence and high or low arousal. This can be further improved by classifying an emotion more precisely than just the four outcomes. The intention of this program is to use it with alexithymic patients as neurorehabilitation.

Emotion detection wristband

Name: Zhao Li
Supervisor: Daly, Ian P
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
Nowadays, emotion recognition can be performed in many ways, such as EEG based emotion recognition, speech-based emotion recognition, text based emotion recognition. However, it is difficult to recognize emotions through peripheral physiological signals in the convenient field. The purpose of this project is to develop a wristband that can perform emotion recognition based on physiological signals on the wrist. So, for the development of the model, this project selected PPG and GSR signals from the DEAP dataset. The DEAP dataset contains physiological and EEG signals recorded from participants while they were watching music videos that were specifically chosen to elicit different emotional responses. The development process is to preprocess the signals and extract relevant features using signal processing and machine learning techniques. Then, training and evaluating different models using the extracted features to regression learning valence arousal and dominance, Finally, it classified emotions by VAD emotion model, such as happy, sad, angry, etc. This project can infer emotional state, which is helpful to improve self-awareness and emotion management ability. It has applications in enterprises, social occasions, children's education and medical fields, which can help people better understand their own and other people's emotional states, and bring convenience to people's life and work.

Machine learning for maze generation and solving

Name: Muqing Ge
Supervisor: Xinruo Zhang
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
This project is based on a game framework called pacman, and the aim is to find methods of the generation and solving of maze levels of the game.

About the game, the winning condition is to eat all rewards hidden in the game. In the meantime, the agent needs to avoid chase from four ghosts.

For maze generation, I used sinGAN-Generative Adversarial Network trained on one single image. I used one of its modified methods which is based on tokens to adapt video game levels generation. It can generate significant maze levels from only one example to achieve target that use limited data to do machine-learning.

For maze solving, I used A* algorithm plus expectimax. A* algorithm takes a heuristic function as an argument. It can help collecting all rewards fast. Expectimax algorithm is a game theory, it can find the best interests in the game tree and can help agent escape enemies.

Socially compliant robot navigation using deep reinforcement learning

Name: Wenxuan Xiong
Supervisor: Liang Hu
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
In recent years, mobile robots have been used more and more widely in life. At the same time, the navigation of mobile robot in complex environment has become a hot topic in related fields.

This paper proposes a mapless navigation scheme for mobile robots using deep reinforcement learning, addressing the over-reliance on maps in traditional navigation methods. The scheme utilizes laser distance sensors to enable the robot to navigate to the target and avoid dynamic obstacles on the map. To enhance the robot's obstacle avoidance ability, the reward function was optimized and improved. During DRL training, the map planner takes in the laser distance, relative distance from the robot to the target and the robot's current action as input, and outputs the next action for the robot. We compared the performance of the ddpg algorithm and the sac algorithm in robot obstacle avoidance, and found that the model trained using the sac algorithm is more stable and accurate. Two dynamic obstacle motion modes were employed during training, uniform straight line and uniform circular motion. Despite the influence of these different movement modes, the model achieved an accuracy rate of over 80% after 1000 training iterations.

Email spam detection

Name: Yufei Ma
Supervisor: Ian DALY
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
Email is one of the most frequently used communication tool for working and chatting. However, an increasingly large amount of spam has affected people's working efficiency, and has made people suffer from defrauding. Thus, it is necessary to detect email spams. In this project, it aims to detect email spam using deep learning method and Natural Language Processing techniques. Enron dataset is selected as email dataset, containing ham and spam emails. First, the data is preprocessed and transformed into vectors through natural language processing approach. Then, the data classification is processed through deep learning network: Long Short-Term Memory (LSTM) with the precision of 94.04%. Next, more complex model Bi-LSTM with Global Vectors and Bi-LSTM with Attention Mechanism are applied, with precision of 93.01% and 91.14% respectively, showing that GloVe and Attention Mechanism have little progress in binary classification.

Smart Wristwatch for Emotion Monitoring

Name: Junyi Liu Liu
Supervisor: Daly, Ian P
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
This project develops an emotion monitoring algorithm based on physiological indicators such as heart rate and constructs an emotion recognition model through machine learning techniques. The open-source authoritative DEAP (Dataset for Emotion Analysis using Physiological signals) was used to provide training and testing data, and the random forest algorithm was selected for classification. The four coordinate systems of the Valence-Arousal Emotion Model were used to achieve the four classifications of emotions. Test results show that the algorithm is more than 30% accurate, has high computational speed, is easy to implement and practical, and is a reliable tool for monitoring individual mental health and related research. A companion smartphone application was also developed to display the user's emotional state.

Machine Learning Techniques For Precision Agriculture

Name: Jianghan Zuo
Supervisor: Abolghasemi, Vahid
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
Agriculture plays a vital role in all aspects of any country: crop exports play an indispensable role in the economic growth of any country, residents need high-quality food to meet their daily needs, animal husbandry and production also need a lot of feed and raw materials.
However, with the increase of population, frequent changes in climate conditions and limited resources, traditional agricultural methods are difficult to meet the current population's demand for crops.
Precision agriculture can make up for the shortage of traditional agriculture by means of technology. Machine learning is an important part of precision agriculture. Within last fifteen years machine learning technology in precision agriculture has made significant progress, machine learning can benefit farmers by providing accurate judgments and suggestions about crops through its algorithm, thus minimizing farmers' losses and improving production efficiency.
The project aims to use machine learning technology to achieve crop classification by processing and classifying the image dataset of crops, such as identifying whether crops are healthy or unhealthy, and what is the disease of crops.
Up to now I have found several high-quality data sets suitable for my project, and I also have a deep learning (a branch of machine learning, which can better process pictures) model for processing and classifying data sets. Under the processing of GPU, the training accuracy can reach 80% at this stage, and the training time of each epoch has been reduced from the initial 3 minutes to about 40 seconds.
At present, the need for improvement is to change the model parameters to obtain better results and compare the existing CNN model with other models to obtain a better understanding of deep learning.

Machine learning for predicting temperature for weather derivatives

Name: Weixu Li
Supervisor: Morteza Varasteh
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
Climate change and the increase of extreme weather events have heightened the weather risk faced by agriculture, making weather risk management a crucial topic of concern.One potential solution to mitigate this risk is through the use of weather derivatives, but accurate temperature predictions are required for effective pricing.
This paper utilizes the Auto-regressive Integrated Moving Average Model in time series analysis to analyze the trend of daily average maximum and minimum temperatures in Xi'an over the past decade. Significance and residual tests are conducted to evaluate the effectiveness of the fitted model.Additionally, a long and short-term memory network temperature prediction model is used to predict daily maximum temperature.This model, which features complex memory cells and considers time correlation of meteorological data, is effective at maintaining long-term memory of time series.
Finally, the two models are compared and analyzed, revealing that the Long Short-Term Memory network model accurately predicts future temperature changes in Xi'an.As a result, the proposed forecast model can aid in the further study of weather derivatives. With the increasing frequency of climate change and extreme weather events, effective weather risk management is becoming increasingly vital,and this research represents a step forward in developing the necessary tools to achieve this goal.

Machine Learning for driving assistance in mobile platform

Name: Yunxiang Zhang
Supervisor: Amit Singh
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
One of the mean reasons which caused a large amount of traffic accidents is driver's attention too focused on a portion of the road and neglect other parts of the road. Thus embedded artificial intelligence technology is used in assisted driving to reduce traffic accidents. Mobile device like Raspberry Pi is a convenient platform to deploy this function.
This project aims to implement functions of road traffic information collection, integration and prompt to assist drivers to drive more safely and reasonably. The core functionalities contains detecting regular traffic participants; issuing a reminder to driver in the case of a large number of pedestrians appearing in front of driver's car; issuing an approach alarm to driver in the case of a small distance to obstacle ahead; real-time operation--runs in real time on mobile devices ,mainly Raspberry Pi and Android phones.
In functionalities implementation, Tensorflow object detection network is combined with yolov5 to improving detection accuracy of regular traffic participants. And a distance measuring algorithm is used to measuring the distance from driver's current position to obstacle ahead.
All these used algorithms are encapsulated into a executable program runs on Raspberry Pi connected with a camera and a display, which work as a mobile driving assistant platform and can be mounted on the car's centre console.

Smart city based on kv260

Name: Chengao Li
Supervisor: Xiaojun Zhai
Category: AI/Machine Learning
Location: Remote NWU on Zoom

Abstract:
The complexity of urban transportation is increasing rapidly, and the use of deep neural networks is becoming more common due to their high accuracy in various applications. FPGA's high energy efficiency and computing power have emerged as an excellent acceleration platform to perform such tasks. To this end, I completed a flexible video processing framework on the KV260 platform, which can be utilized in intelligent camera applications for smart city transportation systems.
The primary objective of this study was to develop an automatic detection and selection mechanism for the best DNN model according to the application scenario, be it a car or a pedestrian. The framework also supports real-time performance monitoring through a graphical interface on the monitor, providing useful information on power consumption, FPS, temperature, CPU/memory, and other system information.
I deployed models trained through Vitis AI on the KV260 acceleration platform and designed plugins to achieve scene recognition. The results demonstrated that the framework can not only detect application scenarios automatically but also achieve compatibility with other models in the Vitis AI model zoo.
These findings are of significant importance as this project can effectively analyze urban traffic data and better assist in urban traffic construction. The developed framework can provide an efficient solution for traffic analysis in smart cities, providing real-time information to traffic managers for quick and accurate decision-making. Furthermore, it can help develop traffic management systems with advanced AI capabilities to enhance urban traffic management.

Financial Time Series Forecasting based on SVM and other ML techniques

Name: Kai Wen Ng
Supervisor: Dr Morteza Varasteh
Category: AI / Machine Learning
Location: Lab 1 desk 5

Abstract:
Financial time series forecasting is a critical task for financial analysts, traders, and investors. Accurate predictions of stock prices, exchange rates, or other financial metrics can facilitate informed investment decisions and mitigate risks. In recent years, machine learning techniques have emerged as powerful tools for forecasting financial time series. This paper explores the application of Support Vector Machines (SVM) and other machine learning techniques for forecasting Facebook stock data. The paper provides an overview of SVM methodology and compares its performance with other popular machine learning algorithms, such as Long Short-Term Memory (LSTM).

Furthermore, the project discusses the challenges of financial time series forecasting, including the need to consider outliers, setting parameters for machine learning models, and the methods used to train the model. A GitLab repository containing the technical documentation, project code files, and reports is attached, and the project planning process using Jira is also outlined.

In summary, this project focuses on the critical components required to implement a financial time series forecasting tool using machine learning techniques.

Web development project focused on delivering a great user experience

Name: Sarah Muleba
Supervisor:
Category: AI / Machine Learning
Location: Lab 1 desk 31

Abstract:
With the growing demand for easy access to great movies, film reviews have never been more important to the average consumer. With millions of people having access to streaming services such as Netflix and Amazon Prime, which all have thousands of different options, choosing something to watch can become overwhelming. Many opinions about movies can be found on social media sites, the most popular being Twitter. The superhero genre contains some of the most popular movies, with 11 of them being among the top 30 highest-grossing movies of all time. So I decided to create a website that focuses on using Twitter sentiment analysis to determine the sentiment of a specific superhero movie and translate that into a good or bad review for the user. It allows a user to know what Twitter users' opinions are without having to read through all the tweets themselves, saving them time and therefore making movie selection easier.

Create a Kahoot Clone (

Name: Tomi Ashiru
Supervisor: Sangeet Saha
Category: AI / Machine Learning
Location: Lab 1 desk 50

Abstract:
The development of a web application called "X-Quiz It!". This project involves the creation of a Java-based Kahoot quiz clone. The aim of this project is to provide users with an engaging and interactive platform to create, share, and participate in quizzes.

The development process encompasses various stages, starting with planning and designing the user interface. Wireframes and mockups are created to outline different UI components, such as the landing page, quiz creation page, and quiz-taking page. Additionally, the design phase includes selecting a suitable colour scheme, typography, and other design elements in line with the project's objectives.

Following the design phase, the application logic is developed, and features like real-time scoring, quiz feedback, and user authentication are integrated. To ensure a secure and user-friendly experience, the application implements industry-standard security protocols like OAuth 2.0 for user authentication, allowing only registered users to access quiz creation and participation features.

Furthermore, the "X-Quiz It" web application harnesses the power of Java for backend operations, HTML, CSS, and JS for crafting a responsive and visually appealing frontend, and MySQL for efficient database management. As a developer and designer, my mission is to utilize my expertise to create a groundbreaking e-learning platform that rivals Kahoot and redefines the online learning experience. By offering an immersive and effective learning platform, "X-Quiz It" aims to captivate and inspire users, fostering a vibrant and supportive educational community.

An affective therapeutic game

Name: Kaitlan Berg
Supervisor: Dr Ian Philip Daly
Category: AI / Machine Learning
Location: Lab 10 desk 8

Abstract:
The importance of the 4 attachment styles, identified by Bowlby, lies in the fact that they can impact an individual's relationships, both romantic and platonic. Understanding one's attachment style can help individuals identify patterns in their relationships and work towards their healthy development of them. It can also aid in understanding the needs and behaviours of others, which can lead to more empathic and effective communication. Secure attachment is where the individual is comfortable with emotional intimacy. Someone that is Anxious avoidant may have difficulty expressing their emotions and avoid emotional intimacy. Alternatively, Anxious resistant Disorganised however have a mixture of the two leading to a push-pull dynamic in most of their relationships. My game offers an effective, “soft” diagnosing, therapeutic tool. It could be effective for those suffering from one of the variants of spectrum disorders or just struggling with expressing emotions.

This game identifies your attachment style by asking questions that are taken from official psychology journals and revamped to match the theme of the dungeon. This innovative approach to assessment combines fun and engaging gameplay with a psychological evaluation, providing players with insights into their attachment styles. The use of a game as a means of assessing attachment styles has the potential to reach a wide audience and promote greater awareness of the importance of attachment styles in relationships.

After identifying your “diagnosis” the player is presented with a game, designed with that player in mind. Mainly centered around fighting your way out of a dungeon, this game populated the dungeon based on your ‘diagnosis’ with weapons and enemies playing to both the weaknesses and strengths of the given attachment style. Intending to make it clear to the player the impact it can have on relationships of things in a constructive, easy to comprehend way.

Big 2 Card Game

Name: Joeson Hoang
Supervisor: Jarchi Delaram
Category: AI / Machine Learning
Location: Lab 2 desk 3

Abstract:
Big 2 or Dai Di in Chinese is a card game for up to 4 players. It's a game which tests your strategy and wit to rid yourself of your hand and achieve victory over the other players. A game that I have won since childhood nonstop, looking for a challenger to best me. Through practice against AI to get an understanding of the game, to playing against others in the multiplayer mode to test your mettle against others. This game is made in 2D for weaker machines to also be able to run the game with simplified controls of selection that also has indications to show what one can play and is unable to play. Java has been used for its ability for calculations being superior to python, with the addition of having more experience of Java based programming. The AI has been set at a level of a new player who plays what they can, forcing the player to exercise their intelligence to combat those that may have better luck regarding having stronger, more powerful cards. Battling brute force of power with strategy.

Function verification of NFV networks based on distributed ledger

Name: Xiaotian Pu
Supervisor: Miss. Mays Fakhri Hamdullah Al-Naday
Category: AI / Machine Learning
Location: Lab 2 desk 4

Abstract:
By integrating network functions onto industry-standard servers, switches, and storage hardware and providing an optimized virtualization data plane, NFV enables administrators to replace traditional physical network devices with software running on servers, reducing cost, power consumption, and complexity. NFV Virtualization network functions include exchange element, mobile network node, home routing operation, set-top box business, tunnel gateway element, flow analysis, service , guarantee, SLA monitoring, testing and diagnosis, NGN signal, aggregation and network scoping capabilities, application optimization, safety. Function verification of NFV networks based on distributed ledger is a growing area of research that is gaining attention in the field of network virtualization. By using distributed ledger technology, such as blockchain, to securely store and share data, NFV networks can be verified for their functional correctness. This verification is achieved through the consensus-based validation of the ledger, allowing for improved scalability, resilience, and security of the networks. Additionally, the distributed ledger ensures that the NFV network maintains its functional correctness even in the presence of malicious actors. This technology is becoming increasingly important in the field of network virtualization as it allows for efficient and reliable verification of NFV networks. Function verification of NFV networks using blockchain technology can be an effective approach to ensure the accuracy and integrity of network functions. This approach combines blockchain's distributed ledger technology with NFV's virtualization technology to provide a secure and reliable verification platform. Through the blockchain, data is securely stored and stored in a distributed ledger, while NFV provides a virtualized environment in which the network functions can be tested and verified. The combination of these two technologies provides a secure and reliable verification platform, allowing for the verification of network functions without the need for manual intervention. This approach can be beneficial for a variety of applications, from the verification of financial transactions to the verification of network functions in NFV networks.

Name: Remi Idowu
Supervisor:
Category: AI / Machine Learning
Location: Lab 2 desk 10

Abstract:
In computer science, a search algorithm is any algorithm for finding an item with specified properties among a collection of items. The items may be stored individually as records in a database, or maybe elements of a searchable data structure, such as an array or a search tree. There are many different types of search algorithms, each with its advantages and disadvantages. The most common search algorithm is the linear search, which checks each item in the collection one by one until it finds the desired item. Search algorithms are a type of algorithm that is used to find a particular item in a given data structure. Search algorithms are being used in a variety of applications, including but not limited to databases, network communication, artificial intelligence, and software engineering. There are a variety of search algorithms. The most common search algorithms are:

- Linear search
- Binary search
- Breadth-first search
- Depth-first search

Google Maps uses search algorithms to find the fastest route between two points. The algorithms take into account the distance between the two points, the traffic conditions on the roads, and the speed limit on the roads. Google Maps will sometimes give you multiple route options and it is up to you to choose the best route based on your preferences.

This project offers a straightforward and user-friendly map interface that is similar to Google Maps. Java Swing and search algorithms are used to provide accurate navigation between two selected locations via textbox and button input. The program is designed with ease of use in mind, making it an ideal choice for those who want reliable navigation between multiple destinations.

An Android App for Dog Breed Recognition Using Deep Learning Models

Name: Adetomiwa,Jordan Osinloye
Supervisor: John Gan
Category: AI / Machine Learning
Location: Lab 2 desk 22

Abstract:

There are many times when I see a dog and wonder what sort of breed that dog is. There are also times when I may be on the internet and come across an image of a dog and wonder what sort of breed it is. The aim of this project was to build an application that can predict the breed of a dog base on an image that is selected to be predict.

Through the use of artificial intelligence, I built a mobile application that allows a user to be able to take an photo or upload a photo of a dog and find what breed that dog is. This is done through an Artificial Intelligence technique called Image Classification. By training a Convolutional Neural Network (CNN) model on a large dataset of dogs it is able to learn what features make up each specific dog so when it sees an image of a new dog it is able to classify that dog based on the dataset it has learned from. Through the use of tools such as TensorFlow and Android Studio I was able to create the model and deploy on the model into an application.

Name: BAILEY BRUCE-MCCANN
Supervisor: Michael Barros
Category: AI / Machine Learning
Location: Lab 2 desk 28

Abstract:
Within the last 5 years AI has become increasingly important in the biomedical field, specifically around imaging techniques such as the development u-net for biomedical image segmentation. Generative Adversarial Networks are an established technology in AI which incorporate game theory within its training process, pitting a generative model against a discriminator during training to improve the quality of the generators output making less distinguishable from the real images it is trying to emulate.
This project aims to contribute to the integration of in-vitro experiments and simulations of biological networks by developing a model to perform digital signal reconstruction. Representing networks in the brain using deep learning in the form of Generative Adversarial Networks. I have researched and developed a model based on the Pix2Pix network, training it on synthesised images of cell cultures in the brain providing a visual representation of its corresponding connection graph as the labelled image.

IoT Smart Speaker

Name: Ratnesh Kumar Jha
Supervisor: Hossein Anisi
Category: AI / Machine Learning
Location: Lab 3 desk 16

Abstract:
With the development of smart home technology, IoT devices have become an integral part of modern homes. The IoT Smart Speaker is a revolutionary device that takes this trend to the next level. The perfect combination of affordability and versatility, our speaker supports both Alexa and Google Home.
The Smart IoT Speaker uses cutting-edge technology to allow users to access their favourite music, audiobooks, and podcasts through voice commands. Thanks to its elegant and modern design, it fits perfectly into any interior. But the IoT Smart Speaker is more than just a smart speaker. It also acts as the central hub for the entire smart home. Thanks to the integration with Alexa and Google Home, our speaker can seamlessly control all your smart home devices, making your life easier and more efficient. With the ability to receive voice commands, our smart IoT speaker takes convenience to a whole new level. It also supports a custom Python-based speech recognition engine, making it a very accurate speech recognition system.
Besides controlling smart home devices, the IoT smart speaker can also connect to surrounding monitors to ensure your home is always safe. It can even notify your contacts when an anomaly is detected, giving you and your loved one's peace of mind. Choose our smart IoT speaker to enjoy maximum comfort and performance. With advanced features and an affordable price, it's the perfect addition to any modern home.

Creating a smartphone app for locating the Essex woods trails

Name: MAPALO ZENGANI ZIBA
Supervisor: Morteza Varasteh
Category: AI / Machine Learning
Location: Lab 7 desk 15

Abstract:
The portability of mobile devices has made it feasible to create and utilise navigational maps and map-based applications. There is a need for portable pedestrian navigation apps because the majority of mobile map applications now are created for motor vehicles. During hiking, there is a high chance of having an accident. As a result, the climber has to have some gear so they may help themselves preventing them from becoming lost in order to protect their safety while trekking.

Correspondingly, to track hikers as they explore the trails in Essex Woods, hiking apps with GPS trackers and a GUI interface are required. I will create a mapping smartphone app that utilises an existing web mapping service and database to enable navigation and route planning easier in a number of forests in Essex. Users should be able to add new trails to the database using the app by utilising the GPS sensors on their phones. This project should demonstrate basic app development skills, online service utilisation, including database connectivity, and GUI programming.

Artificial Muscle Controlled Bionic Robot Hand

Name: Wenda Liu
Supervisor: Dr. Luo Cunjin
Category: AI / Machine Learning
Location: Lab 7 desk 31

Abstract:
The drive of traditional robot is mostly controlled by conventional electromagnetic motors, pneumatics or hydraulics. They cannot be as agile as natural muscle because when they move, the magnetic field or air/liquid flow generate a resistance or inertance.
This project is a robot hand controlled by Artificial Muscle (AM). AM is a kind of material that mimic natural muscle. Owing to its high flexibility, versatility and power-to-weight ratio compared with traditional rigid actuator.

In this report, EAPs are used as muscle strips, linking bones to realize the control of AM robotic arms. The length and volume of EAPS will change through voltage and current. Therefore, this project carried out the mathematical modeling of the hand-shape manipulator through MATLAB tools, to record its forward/inverse kinematics and D-H parameters. Then, calculate the voltage required by EAPS material to realize the mutual movement between bones, and finally use the AM manipulator to simulate a specific posture.

However, because this is a relatively new technology, I couldn't get this material right now. On the open day, I'm going to demonstrate it by MATLAB simulator.

HTTPS Cache and Proxy

Name: Calum McDuff
Supervisor: Sebastian Holder
Category: AI / Machine Learning
Location: Lab 7 desk 44

Abstract:
Proxy servers act as intermediaries between a client and a webserver by forwarding traffic.

There are 2 main types of Proxy Servers:
- Forward Proxy
- Reverse Proxy

Whilst conceptually similar, the two types differ in that a forward proxy imitates the client when forwarding traffic whereas a reverse proxy will imitate the destination server.

Proxy servers are commonly store copies of previously requested websites. This means the next time a cached website is requested, the proxy can send the cached version, saving both time and bandwidth.
Due in part to wide spread adoption of HTTPS, encryption is now extremely prevalent on the web. This raises issues for forward proxies as it means in a typical configuration, the vast majority of traffic passing through is unable to be analysed by the proxy. This in turn means caching, malware protection and keyword based content filtering is unable to be performed.

To combat this, proxy servers may be configured to perform a “man in the middle” attach (a form of cyberattack) on its clients. In order to perform this it requires configuration on each individual client to unconditionally trust the proxy server via installing a root certificate which the proxy owns.
This is problematic from a security and ease of use standpoint. From the security standpoint, if the root certificate is stolen or compromised, any malicious actor could imitate the proxy server. This could then be used to collect potentially sensitive data such as passwords in plain text (unencrypted) form. From an ease of use standpoint, due to the root certificate requiring installation on any client which wishes to use the proxy, it increases the workload on the system administrators.

If you would like to know more, please ask me!

iotHOME Assistant System

Name: Simon Ojonugwa Malih
Supervisor: Dr. Manoj Thakur
Category: AI / Machine Learning
Location: Lab 8 desk 8

Abstract:
The IoT market is rapidly growing with large companies such as Ring and Phillips already capitalising. A big aspect of the IoT market is the home assistant sector. Companies are allowing customers to use their home management systems to manage their homes remotely via a mobile or web-based application which can range from turning on lights to opening the garage door.

However, this means that the user is being charged a large sum of money for the initial purchase of the system and then additional monthly payments thereafter to use a system which the user does not have full control over nor can guarantee the security of. This project aims to solve that problem.

iotHOME is a DIY home assistant system which enables users to control IoT devices in their homes remotely via a mobile application while also providing a security system which notifies the user when a person enters their home without permission. The aim of the project is to create a streamlined and convenient user experience where they can control their IoT devices remotely via the power of WIFI while also being able to maintain a secure home. This system is intended to be used by users who desire a more customisable and cheaper alternative to a fully managed home assistant experience.

SDN based wireless network in train

Name: Fan Yujia
Supervisor: Walker Stuart
Category: AI / Machine Learning
Location: Lab 8 desk 17

Abstract:
Currently, the UK rail wireless network faces significant challenges, including signal interference, slow connection speeds, and low reliability, which can lead to delays, disruptions, and safety concerns for passengers and staff. With the developing of SDN technology allows for the centralization and virtualization of network control, enabling more efficient management of network resources. This approach can dynamically reroute traffic and optimize real-time network configurations, reducing latency and improving reliability. So, this project aims to explore the benefits of using Software-Defined Networking (SDN) in wireless networks for railways, as a solution to these challenges.
This project uses mininet-wifi + ryu to simulate and collect data. And the findings show that the proposed method significantly improves network performance in terms of latency and reliability compared to other methods.
Overall, this article provides valuable insights for researchers and practitioners interested in the application of SDN in the railway industry, and highlights the potential of SDN to address the challenges of modern train wireless networks. And future research could try to explore the integration of SDN with other emerging technologies, such as edge computing and 5G.

No-battery pond pump

Name: Ziyu Zhao
Supervisor: John Woods
Category: AI / Machine Learning
Location: Lab 8 desk 27

Abstract:
Solar energy is a good choice for human which can absorb sunshine through solar panels which can transfer the energy form and store it in battery. This project is about controlling a very low power microcontroller-ATTiny85 with a view to see how long the device can run from small batteries, solar panels etc. And this project aims to control when and how long the attiny85 chip work and slegp to control the pond pump work and improve the solar energy utilization. Microcontroller-attiny85 controls the process of charging and discharging, which is also the core component of the whole project.
There is an AVR PROGRAMMER with chip attiny85 plugging in the computer like an USB, which is used to connect the software and hardware together. Attiny85 chip is programmed by Arduino IDE programmer with C language. In the code part, it is available to take different strategies on the length of chip's sleep time based on the rate of incoming energy to turn on the load at the right time and turn it off. In the physical part, there are a solar panel, supercapacitor and attiny85 chip in parallel.
During the entire project period, four chip-control strategies have been tested and compared. They are threshold activation(Threshold), sleeping for fixed times"Fixed"), adaptive('Adaptive') and directly('Direct).

The Arrow That Always Comes Back

Name: Yuhang Sun
Supervisor: Dr John Woods
Category: AI / Machine Learning
Location: Lab 8 desk 29

Abstract:
Wireless Power Transfer (WPT) is a rapidly developing and dynamic field with many practical applications in the healthcare, automotive and consumer electronics industries. This article discusses a WPT system using resonant coils that has been specifically designed for use in archery.

Lost arrows are a common occurrence in archery and can result in significant costs to archers. The proposed WPT system has the potential to recover lost arrows, potentially minimizing replacement requirements and saving archers money. This is achieved by using a primary and secondary coil operating at 200KHz and a rectifier circuit and parallel filter capacitor on the secondary. The rectifier converts the output to DC and the filter capacitor minimizes ripple, allowing the LED or buzzer to be powered wirelessly.

Based on the experimental results, the WPT system proposed in this study shows promise for use in archery, as it uses resonant coils operating at 200KHz and is capable of recovering lost arrows through LED lights or buzzers.

In summary, the resonant coil WPT system presented in this article offers a practical and cost-effective solution for wireless power transmission in archery, with the potential to recover lost arrows and reduce costs for archers. Further research should investigate the scalability and adaptability of the system for use in other applications outside of archery. This includes investigating the potential of the system to recover lost items in other industries, and improving its efficiency and economy by optimizing key system parameters.

Java-Based Gomoku Game: Enhancing Strategy and Tactics with AI Algorithms

Name: Shutao Zhang
Supervisor: Ramy Hammady
Category: AI / Machine Learning
Location: Remote NWU on Zoom

Abstract:
Gomoku, also known as Five-in-a-Row, is an ancient board game where two players take turns placing black or white stones on a board. The objective of the game is to form a continuous row of five pieces horizontally, vertically, or diagonally. This project designs a Java-based Gomoku game that provides both single and multiplayer game modes. The game includes functionalities such as saving and restoring game states, switching game modes, and adhering to all basic Gomoku rules. Players can share saved game codes with friends and the game automatically declares a winner if five stones are connected on the board. To enhance the game experience, the project incorporates an Evaluation Function and Minimax Game Tree Algorithm, enabling the computer to calculate the best move in the artificial intelligence mode. This addition makes the game more challenging and enjoyable for players.

Application of Machine Learning in Stock Price Prediction

Name: Yuning Wang
Supervisor: Kanellopoulos Panagiotis
Category: AI / Machine Learning
Location: Remote NWU on Zoom

Abstract:
Use machine learning to predict stock market price fluctuations and give users sound advice. Users can select their own portfolio of stocks and the model will predict the ups and downs of these stocks and give them a recommended percentage of positions, with a probability of profit for each stock.

5G NR Positioning Using SRS

Name: Meilin Ji
Supervisor: Zilong Liu
Category: AI / Machine Learning
Location: Remote NWU on Zoom

Abstract:
Recently, several positioning solutions based on 5G NR have been proposed. 5G R16 defines the positioning methods for uplink and downlink TDOA; in the meanwhile R17 will further improve the accuracy of positioning to the centimeter level, which will improve the lives of consumers and bring greater economic benefits to various industries. This project realizes and verifies an algorithm to calculate the position of a user equipment (UE) using an NR uplink positioning reference signal (SRS). The approach used is observed time difference of arrival (OTDOA) positioning approach based on the reference signal timing difference (RSTD) or time difference of arrival (TDOA) measurements to perform multilateration or trilateration by applying the theory of hyperbolas, which estimates the position of UE within a network of gNodeBs (gNBs). The project also develops a simulation platform where the transmit signal & channel generation, time delays and the signal processing algorithms cover.

Keeping Software Running Forever

Name: Robert Paton-Smith
Supervisor: Dr Adrian Clark
Category: App Development
Location: Lab 1 desk 13

Abstract:
Software rot, a phenomenon whereby a codebase loses functionality over time due to negligent maintenance and architectural degradation, is a widespread issue that has and will affect almost all digital products on the market. It is in the economic interest of those who develop such software to have a way of ensuring that what they are working on is robust, reliable and impervious to said software rot. For this reason, the question “how can software be written so that it will run forever” has been asked repeatedly. With that in mind, the author proposes that guidelines could be determined and followed to achieve such a goal. Failing that, sticking to these guidelines could at least slow down the growth of rot within a codebase and allow its effects to be intervened and counteracted retroactively.

Throughout the project, the author has explored a subset of publicly available software repositories and attempted to compile and run each on one or more modern systems. In doing so, information was gathered that would prove vital in working towards these guidelines. A vast array of issues with these code bases were encountered, including but not limited to the use of deprecated external libraries, missing files critical to running a program, and code that operated assuming fundamental aspects of a system for graphical output, which are no longer supported.

By the end of the project, the most appropriate solution, where possible, had been found and employed for all of the explored repositories. Each solution has been documented in the report and will be made available on publicly viewable GitHub pages; the effectiveness of each example can be gathered by how well they perform as time progresses. Most importantly, a comprehensive set of guidelines has been written and detailed based on the knowledge accrued throughout the project.

Name: Jamie Ogundiran
Supervisor: Sefki Kolozali
Category: App Development
Location: Lab 1 desk 14

Abstract:
The use of smartphones has increased exponentially in recent years, due to the accessibility and the convenience of mobile applications. Although, there are about 3.04 million mobile applications globally (alvin, 2021), a mobile app that satisfies the end-user and the client is rare to find. The task of satisfying the user needs is known to be a difficult task to accomplish for the developer. Comprehending the underlying problems, this project aims to create a mobile application that is engineered with a user-centered design approach to provide a seamless experience for both customers and employers. This is achieved by analyzing the data collected through user interview, use cases and competitive audit.
The mobile application which is iOS-based is a nail-salon appointment booking application, the main concept of the app is that it has a live interactive booking system, a simple database manipulation system for the employer/admin for the employers with no technical background and a live salon statistics system that displays status of the energy consumption rate and the revenue of the company. Moreover, the project includes other extra features such as social media integration and integrated geolocation function to satisfy the user needs in which we will discuss in this paper.
The mobile application is developed using the react native framework with Firebase Fire store as the database management system.
Overall, the documentation and mobile application produced in this project are highly valuable resources for developers seeking to create user-centric mobile applications. And it represents an important step towards enhancing the overall quality of mobile applications.

Whiteboard

Name: Li Qinzhao
Supervisor: Junhua LI
Category: App Development
Location: Lab 1 desk 42

Abstract:
The Web Whiteboard is an online drawing tool based on Web technology that enables drawing and writing functions on a Web page similar to those of a traditional whiteboard. It is commonly used in educational, presentation and collaboration scenarios and provides a convenient and easy platform for users to create and communicate.The web whiteboard is very flexible in its use, allowing users to draw and write on the whiteboard using a variety of tools and functions. For example, users can use tools such as brushes, shapes, text, colour, eraser, undo/redo, zoom, drag and drop to draw a variety of graphics and other content. Users can also customise the configuration to suit different application scenarios and needs to meet different creative and communication needs.The advantage of the Web Whiteboard is that it does not require users to download and install any software, just open the web page in the browser and use it. It also supports multi-person collaboration, allowing multiple people to create and edit on the same whiteboard at the same time, facilitating teamwork and other activities.The web whiteboard is based on a native implementation of HTML5 and JavaScript technology. Whether you are a teacher, student, speaker or team member, the web whiteboard can be used to create and communicate more vividly, intuitively and effectively.

Collaborative White Board

Name: LUO YIBEN
Supervisor: He Jianhua
Category: App Development
Location: Lab 1 desk 43

Abstract:
This whiteboard project is designed to make it easy for people to record things. People can add cards or notes to the whiteboard to record daily inspiration and goals or bits and pieces of trivia. It is also possible to record links to websites when recording excerpts from other websites. Interesting pictures, music or videos can be added to the whiteboard for viewing and playing back. People can choose brushes to draw or write with, and the colors and thickness of the brushes can be changed. The project also allows multiple people to collaborate and interact with others online through the whiteboard, sharing interesting insights together with others.

Web development project focused on delivering a great user experience

Name: Liang Shuang
Supervisor: Zhai Xiaojun
Category: App Development
Location: Lab 1 desk 46

Abstract:
The project aims to develop a project management platform for large enterprises to improve their project management efficiency and effectiveness. The platform will offer four roles, namely the platform side, the company, project managers, and employees. The platform side will manage user accounts, while the company can manage its managers and employees, check the progress of projects, and analyse data. Project managers will be able to assign tasks to team members and view the progress of team members' tasks, as well as edit the manual, mission charter, and rules. Employees will receive assignments from managers and upload project-related documents, such as word documents, to the platform. The platform will promote standardized management, facilitate evidence-based business management, and prevent project failure caused by project managers or employees passing the buck.

This project was built using the PyCharm IDE. The back-end language is python and the system framework is Django. Django is an open source, advanced Web application framework written in the Python language. It is designed to be simple, efficient, and quick to develop complex database-driven Web applications. Has a powerful URL routing system and view function, can be convenient for programmers to write code, and easy to program maintenance. Django provides a built-in password hashing algorithm to ensure the security of user passwords.

Graphical Mobile App to Compare Sorting Algorithms

Name: Luc Stradling
Supervisor: Manoj Thakur
Category: App Development
Location: Lab 10 desk 4

Abstract:
The goal of this project is to create an application that would enable people to compare sorting algorithms side by side visually. This could be helpful for computer science students or those in the industry as a learning tool or even just for those that are generally interested.
This program would allow the user to enter a string of numbers and then compare them using an animation in a graph format.
I would compare this closely to a sort of thesaurus for algorithms that you might find in an everyday coding environment, such as a school or a workplace, and would hopefully suggest a more appropriate algorithm for the amount of data being entered.
For this project, I have used Java programming and android studio to build the application itself.

Online Teaching Platform

Name: irfan nasir javed ramzan
Supervisor: hu Lian
Category: App Development
Location: Lab 10 desk 18

Abstract:
The demand for new teaching strategies is more than ever in the current educational environment. Learnify is an online teaching platform created exclusively for elementary school instructors and students, with the mission to change traditional education into an interactive and engaging experience. Designed using cutting-edge technologies like React, Prisma, Node.js, and Next.js, Learnify gives instructors and students a smooth and user-friendly environment.

React is a popular JavaScript library used to build the user interface. This gives users a fast and responsive experience. An open-source Plugin like Prisma ensures that databases work well together, making it easy to manage and get data. The back-end infrastructure is run by Node.js, which is a JavaScript runtime. It is a high-performance and scalable solution for the platform. Last, Next.js, a framework for React, is used to optimise server-side rendering and make the web app run better overall.

At the core of Learnify is its robust quiz creation functionality, enabling teachers to create quizzes, and student-specific tests and upload videos, images, or any other multimedia content to help students learn better. Next, students may participate in these tests, receiving points for their successful completion and generating a sense of accomplishment and drive. This participatory method makes learning more pleasant and increases retention and comprehension. Learnify also promotes peer-to-peer engagement, allowing students to cooperate and learn from one another in a supportive online environment. Instructors may also assign courses, track student progress, and give personalised comments, ensuring each student receives the attention and advice necessary for success.

By utilising the newest web development technology and prioritising user experience, Learnify is positioned to redefine primary school education. The platform provides teachers and learners with the tools they need to explore, learn, and develop in today's rapidly expanding digital world.

Online Teaching Platform

Name: Rayyan Rashid
Supervisor: Dr Alexandros Voudouris
Category: App Development
Location: Lab 10 desk 19

Abstract:
Online education has advanced as a sector that is changing the way we study and interact with others. Online education platforms are now more accessible, engaging, and productive than ever before, thanks to advances in technology and powerful frameworks. My goal is to create a professional, yet simple online teaching platform that will cater to universities.

'Thinker Learning Platform' has been created with NextJS, a react framework, and to access my serverless database of MySQL I have used Planetscale as it allows for scalability in the future. There are two main users on the platform - students and teachers. Teachers are able to see all available students, add exams, and create course material. As well as, students can chat with other pupils and teachers, create notes for the course they are learning and they can interact with the course material.

Gift-List Organiser Website for Parties

Name: zak street
Supervisor: Dr. Ramy Hammady
Category: App Development
Location: Lab 10 desk 20

Abstract:
The project is a platform that allows users to create gift lists from Amazon URLs and invite others to contribute towards the purchase of those gifts. The project is intended to simplify the gift-giving process, particularly for events such as birthdays, weddings, and other occasions. The website will allow users to add products from Amazon to their gift list. Once a gift list has been created, users can invite friends, family, or colleagues to join the list which allows others to buy products by themselves or group-buy. This feature allows individuals to pool their resources and collectively purchase gifts that may be out of their price range if purchased alone. This project aims to enhance the gift-giving experience by making it more collaborative, efficient, and accessible. The project used HTML, CSS, JavaScript, PHP, and MySQL. HTML was used to structure the content and layout of the web pages, while CSS was used to style and customize the website's visual appearance. JavaScript was used to implement pop-up notifications. PHP was used as the backend to handle dynamic content, form submissions, and user authentication. Finally, MySQL was used as the database management system to store user information and gift lists.

using Wind/rainfall output to determine weather patterns

Name: Yuxin Zhang
Supervisor: Walker, Stuart D
Category: App Development
Location: Lab 10 desk 23

Abstract:
The current weather map, you have to enter a search to show the local weather.

The program focuses on helping people pay more attention to the weather. Help people keep an eye on the amount of rain and wind in the area, which helps people solve problems faster. For example, farmers irrigate according to the amount of rain on the map.

The goal of this project is to create a global map that allows users to choose what type of map to display. Displays the map based on the type selected by the user. Users quickly meet their needs.

Web development project focused on delivering a great user experience

Name: Rosie Cooper
Supervisor: Jon Chamberlain
Category: App Development
Location: Lab 10 desk 24

Abstract:
In the modern age, sources of stressors are high and building, especially post-Covid. The aim of this website is to give people the tools to alleviate those stressors and make stress management a stress-free journey. By offering a wealth of information for both first-time meditators and seasoned gurus, creating a space to build a community and providing someone to talk to when things get tough.
This product was created with HTML, PHP, CSS and MYSQL.
The creation of this website revolved around one thing, the user. By utilising numerous User Experience techniques such as User Stories and User Personas as well as rigorous iterative testing. From wireframes to functionality, it was all filtered through prospective users and actioned upon based on their opinions and feedback. In order to garner as wide of a user base as possible, accessibility has also been paramount in the creation of this website; a range of different needs from user has been considered.

Tourism attraction website

Name: SHIYU SHI
Supervisor: Morteza VARASTEH
Category: App Development
Location: Lab 7 desk 2

Abstract:
Tourism is one of the most important economic sectors in the world. It employs one in every ten people on the planet and provides livelihoods for hundreds of millions of people and enables people to experience some of the world's cultural and natural treasures. However,since the start of the Coivd-19 pandemic in 2019, tourism has suffered an unprecedented blow. Thus, tourist attraction websites can better inform the public about the attractions and facilitate the recovery of the tourism industry. On my website, there are three characters which is user, administrator and guide. They all have access to many features in this website. The languages used for all the programming are Java, HTML, CSS, JavaScript, jquery. And the database I used is Mysql.

Voting to make collective decision

Name: Gideon Oghre
Supervisor: Alexandros Vouduris
Category: App Development
Location: Lab 7 desk 3

Abstract:
Humble Opinion is a voting system web service that allows users to create questionnaires to ask the public to choose between various options. Whether it is to rank options from best to worst or simply asking what someone preferes, Humble Opinion helps you know what the public are thinking. The goal of Humble opinion is to create a software that implements impartial decision making utilising multiple voting rules. This project is about creating a website that is user friendly, aesthetically pleasing and fulfils the demands of the user in a fast, efficient style. Humble Opinion was created using HTML, CSS and PHP for front end programming with PHP and SQL for back end programming.

A Domain-Specific Language for Text Processing

Name: Chi Ho Chan
Supervisor: Dr Tasos Papastylianou
Category: App Development
Location: Lab 7 desk 8

Abstract:
The existing tools for text processing such as Awk, Sed and Grep often be considered beginner unfriendly, and not readable, which stops people with little coding experience to use the tools. Also, there is no preview of the file contents after operations like text manipulation to prevent human errors.

Therefore, this project aims to build a domain-specific language for text processing which highly focuses on language readability and usability, using a common lexer and parser generator called ANTLR. The language provides a natural-language-liked syntax, allows a try mode to preview impact on text files after operations and can handle both structured and unstructured text by text searching and text manipulation.

THYNK UNLIMITED: Innovative Web Application for Maximizing 3rd Party Amazon Seller Success

Name: Uzair A. Popalzai
Supervisor: Maria Kyropoulou
Category: App Development
Location: Lab 7 desk 9

Abstract:
E-commerce growth has spurred the rise of third party sellers on platforms like Amazon, who face challenges in efficiently managing their businesses and staying competitive. This capstone project presents THYNK UNLIMITED, a cutting-edge web application that empowers third party Amazon sellers. Utilizing a ReactJS frontend and a Python-based FastAPI backend, the system integrates MongoDB and PostgreSQL databases for data handling. It offers robust business, product, supplier, and inventory management with in-depth analytics on supplier offerings. Streamlining operations via calendar and task management features, enhancing productivity and organization; THYNK UNLIMITED provides actionable insights and effective management capabilities, ushering in a new era of success for third party Amazon sellers.

Choose-your-own-adventure / Hyper text game engine

Name: Adam Michael Mitchell
Supervisor: Tasos Papastylianou
Category: App Development
Location: Lab 7 desk 10

Abstract:
Authors of Choose-Your-Own-Adventure (CYOA) books have a hard time of getting their physical books to the screen and hypertext game developers have a hard time looking for a single engine that can fulfill all their needs when developing a hypertext game. Well, I have the solution. A single game engine that can fulfill the needs of both with an easy to use GUI, text formatting and simple text editors all in once engine.

The GUI is a sleek modern design that lets the user feel that the engine is both user friendly as well as easy to use. It contains simple instructions on how to work every facet of the engine as you go through the engine and edit or create your own CYOA and Hypertext Games in a single place. No need to open different engines for this problem as this single game engine solves it all.

Text formatting allows Authors and game developers to parse their books or files through a text process that will format their text into playable games. It will take a single .txt file that an author will enter into the GUI and edit the file down into its individual pages. It then proceeds to convert it to an HTML format and document adding in the relevant page links at the same time. Giving the user files for a playable CYOA game.

The Text editors allow users to either edit their existing story's that have been created or write their own hypertext game. The in-built text editors' functions for both the authors and hypertext game developers allow the users to either edit or create their own story's/games. The hypertext game editor is a single in-built function that creates the hypertext game files for the user with a press of a button.

Developing a website to help aid with mental health, through presenting emotional data and using data analysis.

Name: Adam Littler
Supervisor: Vito De Feo
Category: App Development
Location: Lab 7 desk 11

Abstract:
This project aims to help people with their mental health through providing easy-to-use tools to track and analyse emotional data.

The project takes the form of a website, as this grants access to the most amount of people whether that is at home, at work or even on the go. As the website is built with mobile devices in mind this also allows it to be translated to an app later down the line.

The website will allow users to input data entries regarding 1 of 4 emotional states. This will help them keep track of actions either themselves, or others, take that make them feel a certain way. This is then displayed graphically as well given an in-depth breakdown of the statistics. This allows users to identify areas of their life that can benefit from a change. This could be in the form of people that regularly make a person sad or certain task that regular make them anxious or angry. They can make a conscious effort to tackle these recurring issues.

The goal of the website is to allow people to take a step back and really look at what affects their lives the most. Even from early prototypes this has yielded very positive results.

Secondarily, the app also allows users to communicate with each other, through an asymmetric messaging system powered by data analysis. The site will allow users to send 1 message a day to someone who's previous week aligns with their own - encouraging people to help others or be helped by others throughout the ups and downs of the mental health journey.

This allows users to find strength through each other, even when they know nothing about the other person. It also serves as an incentive to keep users coming back and interacting with the website to keep improving their mental health.

Social Media platform for travellers

Name: Esther Adebowale
Supervisor: delaram jarchi
Category: App Development
Location: Lab 7 desk 14

Abstract:
Locked down, isolated and uncertain. Its was 2020 when the world was frozen for a little while. Nobody could come and nobody could go. The undiscovered remained as such, patiently waiting to be found. Now the time has again where the world has defrosted and come back to life. So, with the opportunity to go anywhere in this world, why wait!
Often people have chosen not to travel because of financial reasons and because of lack of companionship. In my project I aim to combat both problems as travelling with one or more companions has proven to lower costs and increase safety. I have created a social platform for people looking for travel companions to accompany them. All users will be verified with a form of identification (e.g. passport/driver's license) while scanning their face to remove the likelihood of users falsifying their identities. This is to create a safer environment for travellers to meet and connect.
Users will be able to post the location they want to go to (e.g. Maldives, concerts, festival etc), post their travel experiences or anything related on their social feed. Users will be able to make connections with people they would like to travel with, with the guarantee that there talking to a verified user and not someone behind a fake account. When users do eventually plan to travel together, there is a section dedicated to helping them plan and schedule their trip. Users will also have the chance to give feedback on how their trip was with their companion with a rating system, so others in the future others can make informed choices about who they travel with. All of this will be mainly powered by flutter, openCv, Firebase and node JS.

Presents!

Name: Jia Wen Chin
Supervisor: Dr Long Yunfei
Category: App Development
Location: Lab 7 desk 21

Abstract:
Presents! is a full-stack web app that makes group buying a gift a fun, seamless experience by providing
group chat functionality, split bill payment process, and gift voting all on just one platform.

Group gifting enhances the quality of the gift, lightens the financial burden on participants, and from an emotional viewpoint,
makes the recipient feel loved receiving a warm, loving group effort and makes for an fun, interactive occasion

Features include :
- The host creating a party and users able to join the party via a partyCode
- The host is able to set the member limits for a group and number of group limits beforehand
- Participants able to chat in the party's main chat and create groups to buy presents
- Voting for a trusted group representative to purchase the present, group chat functionality
- Voting for a gift to be bought
- Split the bill and make payments using PayPal
- Passwords are hashed and encrypted using passport

This RESTful web app was built responsively to fit multiple device view-widths such as : SAMSUNG Galaxy S20 Ultra, Monitor 1920x1080, iPad Air
Tools used to built the web app include :
HTML, CSS

CSS Frameworks :
Bootstrap

Javascript Frameworks :
Express, NodeJS

Javascript Templating Language :
EJS

Database used :
MongoDB, Mongoose

Utils :
Socket.io, passport, PayPal Sandbox API

Web Development Project focused on delivering a great user experience. A Virtual Teacher Platform

Name: Nathan Edwards
Supervisor: Dr Jon Chamberlain
Category: App Development
Location: Lab 7 desk 22

Abstract:
There is a growing need for intuitive, approachable, and effective technologies that may help teachers run their classrooms efficiently due to the quick adoption of technology in the education sector. This project introduces a Virtual Teacher Platform that aims to provide a smooth user experience by providing a range of classroom management tools created to meet the requirements of educators in the modern digital era.

The Virtual Teacher Platform includes functions like Seating Plan Design, Management, Scaling, Daily Itinerary/Schedule, Behavioural Monitoring and Management, and Attendance Monitoring and Management. With these tools, teachers may make, save, and see seating plans for each of their courses, giving them control over the arrangement and management of their classrooms.

The platform was developed using Next.JS, TailwindCSS, Prisma, Vercel, and Planetscale. It is simple to use and maintains a high degree of performance. The design language guarantees that educators, regardless of their level of technical ability, may easily explore and use the different capabilities provided by the platform.

This project's deployment readiness is one of its primary features. Vercel's public deployment of the website enables easy testing and design assessment. The platform has also been carefully designed with usability and accessibility in mind, meeting the varied needs of users, including those with disabilities.

By providing teachers with a convenient tool to help streamline their daily activities and increase overall classroom efficiency, the Virtual Teacher Platform marks an improvement in classroom management. This project highlights the potential of technology to alter how teachers manage and engage with their classrooms by focusing on user experience and incorporating necessary functionality.

open answer quiz web app for e-learning in python

Name: Dooshima Samantha Agberagba
Supervisor: Raza Haidar
Category: App Development
Location: Lab 7 desk 24

Abstract:
Topic: Open Answers quiz web application for e-learning in Python.
Name: Dooshima Samantha Agberagba
Reg No: 1907627
Category: Web Application Development.
ABSTRACT
The goal of my project was to create an innovative web application for students. The app is designed to better the learning experience of the students by creating interactive and fun quizzes that lets them test their knowledge in python and give them immediate feedback.
The application lets students log in and take quizzes and the quizzes can be attempted multiple times by the student. After submitting your quiz, the app immediately lets you know your mark, it also lets you know what was answered correctly or incorrectly and provides the right answers to questions answered incorrectly.
The project was developed using JavaScript, CSS and HTML and MySQL. A database management system that stores and manages quiz questions and user feedback has been included in the webapp. To make sure the web app meets the requirements of both the teachers and the students, the effectiveness will be evaluated through feedback and user testing. In addition, to the quiz web app being a way to test students' knowledge it also informs the teachers of the strengths and weaknesses of their students, allowing them to know where each student requires more help and how to modify their teaching to meet those needs.
In conclusion, the open answer quiz webapp is a necessary tool that encourages active learning and improves the efficiency of the teaching process.

Three Random Words - a biometric login system

Name: Trina Roy
Supervisor: Haider Raza
Category: App Development
Location: Lab 7 desk 25

Abstract:
Our information is always at risk of getting caught on the wrong hands, so Microsoft decided to develop Windows Hello, a biometric login system for its devices that have either the latest Windows 10 operating system update or Windows 11, with the matching device specification.

In order to answer this problem, I decided to make a Python biometric login system (or app) with PYQt5 as the base of the app, which I called "Three Random Words". It uses Pyqt5 as the Graphical User Interface, Deepface for facial recognition, OpenCV for video capture and has database support. You can export the data in an encrypted PDF or excel file (the decryption key will be included). There is also the option of choose which type of login style the user would prefer: biometric, username and password or with a PIN.
The app uses a CNN (Convoluted Neural Network) for identifying the faces.
From this app, I have been able to identify that the CNN is most effective for face processing.
In conclusion, I think that the app fulfils the role of the answer nicely.

Online Music Website

Name: Shizhuo Shao
Supervisor: He Jianhua
Category: App Development
Location: Lab 7 desk 26

Abstract:
As the network carrier of music, music websites have an impact on the development of music in the way of transmission and appreciation. Nowadays only a few websites can meet users' full needs, such as having a strong online music library, combining songs with videos, and allowing users to upload songs themselves. Based on the current situation, in the full analysis of the market prospects of the industry, I designed a multi-directional function of the music website.

Using InteliJ IDEA to develop, the project uses Java to compile stand-alone functionality and combines JavaScript, HTML, and CSS programming on the front-end client side. Use MySQL database to store all user, music files and other data.

After investigating a lot of data and user experience, I integrated existing music websites, designed and developed the most suitable website for users. This music website provides songs and music videos for everyone to play, and users can use the website to satisfy their music needs, create their own playlist, comment on the songs. The music website will help to locate users' preferences quickly and accurately, also allow them to upload their own music in public.

Dynamic composition of personalised e-learning content

Name: WeiHao Kang
Supervisor: Dr. Barakat Lina
Category: App Development
Location: Lab 7 desk 27

Abstract:
This project aims to provide learners with a personalised and adaptable online learning platform that makes it easy and satisfying for them to learn what they need to know. There are two main roles in the platform: learner and teacher, with the learner being able to freely choose the content they want to study and to test and mark it by answering questions on the learning site, and the teacher being able to upload lessons and review and mark students' papers. The online learning platform can be used to assess the academic level of the student based on their test scores and then provide the student with a course that is tailored to their current level to ensure that the student continues to be interested in learning and that they have learned the right content for them. After the learner has completed the content they can be tested again and if they meet the required score then the recommended course will be recommended to the student at a new level.

The project, built on Springboot + Vue, utilizes Java, JavaScript, MySQL + Redis databases, and AliCloud's OSS for storing and playing course videos. Design features, such as sha-256 encrypted login passwords, double verification, graphical captchas, and SMS verification, ensure security.

I encountered many problems during development, such as how to secure the site (login details, separation of privileges, passwords, gateway filtering, etc.) and cross-domain issues with CORS, which plagued me for a long time, but I tried to solve these problems through study and eventually overcame them.

Future expansion could involve an AI decision forest API for course recommendations, optimizing recommendation granularity, and introducing detailed assessments in affective-cognitive and mental-motor skill domains to enhance the site's value as a learning resource.

Collaborative whiteboard website

Name: Minghan Yin
Supervisor: Liang Hu
Category: App Development
Location: Lab 7 desk 28

Abstract:
The aim of this project is to provide a shared collaboration platform for staff who need to collaborate on projects in teams so that they can simply share and edit projects within the same team. There is only one role in this project, that of collaborator, the user. Users can create their own teams and invite other users to join them by sharing their team number. Users will be able to draw, type and upload images on their whiteboard. They will also be able to set countdown reminders. Users will be able to invite other users to be viewers or editors of their whiteboard. The content on the whiteboard can also be downloaded as an image and the content can be shared by entering an email address.

The project is built using the springboot and mybaits frameworks, the front end pages are written using bootstrap templates, using html language and JavaScript scripting language and Jquery scripting language. The collaborative whiteboard allows for a more comprehensive range of features, such as changing brush colours and sizes, inserting text, inserting images, timers, erasers, clearing screens and sharing images to ensure a great user experience.

After reading books and thinking about how to implement collaborative projects, I managed to solve the problem by using a single thread to process the drawing so that when a project is opened by one person, no one else can click in to solve the problem, and only when that person exits the project can another member of the team click in to make changes.

If this project becomes commercially viable in the future, I plan to improve the following features: simultaneous editing by multiple users, adding audio and video to the drawing board, and enhancing the functionality by implementing drag and drop for inserting images.

Web development project focused on delivering a great user experience

Name: MIN WEI
Supervisor: Jon Chamberlain
Category: App Development
Location: Lab 7 desk 39

Abstract:
Web development project focused on delivering a great user experience
Name: Min Wei
Registration Number: 2002177
Category: Web Development
Abstract
The aim of my Project is to design and build a website that will be focusing on specific user target group. In which, the website should be designed to deliver a great user experiment follow by a suitable user testing during the process of development in order to gain the user feedback which are then been used to improve on my project standard. Specifically, my user target will be focusing on League of Legends community since I enjoy this game a lot which I would like to do a game guidance to it and also I have learned that there has been an increase amount of player for League of Legends for the past 10 years based on the “literature research”. Therefore, I decided that I want to build a guidance website for beginners to have a easier start to the game, as well as providing other functionality such as quizzes and merchandise just to bring more interaction with the users. The Website consist of 6 pages. First page will be the introduction page as to give a brief understanding to the user what my website will be about. The second page will be the “Control and Features” page, as here the user will learn about how the character moves in game and how to use their ability to attack follow by some info such as history of the game, etc. The third page will introduce the character and item to the user. The fourth page will be the quizzes. The five page will be the merchandise product that user can purchase. Finally, the last page is for the basket and payment.

Web-based advanced MCQ testing for adaptive dynamic learning

Name: Mihai-Alexandru Ivanus
Supervisor: Nick Zakhleniuk
Category: App Development
Location: Lab 7 desk 41

Abstract:
Because the technology keeps evolving, nowadays there are different approaches that can be used for online learning. This project is focusing on delivering an interactive experience on learning by using a Multiple Choice Question system. The topic I chose for this project is about Java programming language which can be used in any field of interest. Particularly, this project is focusing on using modern technologies in the process of learning. One of them is the ability to have a feedback, pre-engineered by teachers or generated by AI, for a better understanding of the subject. On top of that, the project provides a forum where users can discuss any questions that they have encountered during the tests so that they can have a fully understanding of any unclarities. More than that, statistical data is included to keep the users motivated during the process of learning but also to see what they need to improve more. The statistical data can be useful for teacher as well, helping them to improve the Multiple Choice Questions over time. Overall, the project is focusing on helping users to improve their knowledge and confidence.

Online Language Learning Website

Name: Becky Oni
Supervisor: Dr Delaram Jarchi
Category: App Development
Location: Lab 7 desk 45

Abstract:
Since the start of the pandemic in early 2020, it has been reported that over 30 million people have attempted to learn a new language [1], by use of many popular online language learning resources and mobile applications. However, language learning had traditionally been limited to books and audio files, which often meant learners struggled to find structure to their studies; and with no real way to engage with native speakers, this meant that many quickly became disinterested in their language learning journey.

In this project, I aim to design an online language-learning website which will address this issue and appeal to users interested in learning a new language. My website, otherwise known as 'Soy Tambien', will enable users to create individual user profiles to access a number of language courses. Users will also be able to engage with content/posts in their target language and communicate with other language learners, preferably also in their target language.

With these features, users are incentivised to progress in their language learning journey and connect with others making the process more enjoyable and provide real-world uses for the languages which they are learning.

To build this website I will make use of a number of technologies such as HTML5, CSS3, PHP, JavaScript, My SQL and others in both the front and backend development in order to implement the features and functionality which I have previously mentioned.

Name: Cyril Ayodola
Supervisor: Li Junhua
Category: App Development
Location: Lab 7 desk 46

Abstract:
Map annotation and object recognition

Another way of saving experiences
The aim of this project is to design an application that allows you to document the experiences you have had around the world on google maps as well as having the option to rate your experiences from great to decent to horrible. This application also includes an additional feature which is object recognition, this is a bonus feature that can allow you to identify objects you are not familiar with.

Mobile App For Autism Spectrum Disorder Patients

Name: Artie Junior chiota-dube
Supervisor: Michael Barros
Category: App Development
Location: Lab 7 desk 49

Abstract:
This project aims to aid with the development of children suffering from Autism Spectrum Disorder. I will be using a variety of unique methods to aid parents and guardians with the task of remotely monitoring a child's development whilst providing visual stimulation all in the palms of a child's hands.
I aim to fulfil the need of providing parental intervention for a child's development following research that showed that there were no apps that provided a direct means of contact between a child and a parent. I aim to implement features that use the physical responses from a child to optimize the content provided on the app for speech development and visual stimulation.
The app will offer a video browsing section that will allow endless viewing of videos – a feature that can be likened to the reels feature found on Instagram. The direct means of communication provided will be fulfilled through using a generated text message provided by the app and, a call feature that calls the guardian during a potential emotional meltdown.
The app has been programmed using Swift UI with the UI-Kit and Health-Kit libraries because of Apple's reliability making reliable devices, a feature integral to the success of this app.

ReachFit - Mobile Fitness App

Name: Gustavo Dos Santos
Supervisor: Delaram Jarchi
Category: App Development
Location: Lab 7 desk 56

Abstract:
This project aims to deliver a mobile application designed for both beginners and experts to hit their intended fitness goals. The app is to be named "ReachFit" and will be free to use for all. With my experience in Health and Fitness, I believe I can create an application that will allow users to reach their intended goals precisely and effectively.

The application will feature a clean and user-friendly GUI that can be customised to the user's preference. The app will function through four main processes: Collection of user data and end goal to create a profile around them, Predict Caloric, Hormonal and other metrics using traditional formulas and user data and lastly, interpret user data and other metrics to develop a Bespoke plan for the user to achieve their goals. The final plan may include diet options, water intake, and a workout tracker depending on what initial goals the user sets.

Archery

Name: Hugo Kit Greenwood
Supervisor: Dr Juntao Yu
Category: App Development
Location: Lab 7 desk 61

Abstract:
Archery is a secure and transparent art provenance platform designed to empower the art community. Artists, owners, researchers and institutions can use it to share and track information about history, creative process and the value of art.

Cryptographic technologies are the beating heart of the Archery platform. Blockchain ledgers are used to provide an immutable and open platform for art documentation making it easy to trace the provenance of a work of art and verify the authenticity of any record. This approach helps to prevent misinformation or omission and ensures that all information recorded is challengeable, and untamperable.

Any record can be challenged or verified through the built in social and cryptographic tools. Feedback is embedded into the record's ledger itself to ensure that any feedback is as immutable as the ledger it relates to. The immutable nature of Archery ensures that all information on the platform is accountable, verifiable, and reliable.

Archery's aim is to help build a community of art lovers and experts driven by a collective love of fairness and transparency. Providing a secure and open method for artists to share their work, art lovers to discover new works, and experts to share knowledge and challenge each other. By creating a community of like-minded people, Archery hopes to create a more equitable and open art world where everyone has a freedom to share their perspectives.

Tech stack: MongoDB to store the blockchain records, PostgreSQL database with Redis caching for storing media and user authentication data. NodeJS for the webserver and Flutter for the Application (allowing cross-platform support).

Users can access the platform through the mobile and desktop app or through the API. Developers and organisations will be able to licence the Api either to create their own Archery clients or to integrate the platform into existing products.

GamifyFlix: Gamified Film Recommendation System

Name: Emil-Sebastian Postolache
Supervisor: Morteza Varasteh
Category: App Development
Location: Lab 7 desk 63

Abstract:
In this project, I will be presenting how I went about designing, developing, testing and evaluating a gamified web-based film recommendation system that incorporates collaborative filtering as its recommendation algorithm. The primary objective of this system is to provide users with personalized film recommendations while engaging them through a gamification technique. The system rewards users with experience points for each film they rate, fostering increased interaction and data collection, which ultimately improves the recommendation quality.
To achieve this, I have covered in detail the development process, from the initial concept to the final implementation of the web-based system. The work carried out includes the exploration and selection of suitable collaborative filtering techniques, the design of the user interface, the integration of the gamification elements, and the evaluation of the system's performance in terms of recommendation accuracy and user engagement.
Throughout the development process, I employed iterative design and testing methodologies to ensure the system's usability and effectiveness. This project not only showcases the potential of incorporating gamification elements into recommendation systems but also contributes to the growing body of research on enhancing user engagement in online platforms.

Community cooking and sharing

Name: YIMIN LU
Supervisor: Dr. Jianhua He
Category: App Development
Location: Lab 7 desk 64

Abstract:
With the development of society, community service sharing is becoming more and more important. In order to help each other and share services, the community needs volunteers to cook extra food, which will be shared and provided to people in need. This kind of sharing is not easy , it needs to be implemented with the help of a mobile based app, so that it can be made easier, the app can create requests based on the needs of volunteers, they can cook extra on a certain day, and then send these requests Send it to other members of the community who can accept it and share the delicacy/item. It must also realize the requirements in reverse, that is, the individual needs food service, and it can be accepted by all members. Once the member accepts the request, it can be updated to others, so that others will not cook food and waste food.
This project is based on mobile phone program development to support the above functions of mobile application development.

Web development project focused on delivering a great user experience

Name: kevin Olakitan
Supervisor: jarachi delaram
Category: App Development
Location: Lab 7 desk 68

Abstract:
web development can be an easy task to learn but an complicated one to master if the right steps are not taken. They are many important concepts and aspects of web development that need to taken into account when design a website like the style, layout, font etc. but the most important one arguably is the user's experience, since most things if not everything is centred around providing the user with a good experience when interacting with the application since that's what website are usually made for these day. without any consideration for the user's experience a website is most likely to fail is the functionality and aspects of the website will not adhere to intended target audience which is nullify its existence for it the first place . The goal of this project is the demonstrate what good user experience looks like and how it adapts to multiple clients needs without deviating from the website main purpose, the website will also provide clients to submit feedback to further improve their experience as whole.

Web development project focused on delivering a great user experience

Name: Rahul Kainth
Supervisor: Jon Chamberlain
Category: App Development
Location: Lab 7 desk 69

Abstract:
Women's football popularity has never been anywhere near as compared to men's football, which is the most watched sport in the world. The reason for this is that people either had no interest or lost interest of women's football. Therefore, the aim of this project is to create a fantasy league website for the Women's Super League (WSL) which would allow people to compete with their friends and family. This would hopefully encourage more people to start or continue watching women's football. The main functions of the website are to allow players to create their own fantasy team, to allow them to make transfers to their team and have scoring system. I have used PHP, CSS and MYSQL to create the website.

PHP is an open-source, free server-side scripting language that is frequently used in web development. I used PHP to embed dynamic activity to web pages. CSS is a style sheet language which I used to style the HTML element to change its borders, colours, spacing and allows imitating transitions and transformations. MYSQL is an open-source relational database management system based on Structured Query Language (SQL). I used this to create the databases that contain all the data for the website.

XAMPP is the software that was used to run the backend files through PHP and MYSQL. It is a free and open-source cross-platform web server solution stack package which I used to run the MYSQL data. To run the localhost, I had to open XAMPP as administrator and start both the Apache and MYSQL modules. I have created tables such as "users" to allow the users to register and sign in and created "club", "player" and "positions" tables to allow the user to create their own fantasy team using the players in the database.

Designing of Web-Based Advanced MCQ Testing Engine for Technology-Enhanced Learning

Name: Prince Ekewenu
Supervisor: Nick Zakhleniuk
Category: App Development
Location: Lab 7 desk 70

Abstract:
Many people, including students and workers rely heavily on the internet to develop their learning skills. This allows the internet to grow as they contain variety of resources that can help users become more educated, such as researching, education websites, e-commerce websites, and many more. The main goal for this project is to develop a technology-enhanced education platform for learning testing and self-education applications. As an example of the application, we demonstrated its use to provide learning in mathematics for schools and colleges. The platform is enhanced by various functionalities which are useful functions for both user's and admins (teachers) to adapt to the website better. Functions such as creating and starting quizzes, processing the results, getting dynamic feedback, security, registration, will all be illustrated on the website. The languages I will use for this project to successfully completely my websites are HTML, CSS, JavaScript, as well as backend languages like PHP and MySQL.

I have also carried out extensive research that explains why and how the use of technology is wildly appropriate for education. Many articles have illustrated this as most of them suggest that they can use adaptable functions like Artificial Intelligence; they can develop the application by creating schedules, grade systems, feedback system, etc. The developed platform was demonstrated for Maths learning; however, its structure and capabilities are universal and can be used for other subjects.

Photo sharing via cloud

Name: Fengyu Li
Supervisor: Kun, Yang
Category: App Development
Location: Lab 7 desk 75

Abstract:
As technology advances, the resolution of digital images has increased, leading to a greater demand for memory when storing them. Cloud technology has revolutionized the way in which users store and share photos, allowing users to store their photos on online platforms and access them from any location. Photos can be shared with friends or kept confidential and secure. To provide a more user-friendly approach for managing large collections of digital photos, this project designs an online smart album sharing system. Utilizing MobileNet and Tesseract-OCR, this system automatically recognizes and extracts effective information from massive photos in various application scenarios based on both visual and textual data, thereby facilitating users to label, search, and share photos with others. This project is constructed with React, Flask, SQLite, and Material-UI. React provides the front-end interface, allowing for a dynamic and interactive experience. Flask is utilized on the back-end for server-side logic and SQLite for data storage. Material-UI is used for a sophisticated and contemporary aesthetic design. Collectively, these components form a capable website with an attractive interface and user-friendly experience.

An automated plagiarism in programming report generator

Name: Qixuan Cao
Supervisor: Ian Daly
Category: App Development
Location: Lab 7 desk 76

Abstract:
Plagiarism detection is an essential component of maintaining academic integrity, particularly in higher education. With the widespread use of online resources, like google scholar, plagiarism has become increasingly prevalent and harder to detect which can be a time-consuming and challenging task. Some open-source programs for detecting plagiarism in source code, like JPlag and Moss, have emerged as the popular solutions due to its accuracy and efficiency. However, these highly specialized programs often come with only source code and require users to deploy them on their computers as prompted.

This project aims to develop a detection application (Website) based on JPlag, which can provide a user-friendly interface for users to do the plagiarism detection in an efficient and concise way and also provide some new functions which can really help improve the experience.

Vue.js framework will be used to create a highly interactive and responsive user interface(front-end) for the JPlag based application. Spring Boot framework will be used to develop the back-end program, providing a range of features and tools for managing the analysis process, login verification, generating plagiarism reports and giving the corresponding information back to the front-end. MySQL will be employed to store the basic information of users like login details and the analysis results. And it can also provide users with access to a history of their past submissions.

This system is intended to make the process of plagiarism detection more accessible and efficient, while also providing a more user-friendly experience.

Hypertext Game

Name: Runhang Qu
Supervisor: Jianhua He
Category: App Development
Location: Lab 7 desk 78

Abstract:
Title: A Tool for Creating Hypertext Games
Abstract: Hypertext games are a type of interactive fiction where the player navigates through a story
by clicking on hyperlinks within the text. Each hyperlink leads to a new section of the story, allowing the player to make choices and explore different paths. Hypertext games can be played in a web browser or on a mobile device, and they often include branching storylines, puzzles, and other interactive elements. This project aims to develop a tool for creating hypertext games, which are a type
of interactive fiction that allows players to navigate through a story by clicking on hyperlinks within the
text. The tool will enable users to easily create and edit branching storylines, add interactive elements
such as puzzles and choices. The tool will be designed to be user-friendly and accessible to both experienced game developers and novice users. Once the tool is developed, it will be used to create a
hypertext game as a proof-of-concept. The game will be a mystery/adventure story with multiple endings, and will showcase the capabilities of the tool. The final product will be a valuable resource for
game developers and interactive fiction enthusiasts, as well as a fun and engaging game for players

Online Teaching Platform

Name: Daniel Samuels
Supervisor: Alexandros Voudrouis
Category: App Development
Location: Lab 7 desk 79

Abstract:
In order to help teachers and their students, I focused my final year project on creating an online teaching platform. Students' accounts can be created on the teaching platform by teachers when they sign up. The website allows teachers to post educational materials for their pupils to use, such as videos, written papers, and audio recordings.

HTML and CSS were the core technologies utilised to generate the various sections of my website, just like they are for most websites on the internet. I utilised Bootstrap, a front-end web development framework, to make it easier to create the minor elements that make up each page of my website, including the header, footer, and main body of each web page. My teaching platform needed the capacity to retain user data like usernames, passwords, and teacher-curated course content. This crucial feature was accomplished by a MySQL database that captured user information in tabular form.

The ability to retrieve stored data and strong security to guard against user data leaks were indispensable for the online education platform. Verification of registered users and the accurate presentation of course information were also critical to the smooth operation and user experience of the teaching platform, so I adopted the Node JavaScript framework to accommodate these requirements.

Collaborative Whiteboard web site

Name: kardo Rasul
Supervisor: Riccardo Poli
Category: App Development
Location: Lab 7 desk 87

Abstract:
The aim of the Collaborative Blackboard is to facilitate online teaching (distance learning). Whether you are a student doing a university course or an adult looking to expand your skills - this virtual learning tool can be used for all different levels of learning. It provides an effective and efficient means of remote learning. Facilitating interactions between instructors and students. Instructors can easily engage their class and provide personal attention through group discussions. With the rapid development of technology and the exponential increase in the number of Internet users around the world due to social networks such as Facebook, Twitter, Instagram, and WhatsApp the demand for studying online is higher than ever. It has now become an alternative to traditional learning.
electronic devices as their daily driver, as opposed to other conventional methods. This includes things such as electronic/online scheduling, entertainment, storage, and more. A study carried out in January 2021 revealed that there are over 4.66 billion active internet users. This project aims to explore this change in technology and provide a way for students of any age to utilize a website that will allow them to be able to manage their study resources to improve and maximize their overall work rate and efficiency. This online learning tool breaks through all limitations that a physical blackboard comes with, as it doesn't only allow the user to draw, write and stick things on it but it will also allow support for multimedia files, such as pictures and videos. Support for social media will allow for boards to be shared on different platforms and since it is web-based, boards can be accessed from anywhere. This project is implemented through a website that will allow users to write, draw, share, create different boards, add stickers, set alarms/reminders, and add web addresses. To make the board collaborative, users will also be able to share their boards with other users that will be able to either view or edit the boards.

Structured Reviews: Internet Database

Name: Deli He
Supervisor: Sefki Kolozali
Category: App Development
Location: Lab 7 desk 90

Abstract:
Passing information and comments on the internet has always been an important function of the internet and the purpose of this project was to build a website. I built a forum site where people can post comments and pictures, and even upload relevant files. The site has a clean and complete page and is clearly grouped to help people select and find relevant information. Administrators can divide users into general users and member users, member users can query and post content

The project website uses Java and SpringBoot technology to create a unique addtion, delete and check functionality, using MySQl to store the data. A servlet console is used to control and JDBC is used to access the database and MySql is used at the core to manage the data, making the data more specific and the system more automated.

Action Fraud Reporting App

Name: Charles Burgess
Supervisor: Ramy Hammady
Category: App Development
Location: Lab 7 desk 92

Abstract:
I have developed an Android app that provides users with two options for reporting crimes and additional sections for staying informed and accessing relevant information.

The options for reporting crimes include a regular text-based email system and an activity-based reporting system. With the regular email system, users can send an email with a subject and message directly from the app. The activity-based reporting system offers a set of pre-defined buttons to add relevant details about the crime, such as the type of crime, location, and time of occurrence. Users can also provide additional information about the situation. Both options generate a notification for that user with their case number that they can copy to acknowledge the report.

The app's sections include a news section that displays an RSS feed of news and updates. The information section provides details about Essex Police, including nearby police stations' addresses and contact information for Action Fraud. This section also includes a frequently asked questions section to provide quick and accessible answers to common questions that users may have.

Overall, my app aims to provide users with convenient options for reporting crimes, staying informed about crime-related news, and accessing essential information about the police and other relevant authorities. I hope that this app will make it easier for people to report crimes and receive timely updates and information about crime-related issues.

Designing of Web-Based Advanced MCQ Testing Engine for Adaptive Dynamic Learning

Name: Ethan Namugera
Supervisor: Cunjin Luo
Category: App Development
Location: Lab 7 desk 93

Abstract:
Personalisation is crucial for efficient learning outcomes for students as they strive to expand their scope of knowledge for future assessments. There is still an infancy of websites that include multiple choice questions that create individualized feedback for students after they finish.
With the development of this project, it will break the norm of the simplicity of feedback after partaking the quiz. The project main goal is producing dynamic feedback after the student finishes through a whole array of features whether from the correction page, to chatbots and forums to expand their knowledge for all knowledge groups. With a user-friendly user interface, the highlighting of user statistics and novel features included, the website meets the requirements for future stakeholders.
Talk about tools used to achieve these requirements are SQL and PHP which are for the backend and frontend frameworks of the website respectively and the inclusion of simple NLP to help in providing unique feedback.

Visualising search algorithms

Name: Cezary Ogloza
Supervisor: Maria Kyropoulou
Category: App Development
Location: Lab 7 desk 94

Abstract:
This project aims to develop a desktop application utilising the Java programming language and Swing library. The primary objective is to teach students about various search algorithms such as depth-first, breadth-first, Dijkstra, A*, etc. Understanding these complex algorithms might be challenging, but it is crucial for comprehending one of the most important mechanisms in programming.

The goal of the application is to provide clear visual representations of the algorithms and present only the most important information without overwhelming the user. Moreover, in order to enhance user engagement, the application will interact with the user, testing whether they understand the currently displayed algorithm. As the application features a simple and practical interface for free traversal between various steps, the user will have complete control over the pace of learning.

The application will blend free step traversal with short knowledge tests to provide customised experiences for each user, as each has varied learning demands. Ultimately, users will be able to better comprehend several algorithmic components thanks to this feature while making the learning process efficient and enjoyable.

Build a drone that follows you

Name: Siyu Liang
Supervisor: Anirban Chowdhury
Category: App Development
Location: Remote NWU on Zoom

Abstract:
This paper presents a software application developed in Python that integrates various techniques such as computer vision, machine learning, and control theory to enable Tello drones to autonomously track targets. The software provides a graphical user interface that allows users to remotely control the drone via Wi-Fi and select a tracking mode and play video from the drone. , either manually or autonomously. The software uses OpenCV library and TensorFlow model to detect and track objects. Autonomous tracking control for Tello drones is implemented using functions provided by the drone library in Python for controlling drone motion, and these functions are used to convert control commands into drone motion. The proportional Integral-derivative (PID) controller is used to calculate the drone's speed command according to the tracking error, and Kalman filter is used to estimate the position and speed of the tracked object. The drone's speed command is sent to the drone via Wi-Fi, and the drone's onboard flight controller executes the command to control the drone's movement. The paper provides a description of the algorithms and techniques used to develop the software, as well as examples of its use in various scenarios. The results show that the proposed software is effective in realizing the autonomous tracking of selected objects.

A Gomoku/Five-in-a-row Game Application

Name: Diwen Fan
Supervisor: Zhang Xinruo
Category: App Development
Location: Remote NWU on Zoom

Abstract:
Gobang is a traditional two-player game. Today it is not confined to the real world of the chessboard, but has also made its way to the computer screen through computer programming. With the development of artificial intelligence technology, more and more people are using computer programming to implement AI in gobang, and the Minimax algorithm is a common AI algorithm that can be used for automatic decision making.
This project is a gobang game with AI developed using Python.The game uses the classic Minimax algorithm, using Alpha-Beta branching to optimise search efficiency, to implement a game AI that can play against the player.
Players can register and log in to their account to play the game and can save and read games in progress and get a score in a rank list.
The AI uses the classic Minimax algorithm to search the game tree to find the optimal position for a piece.
The game interface is implemented using the Pygame library, which has good interactivity and an aesthetically pleasing interface design. Players can choose their position by mouse click, the game will automatically determine the winner and display the game result. The game also supports the functions of undoing and restarting, making it easy for players to operate.

voting to make collective decisions

Name: Liangyu Zhu
Supervisor: Alexandros Voudouris
Category: App Development
Location: Remote NWU on Zoom

Abstract:
With the advent of the age of information and knowledge economy, it is impossible to effectively manage the large amount of information involved in voting activities by relying solely on primitive manual operation. Polling organizers had to get the data manually, wasting a lot of time and making it harder to ensure the timeliness and accuracy of the data. Therefore, an automated online voting system, as an important means to improve the current level of voting management, appears to be very urgent.
In terms of website implementation, the project analyzed the relevant technologies and architecture of the system, built the system business functions according to the actual needs, and designed and implemented the voting website. In order to improve the scalability and simplify the development of the system, the voting website uses Java language to construct the project, and uses the open source framework ruo-yi to realize the separation of the front end and the back end. The front end uses the current mainstream vue2 framework, the back end uses the Springboot technology stack, and the database MySQL is used as the repository. I successfully designed the overall structure of the voting site. According to the demand analysis of the voting website, design and implement four different functions of the voting website, and then carry on the implementation test of each function module. The experimental results verify the effectiveness of the voting website designed in this project.

Community Cooking and Sharing

Name: Yuxuan Xia
Supervisor: Singh, Amit K
Category: App Development
Location: Remote NWU on Zoom

Abstract:
In some areas, some people in the community have suffered from natural disasters or economic difficulties and have been short of enough food for a long time. So in order to help those people in the community who are short of food faster and more conveniently, volunteers who have extra food can use this mobile application based on community food sharing service to express their willingness to make extra food to share.It also allows those who are suffering from food shortages to use the mobile application to request their required food with specific information from volunteers in a timely manner.

This project is based on the Java development language for coding the application functions, using Android Studio development tools to design, write, debug and test run the project application. The core function of the project, "Food Information Bulletin Board", is implemented using Android's built-in Sqlite database. Furthermore, based on the three operations of the Sqlite database: insert (add information), query (query information) and update (update information), users can post food sharing information (with posting time, meeting place, food price and contact information); other users can login to the application to view the food information posted by others; after the two people have finished the food sharing transaction, users can modify the posted request information. After the two-person food sharing transaction is complete, the user can modify the posted request or enquiry message to indicate to the other people in the community that the food has been shared.

Therefore, this project aims to create a convenient, quick, simple and easy to operate food sharing mobile application for all people who have the intention to share food in the same community, so that more people who are in need of food can get through the food crisis smoothly and deepen the connection between people in the sharing process with community volunteers.

Photo sharing system with forum and auto-detection

Name: Junjie Zhao
Supervisor: Kun Yang
Category: App Development
Location: Remote NWU on Zoom

Abstract:
With the development of the Internet, Internet social networking has become an increasingly popular way of socialising in today's society. More and more users prefer to share their photos and feelings about their lives on the internet, and various types of social networking sites are popping up all over the web.
This project is a photo sharing system. The back-end design is done in PHP, the front-end part is done in HTML and CSS, MySQL is used to store the data, and Baidu AI's interface is called in PHP to implement the image detection part.
In this system, users can upload their own photos and also browse other users' photos. When browsing, users can choose to browse all photos or choose to browse photos with specific tags according to their interests. The system also has other useful features such as automatic detection of inappropriate photos, a user forum, and a user suggestion box, which will ensure the proper operation of the system and provide a better user experience.
The system takes full consideration of user experience and privacy, as well as the legality of photos and forum content, and uses both automatic and manual monitoring to remove inappropriate content to ensure user experience and normal operation. After testing, all functions of the system have met expectations and are well used.

Community Cooking and Sharing

Name: Zixian Yu
Supervisor: Amit Singh
Category: App Development
Location: Remote NWU on Zoom

Abstract:
In order to help each other in the community, we need volunteers to make extra food for people in need to share. However, such sharing is not easy. With the help of mobile app, it is easy to create volunteer requests. They can cook extra meals on a certain day, then send these requests to other acceptable members in the community, and then share the cooked food/items. It also has another way to use it, that is, individual needing food can request, and can be accepted by all members. Once a member accepts the request, it can be updated to other people, so that other people will not cook and waste food.

This project aims to develop a mobile application that supports the above functions. The key points are the interface design and function realization of the app. The app includes the registration and login interface to realize the user's registration and login functions. The cooking interface is used to update food provided by a user, and the request interface is used to put forward a demand for food. There is also personal center interface, including multiple sub-interfaces, where one can remove items, change personal information, and log out. The project uses Android Studio and SQlite database to realize all the functionalities.

Tasty's Mobile Application

Name: Oluwaseun Oshin
Supervisor: Dr Yu Juntao
Category: App Development
Location: Lab 2 desk 15

Abstract:
Tasty's is a start-up food company looking to deliver food to the people of Colchester, their target customers are the university and sixth-form students in the city, as they are the largest consumers of fast food. They need a solution that will appeal to the consumers and compete with what dominoes, just eat and subway are offering, the solution will be a mobile app. The Tasty's app will allow users to effortlessly order and monitor the progress of their food from the comfort of their homes until it reaches their doorsteps. This app will be available on IOS and Android through the open-source Flutter framework powered by dart, which allows us to build cross-platform apps from a single code base. The backend will be connected to a NoSQL database called the Graphql API and will be hosted on the AWS (amazon web services) servers. The app will feature four main pages: Home, Offers, Menu and Account. The Home page will act as extensive information/navigation page, the Offers and Menu page will act as item catalogue where customers can add what they want to the basket and the Account page will be suited to the user by housing their personal information and orders. This information will be stored and accessible only by the user via the API which will allow users to Create, Update, Read and Delete data. Purchases will push the orders to the AWS cloud servers and allow the Tasty's workers to read and work on them behind the scenes. These processes will be running back-to-back autonomously, updating the users while the workers are dealing with orders via the API. The application reads the NoSQL database and represents the order status to users through a fancy GUI that will interact with them and give them live status updates.

Event Hosting Web application

Name: Temitope Oshin
Supervisor: Dr Li Juhan
Category: App Development [LS]
Location: Lab 2 desk 9

Abstract:
Events have been a way for people to meet each other and make memories that will last a lifetime. This web application gives the event organiser a way to host and manage these events. It will also handle the delivery and the scanning of the tickets via the event organizers device. This Web Application has been specifically made for the events company EMT entertainment LTD. The website will be designed with a responsive and user-friendly interface, making it easy for users to navigate and interact with the site. To create my web application I am using Java for the Back-end with the Spring Boot framework. I am also using PostgreSQL for the database. For the ticket scanner I am using Java with the OpenCV library.
For the Front-End I am using HTML, CSS and JavaScript.

The client will be able to post upcoming events on to the website and their respective tickets. Users will be able to buy tickets for these events and will receive them via an email with a PDF attachment. They will also be able to contact the client via a form on the website allowing them to either raise concerns or enquire about a private booking. The Client will then be able to check the validity of these tickets using our ticket scanner, this also checks if the ticket has been scanned before, the event and ticket information and who had initially bought the ticket with their information as well. This project aims to provide a comprehensive platform for event hosting and ticket purchasing.

The Data Structure of Biologic Systems: Investigating Intercellular Communication Using Graph Theory

Name: Ethan Hilton
Supervisor: Dr Michael Barros
Category: Brain Computer Interfaces
Location: Lab 1 desk 20

Abstract:
Advancement in computing as we currently know it is coming to a plateau. For decades, Moore's law, the law that states "every two years the number of transistors in an integrated circuit doubles" has remained consistently accurate, however recent studies suggest there are physical limitations to such a law. Because of this, we should be looking to different technologies to build computational systems off of. One place we can look is inside the human brain. Using a device known as a Multielectrode Array (MEA), we can measure activity from clusters of neurons in lab conditions. In my project, I will use publicly available MEA data along with graph theory to try and find recreatable patterns within MEA channels. Using metrics such as betweenness centrality and shortest paths, I'll be looking into how channels interact with one another. From this, I will collate my findings in a research paper with breakdowns and analysis of the data. The goal of my project is to find whether or not the connections within a neuronal network can be used to replace computational components in the near future.

Quantitative Sensory Testing

Name: Calvin Smart
Supervisor: Sebastian Halder
Category: Brain Computer Interfaces
Location: Lab 1 desk 45

Abstract:
Quantitative Sensory Testing (QST) is a process by which an individual's sensitivity to stimuli can be measured. The three common stimuli used for testing are temperature, pressure, and touch. This form of testing has several applications and uses in the medical field. Whether it is being used to diagnose chronic pain, or to establish a pain threshold in an individual who suffers from neuropathy, QST can be effective.

My project is a QST program which tests the user's sensitivity to tactile stimulation. Through the use of tactors placed on the skin, several vibrations of varying intensity are activated in sequence. After running the test, the user will be able to see the results from their test, based on sensitivity scores recorded in response to each vibration. It should be possible for the user to see a trend in their results which indicates the higher the intensity of a vibration, the higher their sensitivity to said vibration.

This program was developed in Python.

Automatic Sleep Stage Classification using Biosignals and Preparing a Sleep Laboratory

Name: Jack Griffiths
Supervisor: Dr Vito De Feo
Category: Brain Computer Interfaces
Location: Lab 1 desk 59

Abstract:
Sleep is vital to our way of life. Deficits in the stages of sleep are associated with many pathologies, especially psychopathologies. Hence, why it is important that everyone gets not just good quantity of sleep, but also quality – spending most of the night cycling through all the stages of sleep. Assessing the quality of someone's sleep requires the eye of a human sleep expert looking at recordings of EEG, EMG, EOG, and more. However, assessing by eye takes a long time to do and not everyone has access to this expertise. Having a system that would automatically stage sleep accurately without a human could provide most of the population with the means to reliably assess the quality of their sleep.

Developing the automatic A.I. sleep expert requires a pipeline that includes preprocessing, feature extraction (relative spectral band powers, time series statistics, etc.), dimensionality reduction using feature selection methods and/or PCA, training a set of machine learning classifiers on the training dataset from an online database, evaluating the performance of the classifiers using a test dataset, and then selecting the best performing classifier. Once a classifier is developed, it can then be applied to data acquired from our own experiments.

This means developing a sleep laboratory where these experiments can be conducted while biosignals are recorded from participants. Doing this required writing a risk assessment, Ethics, research proposal, consent form, and designing experimental protocols for relaxation, napping, and whole sleep. One of the most important signals for sleep recording, EEG, is very sensitive to environmental noise and artifacts produced by EMG, EOG, movements, etc. Therefore, an important step was to selecting an EEG system that acquires good quality recordings. The EEG systems used, tested, and compared were the Unicorn and Enobio, and were compared using an eyes open vs closed experiments.

Name: Victoria Ogunnaike
Supervisor: Dr Vito De Feo
Category: Brain Computer Interfaces
Location: Lab 10 desk 10

Abstract:
Name: Victoria Ogunnaike
Reg No: 1904157
Category: Brain Computer Interfaces
Location: Lavoro Lab

Abstract.
Brain-computer interfaces (BCI) are systems that allow direct communication between the brain and an external device and are being increasingly used for various applications including sleep monitoring. BCI and biosignals were used to conduct a study to assess sleep analysis in humans. The study was split into two parts: the experimental and theoretical.
The experimental phase consisted of collecting data using the Enobio headset and the Unicorn headset. The health bands generated biological data. Data was collected from participants while sleeping. We used Electroencephalography (EEG) to measure the brain activity including alpha, beta, delta, and theta waves. The data was pre-processed and filtered before being used for analysis.
In the theoretical phase, the participants brain activity was analysed. Analysis included machine learning algorithms to classify the brain states recorded, filtering noise, pattern identification. This classifier used EEG data from the experimental phase to predict sleep stages which were recorded in real time during sleep. Another classifier that used biosignal data to predict the labels was generated by the first classifier.
A protocol was established and followed which allowed a standardized result comparison between each participant. Testing phases were carried to reduce artefacts such as noise which enhanced accuracy of measurement.
The results gathered deploy the potential of using biosignals and BCI techniques for sleep analysis in humans.

Internet of Things with SDN

Name: Jiyong Zhu
Supervisor: Bourtsoulatze, Eirina
Category: Communications
Location: Lab 10 desk 22

Abstract:
Abstracts

With the development of wireless network technology, Internet of Things technology is becoming more and more common. No matter from industry, logistics, or urban construction, the Internet of Things has become a hot topic now. The Internet of Things is an extended and expanded network based on the Internet. It is a huge network formed by combining various information-sensing devices with the network to realize the interconnection of people, machines and things at any time and any place. Of course, there are also many problems in the Internet of Things technology, such as the management of massive terminal devices. It takes a lot of time to reconfigure a large number of terminal devices, making it difficult to quickly and flexibly configure new applications. This paper draws on the idea of separation of control and forwarding in SDN, and designs a device management system architecture based on SDN. It can realize the management of users connected to the Internet of Things, the management of Internet of Things devices, the establishment of authorized access for users and devices, and the dynamic display of network devices.

High-Speed Train IoT Networks with 802.11ax (Wi-Fi 6): A Simulation Analysis Based on Cisco Packet Tracer

Name: Yuting Li
Supervisor: Walker, Stuart D
Category: Communications
Location: Lab 8 desk 19

Abstract:
The advent of Wi-Fi 6, with high throughput and concurrency, enables the implementation of Internet of Things (IoT) systems in high-speed railway environments. This paper investigates the integration of IoT technologies in high-speed railways, focusing on the key concepts, technologies, and demands. Several business scenarios are designed based on requirements, such as fire/gas alarms, cargo logging, and train status detection. Using Cisco Packet Tracer simulation software, an IoT network topology for high-speed railways is developed. IoT devices are programmed with Python for communication and remote management via a server web page or a static IP address. The study concludes with the deployment of security policies and the assessment of network performance against potential attacks. This research emphasizes the feasibility and benefits of incorporating IoT systems into high-speed railway environments, leveraging Wi-Fi 6's capabilities for enhanced connectivity, efficiency, and security.

WiFi-based Indoor Positioning

Name: Zhiyue Yin
Supervisor: Zilong LIU
Category: Communications
Location: Remote NWU on Zoom

Abstract:
In recent years, several indoor location solutions based on Wifi, Bluetooth and UWB have been researched. Due to the limitations and complexity of indoor environments, solutions for implementing low-cost and accurate positioning systems are still open. This project aims to systematically study the location technology based on WiFi, and improve the location performance from the bottleneck of Time of Arrival (ToA) and Angle of Arrival (AoA).

A WiFi system based on the 802.11a protocol standard is established, which includes signal generation and transmission, wireless propagation in indoor environments, signal reception, signal processing and location-related algorithms. Since the signal processing and location-related algorithms rely on the results of channel estimation in the WiFi system, three different channel estimation methods, Least Square (LS)-linear, Least Square (LS)-spline, and Minimum Mean Square Error (MMSE), are adopted in the system to compare the subsequent results. ToA is estimated using the Multiple Signal Classification (MUSIC) algorithm, the Sequential Component Cancellation (SCC) algorithm, and the SCC-based Space Alternating Generalized Expectation Maximization (SAGE) algorithm, where the SAGE algorithm produces the most accurate results. As commonly used AoA estimation algorithms have high accuracy, only the MUSIC algorithm is adopted for AoA estimation. Based on the results of ToA and AoA estimation, the ToA positioning method and the hybrid ToA/AoA positioning method are implemented to achieve location functionality. The results show that both positioning methods have high accuracy, and the hybrid ToA/AoA positioning method outperforms the ToA positioning method.

FMCW Radar and Communication for Automotive System

Name: Chai Yicong
Supervisor: Zilong Liu
Category: Communications
Location: Remote NWU on Zoom

Abstract:
This report presents a method for measuring both range and velocity values using two-dimensional FFT algorithm and implementing a two-dimensional Constant False Alarm Rate (CFAR) Detector detection in range and Doppler dimensions. The proposed method effectively extracts target signals from noise and clutter. The FMCW transmission signal, echo signal, and intermediate frequency signal are modeled, and a two-dimensional FFT combined with a two-dimensional constant false alarm rate (CFAR) detection method is used to decouple range and velocity and extract target information. The simulation experiment for range and velocity estimation of moving targets is also conducted.

In addition, the study explores the potential of radar and communication sharing systems (RadComSS), which is facilitated by the similarities between radar and communication systems. A FMCW-BPSK waveform is designed in this report, where the original communication code is modulated onto the phase information of the FMCW signal using binary phase shift keying (BPSK) modulation. The resultant FMCW-BPSK signal is used for both radar and communication purposes. The simulation results show the bit error rate (BER) curve of the shared signal, providing insights into the communication performance of the RadComSS.

In summary, this report proposes a novel method for range and velocity estimation of moving targets using two-dimensional FFT and CFAR detection, as well as explores the potential of RadComSS using FMCW-BPSK waveform. The simulation results demonstrate the effectiveness of the proposed method and the feasibility of the RadComSS.

Wireless Sensor Networks for Home Environment Monitoring

Name: Ruipeng Zhang
Supervisor: Kun Yang
Category: Communications
Location: Remote NWU on Zoom

Abstract:
With the development of science and technology, people's quality of life has also improved. In people's material life, housing is an inextricable topic. Almost every family has a residence. People's requirements for residence are not limited to whether there are some furniture and whether the decoration is beautiful. Whether the home environment is suitable or not is becoming a key issue. The development of wireless sensor network technology, it provides a more convenient method for the real-time detection of environmental data. In this paper, a home environment monitoring system based on wireless sensor network is designed by using Zigbee technology. The temperature, humidity and other parameters are collected through the sensor acquisition module, providing detailed and real-time environmental information and sending it to the user's mobile terminal in real time. The system has the characteristics of low power consumption, wireless, low cost, long working time and convenient maintenance, and has practical value in environmental monitoring.
The system collects the temperature, humidity, smoke concentration and other parameters in the environment through the sensor acquisition module, provides detailed and real-time environmental information, and transmits it to the user's mobile terminal through wireless. The paper introduces ZigBee technology and its network extension protocol and other related theories in detail. It uses CC2530 as the core transceiver chip and selects various sensor modules suitable for home use. The circuit design of the system terminal node and the mobile terminal receiving software are designed. Finally, the communication and acquisition functions of the real object are tested. It is proved that this scheme can obtain the environment data in real-time and upload it to the mobile terminal for users to view, thus realizing the expected function of the system.

House Scale VR

Name: Nikolas Kouis
Supervisor: Katerina Bourazeri
Category: Computer Games
Location: Agri Food Lab desk 0

Abstract:
House Scale VR is a revolutionary software that provides a realistic and immersive experience to users by utilizing the Passthrough feature of Oculus Quest 2. Using that feature, users can create virtual objects and transform them into in-game elements.

The editing process begins in passthrough mode, where users can select from a menu of options, including editing and rotating walls and obstacles. Once the room has been customized to the user's liking, the software generates the game world and places the user in one of two maps.

The game is a wave-based survival game featuring two types of zombies: zombies that attack with projectiles, and zombies that attack with their hands. Players have to defend themselves against these enemies by slashing them with a sword or shooting them with a bow and arrow. The walls created during the editing process act as fences that must be destroyed by the zombies before they can reach the player. However, ranged zombies can bypass these walls using their projectiles. They attack away from the player using energy balls. You can even avoid the projectiles by hiding behind the real life obstacles. Players can heal their fences by touching them, which adds an interesting strategic element to the game.

One of the most significant advantages of House Scale VR is that users can play games in their rooms without fear of colliding with real-life walls and furniture. The software represents real-world obstacles in the virtual environment, allowing players to navigate through the game world without any disruptions.

In conclusion, House Scale VR is a game-changing software that brings a new level of realism and immersion to the world of virtual reality. Users can customize their game environment to match their physical space, making the game experience more personal and engaging.

Hypertext Game

Name: Tia Borley
Supervisor: Richard Bartle
Category: Computer Games
Location: Lab 10 desk 2

Abstract:
Hypertext games are primarily a form of interactive fiction, where the choices that you make throughout the game affect your story outcome and how the game you are playing finishes/plays out. With my project, I have created a tool to make these games and created my own story within the tool I have created.

The most common genre within Hypertext games tends to be set under the murder mystery bracket. However, with my game I set it under the fantasy genre. I created my own themed around a Games Design project I created in 2nd year called Crimsyte. This is a decision-based game where choices you make impact your final game outcome but also affect how creatures and characters within the map respond to you as a player

Recreate A Classic Arcade Game

Name: Louis Reeve
Supervisor: Michael SANDERSON
Category: Computer Games
Location: Lab 10 desk 3

Abstract:
For the project, I had to re-create a classic arcade game using a language of my choice but I was not allowed to use any pre-existing game engines. I have re-created the arcade shooter "1942", initially made by Capcom in 1984, using Java and the Java2D graphics API, and to be played on PC. My decision landed on Java due to my prior familiarity with the language and confidence in being able to complete the project using it; I wanted to take an arcade game that I enjoy and attempt to do it justice, which Java gave me the best opportunity to do so. I also modified some visual aspects of the game to bring it a more modern feel. Such as an updated GUI and adding a menu.

CYAN: Choose Your Adventure Neatly

Name: Spike Atkinson
Supervisor: David Richerby
Category: Computer Games
Location: Lab 10 desk 6

Abstract:
CYAN is a writer/reader that you can use to make and play "Choose Your Own Adventure"(CYOA)-style games. CYAN allows you, with no programming experience, to create CYOA games via the Writer GUI, and for someone else to play through your adventures using the Reader GUI. CYAN boasts a versatile input system to give you maximum creative control over what your player sees, allowing for dynamically interchanged description paragraphs, and user choice options, while being simple enough to pick up and use within mere minutes.

An affective therapeutic game

Name: Max Reinsch
Supervisor: Dr. Ian Philip Daly
Category: Computer Games
Location: Lab 10 desk 7

Abstract:
Mental health issues are ever-present in societies across the world today. Numerous peer-reviewed papers have concluded that the extent of this issue has been further exacerbated by the COVID-19 pandemic, necessitating a need to find effective and affordable solutions.
With the abundance of smartphone ownership in the UK and around the world, hand-held devices provide an accessible and affordable alternative to one-on-one therapy.
My focus for this project is to provide an Android-based game which alleviates anxiety, providing quick access for the user.
The game implements a tilt feature in which the player uses to guide the player object to a destination through procedurally generated mazes. Based on background research, colour, sound and puzzle solving have been carefully considered to mitigate the effects of anxiety and to provide a calming ambience.
This project has been developed using the Unity Engine and C#.

Background NPCs

Name: Chenyi Zhao
Supervisor: Richard Bartle
Category: Computer Games
Location: Lab 10 desk 15

Abstract:
The main decision-making structure of the current game AI is the behavior tree. The behavior tree is actually a reactive AI, which has a high degree of human control, which also means that developers need to plan the behavior of AI well, and one of these planning methods is the behavior tree (Another type is FSM finite state machine).

Obviously, the structure of the behavior tree is quite clear and much easier to maintain than a single FSM. The code structure of FSM can be quite chaotic as the number of behaviors increases (you need to consider the connection between each state).

The behavior tree task is an executable node under the behavior tree, and the execution of game character abilities is one of the behavior tree tasks. This leads us to the concept of GAS. GAS is a highly flexible framework that you can use to build action or passive abilities for characters in games. It perfectly matches the original Gameplay code in the Unreal Engine, covering all aspects of complex logic such as skill effects and attribute interactions.

An important factor in whether AI can make players feel realistic is whether AI looks like it can figure out what's going on in the world (AI needs to interact with the world's environment and respond to events). Thanks to the AI perception component that comes with the Unreal Engine, we can enable AI to have visual and auditory perception capabilities that are virtually interchangeable.

This project will present an industrial-level background NPCs'AI implementation. With C++ based behavior tree tasks based on the visual behavior tree provided by the Unreal Engine and the implementation of a self-configured AI Perception Component and self-written GAS framework.

Psuedo 3d Racer

Name: Richard Lewis
Supervisor: Sarafiem Perdikis
Category: Computer Games
Location: Lab 7 desk 4

Abstract:
This project is a pseudo-3D racing game where geometric shapes are used to represent objects i the game world. The player's view is represented as a camera which can be rotated and tilted. The use of trigonometry calculates the coordinates of objects in the game world as the camera moves around. This game consists of roads with buildings alongside consistent curves on the road to navigate. Movement is simulated with arrow keys The distance between objects and the player's frame is updated every frame. Sprites and visual GUI elements along with sound are all utilised for interactivity and animations creating an immersive experience. Trigonometric Projection of 3D objects on to a 2D screen is implemented

Miku's Adventure: A Modern Twist on a Classic Arcade Game

Name: Cheng Jiang
Supervisor: Haider RAZA
Category: Computer Games
Location: Lab 7 desk 5

Abstract:
This project is a re-creation of the classic arcade game, Mario, with new elements and characters to make it more engaging for players. The game features a map with different environments such as sky, forest, hell, and heaven, and various monsters have been added to the game, each with unique abilities and characteristics. Some monsters are small and easy to defeat, while others are larger and can shoot fire. Players control Hatsune Miku as the main character, and the game includes objects that can collide, trigger puzzles, or use the physics engine to kill enemies, making the gameplay more dynamic and challenging. Additionally, I integrated popular games and web-based mini-games into Mario to promote other games and increase their popularity. With consistent game sounds and Mario's movements, this re-creation of Mario aims to provide players with a fun and engaging gaming experience while also promoting other games to a wider audience.

Recreate a classic arcade game

Name: Dominic Farrow
Supervisor: Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 6

Abstract:
Super Mario Bros on the NES was a ground-breaking game. Its innovative gameplay, eye catching art style and memorable music helped establish it as an all-time classic. Therefore, there is no classic game better fitting to be recreated.

The main aim of the project is to recreate the game for PC as closely as possible, as well as add some unique features to modernise the game and add some signature flair. To add some extra challenge, the game was created from scratch using C++ with the SFML multimedia library, which means no game engines were used for development.

The first two levels have been fully recreated, with the tiles, enemies and powerups being 1:1 with the original game. The recreation also includes sound effects, particle effects and the ability to read level data from text files which allow users to create customized levels if they wish to. Advanced features such as view frustum culling, parallax scrolling, and precise a-posteriori collision detection were implemented to modernise and optimize the performance of the game.

The project structure is very modular and uses key object-oriented techniques and game programming patterns to implement the game as efficiently and effectively as possible.

Super Mario Bros Unity

Name: Edward Gransaull
Supervisor: Tasos Papastylianou
Category: Computer Games
Location: Lab 7 desk 12

Abstract:
Many older video games were developed for now discontinued hardware or deprecated APIs which are no longer readily available. In addition, the physical storage media used to store and distribute them is vulnerable to data loss.

This project explores the feasibility of recreating video games by a process of reverse engineering, where none of the original code or assets are reused, in order to preserve culturally significant pieces of software.

This compares with software emulation, which allows a device to run original software developed for another device.

To do this, I have recreated the 1985 video game 'Super Mario Bros' using the Unity game engine and C#.

Arena-style Fighting Game in Unreal Engine

Name: Abraham Khan
Supervisor: Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 16

Abstract:
My project is a 3D fighting game made with Unreal Engine.

Players can fight against AI enemies alone, duel other players, or team up with another player and take on multiple enemies. Fights can take place as duels with no respawns, or waves where enemies continuously respawn until all waves are cleared.

There are 3 combat styles: kickboxing, weapon-based and magic. Kickboxing and weapon-based combat involve melee attacks, whereas magic is based on projectiles and ranged combat. Each style has pros and cons that the player must weigh in any given situation.

C++ is the programming language that I've used for the development of the game. This involves core C++ functionality and Unreal Engine's specific API that allows you to 'communicate' with the engine by exposing variables to the engine's editor and create complex gameplay features.

Whilst C++ was used to create the gameplay, there are many other things that go in to creating a game of this scope. A variety of programs were used to model meshes, create animations, adjust audio files and edit textures. I have also imported (licence friendly) assets to help with this.

There are multiple maps and game modes available for the player to experience, including a tutorial.

Full Stack React.js Website With a Unity Game Product and Marketing

Name: Marc Maslen
Supervisor: Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 17

Abstract:
Medieval Magic is a tower defense game where you defend against the undead using a variety of magic towers that can be upgraded and made even more powerful! There is a leveling system with permanent upgradeable skills, which work by saving and loading the data in the game. Every product needs a place to advertise and market itself, right? This is why for my project I made it my goal to create both a Unity game and a React.js website that complement each other. The website I made was a way to promote and market the game which has multiple pages, a responsive layout, functional buttons, and an account sign-up and log-in system. For the backend of my website, I am using Firebase for authentication, real-time database, and hosting.

Develop a 3D Tower Defense game in Unity

Name: Ifeade Adewoyin
Supervisor: Vishwanathan Mohan
Category: Computer Games
Location: Lab 7 desk 18

Abstract:
The aim of this project is to create a functional tower defence game which can be played primarily on PC but can also be expanded to mobile platforms. Tower defense game are a type of strategy game in which players defend either a specific location or a path against multiple waves of incoming enemies. My project will use a 3-Dimensional top-down tile-based format in which enemies AI will follow a given path towards the base and take 1 life for each enemy that makes it to the player's base. This game will be developed in Unity and C# in which you almost follow a journey through the different scene creations as each level and its difficulty progresses.
Game development allows the opportunity for a developer's creativity to shine and allows the incorporation of any features and designs conceivable and implementable. In my case this was, albeit limited, to assets that were financially viable to me. A game, however, can always be further developed and improved upon especially using the agile methodology as projects can easily and effectively be updated to add more levels, maps, defensive options, and enemy types to ensure a positive user experience.
Choosing this project was the most ideal for me as I have always had a genuine interest in games and as someone with the primary goal of learning all I can about game development this project finally helped shed light on just how much work is required to make a functional game. It also made me aware of the magnitude of work required for the creation of any functional game worthy of publication especially when scaled up to the complexity of AAA games.

Creating a Doom-like game engine from scratch

Name: Alastair Monis
Supervisor: Aikaterina Bourazeri
Category: Computer Games
Location: Lab 7 desk 19

Abstract:
The primary objective of this project was to develop a game engine that closely resembles both visually and in terms of the gameplay loop the id tech 4 engine used to build Doom (1993). I have made some alterations and came up with “Spaceship Escape”, a first-person maze-solving game. In the game, you, as the player, must navigate your way through a complex spaceship with multiple rooms and complicated pathways. Not including the numerous enemies that resemble imposters and crewmates from the game “Among Us”, which gained popularity in mid-2020. Fight your way through the numerous enemies and take the damage they deal, or zip past them before they realize you’re there, the choice is yours. The game itself was programmed in vanilla java, without the use of any third-party libraries or additional supplements, such as open-source java files or Unity. The game’s levels take place on a flat plane which is generated from a 128x128 pixel .png file. This allows users to create their own custom levels and textures, enabling them to modify and change the aesthetic of the game to suit their whims and wants, which can be done by editing the appropriate image file.

'Find The Ant' Game

Name: Yu Xin Kang
Supervisor: Themistoklis Melissourgos
Category: Computer Games
Location: Lab 7 desk 20

Abstract:
Find the ant is a single-player logic-based computer game that helps children and adults improve their strategy skills. The aim of this game is to catch an ant that moves underground on an N x N board. Players can dig a hole in a square to see if the ant is there. If it is, they win, but if it is not, they can find the ant's pheromone trail from a previous visit to infer its possible location. The ant moves pseudo randomly, leaving pheromone only in some squares, and the world is toroidal.

The game is programmed on Unity using C# and is compatible with Windows or any PC that can run a .exe file.

The Tower

Name: Mark Greig
Supervisor: Dr Vishwanathan Mohan
Category: Computer Games
Location: Lab 7 desk 23

Abstract:
The Tower is a side scrolling 2.5D “Hack-and-Slash” game in which players fight through the floors of the tower, gaining new abilities along the way to progress in the quest to clear the demons out. Players start with basic abilities, jumping, attacking, dodging, etc, and can chose to develop their character along two different paths throughout the game.
The theme of the game is based on seven emotions, with the level, enemy, and boss design incorporating an emotion, and the final boss of the game representing an amalgamation of all seven.

The game is made using the Unity Engine with all assets, coding, sound design, level design, character design, art style, and gameplay created by me. Unity Engine was chosen due to its adaptability and familiarity.

Creating a 2.5D game engine in C++ from scratch

Name: Owen Greene
Supervisor: Ramy Hammady
Category: Computer Games
Location: Lab 7 desk 29

Abstract:
A game engine is defined as a software framework primarily designed for the development of video games. Some common examples would be Unity and Unreal Engine. The goal of this project is to create a 2.5D game engine, like that of the original Wolfenstein and DOOM games, that contains common game engine features such as sound, player controls, scene rendering and so on. As much of the code as possible has been created from scratch to allow for a deeper understanding of how game engines work under the hood and how to optimise performance. OpenGL is used in the project to render on the GPU. A sample set of test code, as well as sprites and music, have been included. This engine is built for windows and uses the windows api.

Recreating Street Fighter arcade game in Java

Name: Drew Berry
Supervisor: Yunfei Long
Category: Computer Games
Location: Lab 7 desk 30

Abstract:
Street Fighter is a classic two-dimensional PVP fighting arcade game made by Capcom in the 1980s, where the aim is to defeat the opponent by any means necessary before you are defeated. This project aimed to faithfully recreate this beloved game, while also giving my own interpretation. This was to be made from scratch in Java, using various tools such as Java Swing. The game includes a full roster of characters which will fight with many different attacks, in locations familiar to veteran players. Battle through multiple game modes against the computer or face off against a friend.

Recreate a classic arcade game

Name: Hassan Yusuf
Supervisor: Sefki Kolozali
Category: Computer Games
Location: Lab 7 desk 33

Abstract:
The goal of my project is to recreate a classic arcade game, this is to be done from scratch without using any external game-oriented graphics libraries. The game I chose to recreate was Missile Command by Atari, an iconic Shoot 'em up game released during the cold war to represent US against the Soviet Union. The game involves designing a strategic defence system, controlled by the player to intercept the nuclear attacks before they can reach the cities. The project will require good knowledge of game design, collision handling and simple path finding for enemy AI's. The game will be controlled by a mouse, which will deploy missiles on-click. The game can be further improved by adding features such as new enemy types, power-ups, bonus modes which have different enemy types and better graphics. The finished product will be a modernized fast-pace, engaging game that will incorporate modern game graphics and game design while still being a high quality gaming experience in a short amount of time.

3D Racing Game

Name: James Aiden Gardiner
Supervisor: Themistoklis Melissourgos
Category: Computer Games
Location: Lab 7 desk 34

Abstract:
The main aim of this project is to create a fun and enjoyable 3D racing game with the Unity game engine where the player has to race against the clock to beat their best time. The game incorporates custom ray cast suspension physics to offer a realistic and immersive driving experience and also ensures the cars movements and interactions with the environment simulate a true-to-life feel. This game also utilises a method called Ackermann steering which replicates how cars steer and turn in real life, further increasing the games realism. Every asset within this project was self-made within blender offering a unique and engaging racing environment with the aim to demonstrate a keen attention to detail and commitment to creating a polished, professional product. All coding was completed using the Unity's main language, C#.

Multiplayer Sandbox RPG with AI Mobs/NPC's

Name: Owen Amenze
Supervisor: Dr Faiyaz Doctor
Category: Computer Games
Location: Lab 7 desk 37

Abstract:
This project aims to create an immersive multiplayer gaming experience by designing AI-controlled monsters and non-playable characters (NPCs) for players to fight against as well as interact with. The game also offers players the option to play as different races with unique abilities, adding another layer of depth to the gameplay. In this multiplayer client-server environment, players can interact with one another, form teams, and strategize to defeat designated AI monsters, and interact with NPCs. The project promises to provide an engaging and challenging gaming experience for players looking for a new and exciting adventure.

In addition, the project ensures state permanence by logging and saving user interactions to a SQL database, enabling players to pick up where they left off and track their progress. This also provides the opportunity for statistical analysis to balance gameplay aspects such as damage and health. By incorporating this feature, the project offers a seamless and immersive gaming experience that keeps players engaged and invested in the game.

Create a DOOM engine from scratch

Name: Pedro Ferraz
Supervisor: Ana Matran-Fernandez
Category: Computer Games
Location: Lab 7 desk 40

Abstract:
My project is about creating a 3D graphics engine from scratch using C. The engine has to be based on the graphics engine of the 1993 PC game called DOOM, which is a first-person shooter that pioneered advancements in 3D graphics. In this project I have to learn about 3-D graphics, geometry, concave rooms, vectors, rotation matrices, cross product, and try to implement as much of it as I can to create my own DOOM-style graphics engine.
I also decided to create a level editor, which allows the user to create levels and see the changes in the actual game. The user can also choose the texture and tiling when creating the level. The level editor saves a lot of time hand coding the levels, and it also lets anyone create levels and try them out on the go.

Who's phone is it?

Name: MAN YIN WONG
Supervisor: Bourtsoulatze, Eirina
Category: Computer Games
Location: Lab 7 desk 43

Abstract:
Imagining yourself walking down on the street and you found an old classic Nokia cellphone. It probably dropped by someone but you took it nevertheless and thinking it might could be sold on eBay or putting it on auction with a good price. You are glad that the phone is still working but you noticed something suspicious after you browsed around the data in it. This is a mystery solving game - included criminal graphics - that created by Javascript, html and CSS. The idea is to bring the mystery for players to explore the game with curiosity and fun and player is not just solving mysteries on the phone but also playing three classic Arcade games from the 90s, Pac Man, Space Invader and Snake. The gaming experience might be presented differently when it compares to the others and the inspiration of it is from the Horror website game from Japan.

Game for Android: Ruin

Name: Herkus Krisciunas
Supervisor: Dr Richard A. Bartle
Category: Computer Games
Location: Lab 7 desk 47

Abstract:
Ruin is a 3D isometric adventure game for Android mobile devices developed using Unity, Blender (open-source 3D modeling software), and Cascadeur (machine learning-based 3D animation software). The game is set in a dystopian universe, where a cosmic virus feeding off of sentience threatens the existence of life and universe itself. Following the consumption of its planet, a nameless warrior wielding a katana, driven by pure vengeance, becomes the only force standing before the insatiable appetite of the cosmic virus. The main set of objectives in Ruin is to control the nameless warrior and to rid the universe of the looming threat, while traversing desolate landscapes, fighting different enemy types and bosses, mastering the flow of combat, and overcoming an unfair world. The result of the project is a vertical slice of the game containing all of the core mechanics and features some of which include: multiple enemies, each with different abilities and combat styles, a single level containing traps and combat arenas, a soundtrack composed specifically for the game, a fully custom 3d character model for the player and edited third-party character models for the enemies, custom 3d animations for all of the game assets, and many more. As a vertical slice, the project is easily expandable, as the core features and mechanics have been implemented; the use of Unity allows for a relatively seamless development of the game for other platforms. Ruin is the result of blending casual and adventure game elements - a perfect experience for mobile platforms and beyond.

Arcade Racer Lite

Name: Yael Haeems
Supervisor: Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 51

Abstract:
During the second decade of the computer games industry, arcade machines were dominating a large portion of the market as the only place to play good quality titles, many of which later recieved console remasters playable today. Arcade machines, despite their size, had very little processing power and memory compared to today's standards. Due to the technical limitations, many machines relied on a dedicated 'road chip', which had its own graphics memory and handled the basic drawing of the road(s). On top of that, many of these machines could not do operations such as division and multiplication, so programmers had to come up with some clever tricks in order to create a convincing environment.
This project is written in C++ using a graphics and media library called SFML. No game engine was used in the creation of this project, and it was built from scratch. This means coding everything from the window opening,the sounds playing, UI elements on screen, game states, game behaviour, handling input etc. This game aims to recreate a classic arcade racing game, providing gameplay similar to that seen in the NAMCO Atari Pole Position franchise, where the player engages in a time trial race to the finish. Steep curves in the road and collidable objects will cause the player to have to anticipate a sharp turn and preposition on the road, not steer off the road and not collide with enemy cars if they want to beat the race in a good time.

Super Mario Bros

Name: Antonis Efthymiou
Supervisor: Katerina Bourazeri
Category: Computer Games
Location: Lab 7 desk 52

Abstract:
The objective of my project is to recreate the iconic Super Mario Bros 1985 2D virtual game, with a modern and dark twist. The reimagination of this game is developed using Unity Engine and C# as the programming language. The game utilises a 2D Sprite-based art style that includes cute animations, compelling music and fun sound effects. In order to reach a broader audience, it has been decided to use keyboard input as the method of control for the game.
The game consists of three dissimilar levels and a boss level, each one with its own colour palette. Every level brings a different atmosphere and a variety of enemies that keep the player engaged. As the character progresses through each level, they can gather cherries which will help restore their health and add points to their score. The game has a simple yet classic keyboard control with the WASD keys or the arrow keys, enhancing accessibility and enjoyment for players of all skill levels.

Recreate a classic arcade game

Name: Andrew Darkwa
Supervisor: Yunfei Long
Category: Computer Games
Location: Lab 7 desk 54

Abstract:
The aim of this project is to recreate a classic arcade game. Throughout the years, Galaga has been adapted to a variety of systems, influencing a lot of other space shooter games that were created around the time. Still to his day a favourite among fans of classic arcade games. Classic arcade games are completely outdated due to the sound and graphics quality being mediocre compared to the now modern video games. The technology used were very limited and the hardware used back then was not able to handle a lot.
The visuals and sound effects of classic arcade games were commonly kept basic to make them appealing and simple for players of all ages. Players were always trying to beat their previous score, outscore their friends or try to make sure no one can beat their record.
Using Python, I will be recreating a classic 2D arcade game Galaga and implementing its original sounds, features, style, mechanics and the algorithm of the enemy movement patterns to bring nostalgia back to those who used to play this game in the past and show the new generation what they missed out on. This all has to be done to meet the design requirements ensuring the game will be smooth and enjoyable to play.

Super Mario Bros

Name: Gvidas Kalvonis
Supervisor: Dr.Themistoklis Melissourgos
Category: Computer Games
Location: Lab 7 desk 55

Abstract:
The Super Mario Bros game, created in 1985, was a start of a series that became a massive success that is a favourite of so many people across decades. This game also shows how far the computer games industry has advanced during the years. My project is to recreate the original Super Mario Bros using the Unity game engine with the help of C# programming language. Recreating a classic such as this is challenging as everything apart from the Sprite sheets will be done from scratch such as Mario himself and his controls, level designs, all the enemy characters and their behaviours, the boss (Bowser) at each of the individual boss rooms, the platforms, and their behaviours etc... The main goal of the project is to create 34 individual levels that are as close to the original game as possible with possible slight variations on small things due to different methods and processes in development of the project.

Game for Android

Name: Xinjie Guo
Supervisor: Michael Sanderson
Category: Computer Games
Location: Lab 7 desk 59

Abstract:
The project aims to develop a mobile game called "Chronicles of Knight Errant" and publish it on Google Play.
Chronicles of Knight Errant is a 2D top-down action role-playing game set for release on Android devices, available on Google Play. The game follows the story of a knight who has lost his home due to war. Taken in by a village in his time of need, the knight now seeks to repay their kindness. Players will take on the role of this knight, battling bandits to protect the village.
The game features basic 2D lighting and shadow effects, aiming to provide an adequate visual experience for players. It also includes an interesting weapon and skill system, allowing players to customize their character's abilities and gear. The character level system offers some progression, enabling players to develop their knight as they advance through the game.
Chronicles of Knight Errant features a slightly complex damage calculation system, with the damage dealt by characters determined by 7 different attributes. This allows players to gain a greater sense of accomplishment during character leveling and battles. The game's scenes are designed using Tiled, to create a visually appealing environment for players.
The choice to develop this game for mobile platforms is due to the growing popularity of mobile gaming and the advantages it offers over computer games, such as accessibility and portability.

Monopoly Game

Name: Huang Gehao
Supervisor: Yunfei Long
Category: Computer Games
Location: Lab 7 desk 60

Abstract:
The game of Monopoly is a traditional board game and is a competitive multiplayer game. This game is a great way to develop a sense of investment and increase your sensitivity to numbers. For this project, I designed a single player Monopoly game using unity based on the Chinese Journey version of Monopoly. The rules and mechanics of the game are similar to those of the Board Game version in that the player has a certain initial fund and uses the mouse to move the player around by throwing dice, triggering different effects on the different squares to increase or decrease the player's assets, and finally calculating the total player assets at the end of the game to determine the winner. In addition to this I have added a player skill, each player starts with a skill that they can use on their turn of action to gain an advantage and increase the uncertainty of the game. Compared to the board game version, the computer version of Monopoly is much simpler as there is no need for an extra person to play as the bank, the game automatically adds and subtracts assets, making the game faster and smoother. The PC version of Monopoly does not require you to worry about losing items that may prevent the game from continuing.

Super Mario Bros

Name: jamie witt
Supervisor: Katerina Bourazeri
Category: Computer Games
Location: Lab 7 desk 62

Abstract:
the hit 1985 game super Mario bros lovingly recreated using both unity and c#. Designed to provide the authentic gameplay experience known and loved, all whilst implementing a fully adaptable level system designed from the ground up to allow for custom user designs. Enemies and power ups have been reimagined to give any budding player the ability to alter the level as they please, all whilst remaining faithful to their original behaviours and designs.

Find the Ant game

Name: Mitchell Dixon
Supervisor: Riccardo Poli
Category: Computer Games
Location: Lab 7 desk 65

Abstract:
This version of a find the ant game is designed in a way to allow the player to learn gameplay mechanics from the previous modes and apply them in the harder game modes. The ant will make use of algorithms to either avoid capture or, in the case of the 3rd gamemode, try to capture the player.
It is designed to be simple to play and not take a lot of time to complete each game so that it can be played in short bursts.
The game keeps high scores of the players based on how fast they find the ant and how many actions they took. The addition of a score system allows players to compete and improve.
Each game mode has differences from the others, whether that be the main objective changing, the style of the board and possible ant movements being more complex, or how it is scored.
The ant game is programmed using JavaFX which allows the use of interesting animations to make the player's experience more entertaining.

Background NPCs

Name: Stevee Pang
Supervisor: Richard Bartle
Category: Computer Games
Location: Lab 7 desk 67

Abstract:
Background NPCs are non playable characters typically inserted into a virtual environment to enhance the immersion or realism of a video game experience.
Background NPCs are a staple feature of a variety of video games in various genres , most notably found in role playing games of both single player and multiplayer variants .
My project focuses on learning about the “behavioural stack” of background NPCs , otherwise described as what the NPCs normally do uninterrupted , how or if they interact with players . As well as identifying common pitfalls/issues to avoid whilst developing background NPCs for any game . These issues range from breaking immersion to computational stress as well as development stress . It is important to note that the goal of the project is at heart a research project and not the development of a full game . The developmental goal of the project is to create a virtual environment populated by NPCs that avoids pitfalls and issues that I had found while researching the topic.

Create a DOOM engine from scratch

Name: Dylan Greenwood
Supervisor: Tasos Papastylianou
Category: Computer Games
Location: Lab 7 desk 71

Abstract:
Doom is a classic 3D FPS (First Person Shooter) game which many people have played or heard of. This project focuses on recreating a more modern Doom styled engine, coded in Java, using the LibGDX framework, with OpenGL API. This project focuses on making a Doom engine with additional components which aren't normally seen within Doom, these include a dashing mechanic, and sprinting. The engine itself runs a demo which contains a test level, which includes, ramps, platforms, and holes in the floor of the walkable plane to better demonstrate the capabilities of the engines ability to handle; Lighting and environmental effects, collisions, and object rendering. Through experimentation and user testing, I can show that the engine is capable of rending complex 3D scenes at high frame rates.

RogueAI

Name: Mark Taylor
Supervisor: Faiyaz Doctor
Category: Computer Games
Location: Lab 7 desk 72

Abstract:
The concept for my CE301 project is a game named RogueAI. In this game, the player will command a group of characters, each with their own quirks and behaviours, and try to get them to the end of the level while getting as high of a score as possible though beating enemies in their way, collecting items and beating the level as fast as possible.

Background NPC's with GPT

Name: Tom Finch
Supervisor: Ramy Hammady
Category: Computer Games
Location: Lab 7 desk 82

Abstract:
This project uses GPT-3 to give the NPC's in this game authentic and original dialogue depending on what the player asks them. The reason I chose to do this is because I love video games and my favourite part about a good game is immersion. With this project I hope to learn how to make my NPC's more immersive by adding a level of unpredictability to the game no matter how many times you play it. The player can walk about the village and ask the NPC's anything about themselves, their daily life and so on. I have added a "personality template" to each NPC to make them speak and act uniquely based on what the template says. The Village is placed in the middle of a dessert and most of the NPC's do not know why they are there, explaining that they appeared there suddenly, just as the player did.
This project uses animations from mixamo and models from Ready Player Me, the map, while acquired from the unity store, was custom meshed by me.

Recreating a 1990s 3D game

Name: Siu Hann Ryan Leung
Supervisor: Long Yun Fei
Category: Computer Games
Location: Lab 7 desk 83

Abstract:
This project aims to recreate an iconic game called Air Combat that was released in 1995 from scratch using Unity and 3DSMAX.
Air Combat is a 3D combat simulation game set in an open world where it requires players to pilot a fighter of their choice and eliminate enemy targets as the game progresses. Players would mainly be using missiles to eliminate their enemy target, where smaller targets such as enemy fighter aircraft would need to take 2 hit to destroy but are also more agile at the same time, larger targets such as enemy bomber would be more bulky and less manoeuvrable, but would need 3 missile hits in order to destroy it.
AI fighters have different actions depending on the situation and position, at the start of each level, AI fighters would usually either fly along a pre-created flight path and fly circles around the map or fly straight towards the objective point, when they detect player's fighter is close to them at a certain distance, they would automatically change to engage mode and engage a dogfight with player's fighter. Sometimes the AI fighters would fly in a formation, with wingman fighters closely following leader fighter's actions.
This project offers me the opportunity to work and learn about the design and programming aspects of a game, such as level designing, 3D modelling, physics integrating, AI systems and much more.

Multi-user Virtual Environment

Name: Ronnie Moir
Supervisor: Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 86

Abstract:
Virtual Reality Worlds have recently become a mainstream topic. Popular titles like VRChat and Facebook's reveal of the metaverse have attracted large userbases and widespread media attention. My project was to create a multiplayer virtual environment allowing both VR and Non-VR players to interact, socialise and play simple games with each other. The inclusion of Non-VR players helps to keep the game accessible as the barrier of entry for VR can be quite demanding. Major features include, networked physical interactions, voice chat, a synchronised minigames and a high visual fidelity map.

Game for Android

Name: Stefanos Savvas
Supervisor: Richard Bartle
Category: Computer Games
Location: Lab 7 desk 89

Abstract:
Having 'Game for Android' as my project, I have thematically chosen to create a medieval inspired, two-dimensional side-scroller/platformer, shoot and run game with the name Mayhem Realms. Ultimate goal of the game is to shoot and kill different enemies while avoiding crowd control effects in order to build up tempo and get to the end of the stage before you get eliminated by the environment or the timer. Mayhem Realms places an emphasis on fast gameplay with game progression being efficiently designed to avoid repetitiveness and burn-out. More specifically, I have decided to develop the game in such way as I always felt like games with zero commitment are the best in scenarios where the player does not have much time to invest.

Mayhem Realms is developed in the Unity 2D Game Engine with the use of the C# programming language and various packages from Unity's Asset Store. Source code for the game has been efficiently developed such that any additional updates on the build can be seamlessly applied to it. The management of the project consists of software such as Jira and tools like GitLab while game testing is done using the Android Studio emulator.

Games have increasingly become a part of our lives and our entertainment over the past few years. People are looking for new adventures and stories that they can relate to and express themselves through while taking a break from the real world. This is one of the main reasons as to why i chose this project and my overall course of study, as I want to explore the endless possibilities that games hold and the immense creativity that they bring.

Immediate mode Vulkan renderer for SDL

Name: Ewain Williams
Supervisor: Dr Michael Fairbank
Category: Computer Games
Location: Lab 7 desk 95

Abstract:
In the current graphics climate where the demands for ever increasing graphical fidelity keep ballooning the complexity of libraries to keep up with the features that users want, there is a lack of simple alternatives to the rendering juggernauts (OGRE3D, BGFX, MAGNUM).
While smaller alternatives do exist (raylib) they are rare and like their larger counterparts often come with baggage that make them difficult to integrate with existing code. This contrasts heavily with the 2D graphics library scene (SDL2, Love2D, libGDX) where solutions are often highly flexible and modular with low barriers to entry and sufficient on demand optional depth to cover almost all use cases.
VSR (Vulkan SDL renderer) aims to fill this 3D niche, offering a simple Immediate mode rendering style API while exposing as much optional depth via shaders + accessible data as possible. With a suite and functions designed in the SDL2 style and implemented in C99 integrating into your current or new projects is simple.
With <30 semicolons or <50 LOC for a spinning cube, VSR can start pushing pixels to your screen with minimal setup. And add basic custom lighting to that scene with only an additional 10 semicolons for 15 LOC (not counting shader code)
VSR is designed with the intent of being able to grow with you as your demands increase and while due to its infrastructure it will never be able to completely compete with the AAA solutions with easily hackable well organized source code an experienced user will be able to extended where required to fit requirements.

VSR was designed with game jams in mind and is perfect for rapid prototyping although with features like lighting or animation left to the user to implement(through custom descriptor and shaders), a ‘warm up’ period would be recommended before jumping in!

Self Suggested Projects with the beast

Name: Shengyi Wei
Supervisor: Vishuu MOHAN
Category: Computer Vision
Location: Agri Food Lab desk 0

Abstract:
The challenge in berry picking is that each berry is unique in shape, size, and ripeness, and many are hidden in the foliage, making it difficult for robots to navigate. Additionally, the environment is constantly changing, which adds to the challenge. At present, one billion strawberries are picked by hand at Tiptree each year, but labor shortages, increasing production costs, and a significant percentage of unpicked fruits are driving the need for robotization of such tasks. This project aims to research and develop a visual recognition system for the agricultural robot "Beast" to improve the production efficiency of strawberry planting. Synthetic virtual datasets are used to expand actual data, and OpenCV is used for image preprocessing. Then, Yolov5 is used for image recognition to obtain the growth status and stage of strawberries and predict the yield. To expand the actual data for the visual recognition system, pictures of individual strawberries from the Fruits-360 dataset are used. These pictures are synthesized by placing them on a background image, with each strawberry cropped from its white background and its gamma modified to create lightning variation. To add a more realistic touch to the synthesized data, different masks are used to cut each crop in a different and irregular shape, emulating obstacles in the scene.

Creating 3D Model Replicas Using 2D Depth Maps

Name: Loris Duke
Supervisor: Dr Manoj Thakur
Category: Computer Vision
Location: Lab 1 desk 7

Abstract:
One interesting facet of the increasing precedence of AR within both industry and leisure is the decreasing cost of specialised equipment to capture one's environment. Previously, 3D environment scanners cost thousands of pounds and were far from reach for the average consumer. Up until a few years ago, what seemed like a pipe dream can now be completed with standard consumer hardware. This project aims to develop a software tool for reconstructing 3D surfaces from 2D depth maps. The proposed solution employs the Bowyer-Watson algorithm and Alpha Shapes to generate a mesh from captured depth data. Depth maps are captured from LiDAR sensors, such as ones now found in smartphones, to capture a 2D representation of a 3D surface. The tool allows users to manipulate the point clouds and generate a mesh based on their position in 3D space. The resulting 3D model can be used for a wide range of applications, including virtual reality, computer graphics, and industrial design. This project offers a novel approach to creating 3D models that is easy to use, efficient and accessible to a wide range of users.

Drone Inspection for Fruit Quality in Indoor Vertical Growing Systems

Name: Morris Man
Supervisor: Dongbing GU
Category: Computer Vision
Location: Lab 1 desk 16

Abstract:
Growing fruits with the use of Indoor Vertical Growing System is growing in popularity for its efficient use of space. However, ensuring the quality of fruits and detecting defects remains a challenge.. This paper investigated on this matter with the approach of computer vision and drones. With the help from OpenCV, the code allows the drone to identify the shape and maturity of the strawberries in an image taken by the Tello drone.The proposed system has the potential to improve the efficiency and effectiveness of the inspection process, ultimately leading to higher quality strawberries and increased profitability for indoor vertical strawberry growers.

Using hand gestures to control a game

Name: Ioannis Strouthos
Supervisor: Adrian Clark
Category: Computer Vision
Location: Lab 1 desk 18

Abstract:
The use of computer vision in computer games has been a growing field of interest in recent years. In this project, the focus was on utilizing a pre-trained model called SqueezeNet, a smaller and more compact convolutional neural network than other models such as AlexNet, to recognize different gestures in real-time.
The project involved training the SqueezeNet model on a dataset of hand gestures and random object images. Four hand gestures were chosen to control character movements in a 2D game: open palm for jump, close fist for slide, thumb vertically for running to the right, and pinkie finger up for moving to the left, but at the same time excluding any other gesture that may be given to it. The trained model was integrated with the Pygame library to create a live testing model that could recognize hand gestures in real-time and control the character's movements in the game.
The results of the project showed that the SqueezeNet model was effective in recognizing the different hand gestures, and the live testing model successfully integrated these gestures with the game.

Tracking Players

Name: Furkan Sevinc
Supervisor: Adrian Clark
Category: Computer Vision
Location: Lab 1 desk 21

Abstract:
The project is based on tracking players in a tennis game. This is done by utilising computer vision techniques to track the players. Using Open cv libraries from python will help generate the code to find the players. I've decided to pursue with this project due to my passion and interest in sports. Using modern day technology in sports has rapidly increased over the years, we've seen it everywhere in football (VAR) and in tennis as well, ball line technology. However now tracking players will help for player analysis, to follow up the positioning of players and to identify the movements of players.

Tracking players can help sports team to analyse both their team and opposition team. With the game of tennis we could be able to identify the advantages and weaknesses of the players. Which hand is more preferred and which direction of the ball affects them the most.

Emotion classification using machine learning

Name: Andrei Alexandru Talpan
Supervisor: Francisco Sepulveda
Category: Computer Vision
Location: Lab 1 desk 49

Abstract:
Facial expressions play a vital role in the communication of emotions and the understanding of human behavior. The recent advancements in deep learning have demonstrated remarkable progress in the field of computer vision, particularly in image classification and object recognition. The primary objective of this project is to leverage both traditional and modern machine learning techniques, such as Convolutional Neural Networks (CNNs) and Support Vector Machines (SVM), to accurately classify emotions based on facial expressions.

To accomplish this, image analysis techniques are utilized for feature extraction, and machine learning algorithms are employed to classify emotions from facial expressions. For machine learning development I have used python libraries such as Keras, TensorFlow and image analysis was performed using OpenCV. Results for machine learning models are 69% and 65% accuracy, for the CNN and SVM models.

Additionally, a web application is developed that enables users to compare models and provides a more interactive user experience than just running a script. It allows users to upload images, record themselves, or take webcam captures to evaluate the model's performance. This was developed using Streamlit library (a python framework) and hosted on Streamlit Cloud. There are 4 models in total that users can interact with, 2 originating from open-source projects: DeepFace and ResMaskNet.

Furthermore, the web application provides valuable insights into how CNNs are utilized in computer vision and gives an overview of state-of-the-art models.

Developing a mobile app using machine learning for garden flower/plant recognition

Name: Alexander Bickmore
Supervisor: Alba Garcia
Category: Computer Vision
Location: Lab 1 desk 74

Abstract:
This project explores the utilisation of machine learning (namely a Convolutional Neural Network) to identify various different plant and flower species in the form of a mobile application that can be used by hobbyist gardeners, professional horticulturists or an ordinary, curious person as an educational or fun tool. Plant identification is a complex task within the machine learning discipline and provides a number of interesting challenges to overcome (sheer number of plant species, intense variation of photo quality, dubious image labelling.)
Training images are segmented from the background, identified by colour and contours and then put through several convolution layers to return the desireable high-level and dominant features of the flowers.
In the future this project could be modified and expanded to assist researchers in identifying plant diseases.

Assessing Blood Samples for Malaria

Name: Matthew Crowson
Supervisor: Dr Adrian Clark
Category: Computer Vision
Location: Lab 1 desk 77

Abstract:
Malaria is a life-threatening disease caused by parasites which infect red blood cells.

The most common way to diagnose malaria is for a trained expert to look at blood samples under a microscope and to count the number of infected cells. This process is time consuming and requires a trained medical professional to perform quite a tedious task. This process could be improved with the use of computer-aided diagnosis.

This project focuses on trying to develop a computer vision system that can be used to detect malaria-infected red blood cells in images of thin blood smears automatically. This involves two main steps: identifying all of the individual red blood cells in the image (segmentation) and determining whether each of the identified red blood cells is infected or not (classification).

Such a system could be used to increase the efficiency of malaria diagnosis, allowing patients to receive their diagnosis sooner. Further work on this project could see the system being ported into a mobile app, which would allow for cheap deployment in the field.

Garbage sorting system based on computer vision

Name: Chenyang Lai
Supervisor:
Category: Computer Vision
Location: Lab 10 desk 12

Abstract:
With the improvement of the level of social and economic development, the improvement of people's material living standards, the increase of population and urban population density, the amount of waste output is also increasing year by year. In response to this situation, garbage classification can give full play to the use value of resources and production materials. But for a wide variety of garbage, how to achieve accurate classification is a thorny new problem. In addition, with the continuous in-depth research on deep learning technology and the continuous improvement of hardware computing power, more and more problems can be solved based on deep learning models, an image classification model can be designed to solve the current difficult problem of garbage classification.

First, designed the ResNet as the backbone network, combined with the attention module CBAM network model, CBAM makes the network model focus on the target to be recognized, and extract more effective features. In order to solve the problem of unbalanced data distribution and improve the generalization ability of the model, a series of data enhancement strategies are adopted, and the model loss function is modified to improve the accuracy of the model.
Then, based on the classification model, a Web-based web page service is designed and implemented. Users can submit pictures or retrieve objects through the web, and query the corresponding classification results.
Finally, experiments were conducted on the classification model designed on the verification set and the collected test set. The experimental results verified the effectiveness of the model and high accuracy.

Build a drone that follows you

Name: Xiaohe Liu
Supervisor: Dongbing Gu
Category: Computer Vision
Location: Lab 2 desk 6

Abstract:
Face-tracking technology for drones is an emerging monitoring and recognition technology with wide-ranging applications. However, traditional drones are limited by factors such as volume, weight, and cost, which pose significant challenges to their practical use. Therefore, the aim of this project is to develop a facial recognition and tracking technology for small drones, with the goal of expanding the range of applications for drone tracking by overcoming these limitations.

This project utilized the DJITellopy library in Python to develop a facial tracking system for the Tello drone. The project used the pre-trained Haar-cascade model in OpenCV to detect human faces and controlled the drone's movement based on the detected face's area and center coordinates. A PID algorithm was employed to adjust the speed for improved tracking performance. Additionally, a software program was also developed using the Pygame library to display the images from the drone and provide interactive control of the drone through keyboard inputs, as well as to provide visual feedback.

Pathfinding Visualiser

Name: Emmanuel Olaoye
Supervisor: Themistoklis Melissourgos
Category: Computer Vision
Location: Lab 7 desk 50

Abstract:
Pathfinding is the process of finding the most optimal path between two points. This project takes the guesswork out of manually planning a journey and plotting the route towards a desired destination.

My project aims to find the shortest route between two destinations on a map for a traveller. This will be achieved by taking in an image of a road and then masking out the lines of the road, therefore removing unnecessary items such as rivers, forests and lakes. Subsequently, the masked image is converted into a binary image where the process of skeletonisation will then reduce the binary image into a 1-pixel-wide skeleton. From the skeleton, the program will recognise the road intersections and place them into a neighbourhood representation which Dijkstra's algorithm can process to return the shortest path to finally display in a user-friendly UI to the user.

Smart Vision system for Food Assembly Robots

Name: Haocheng Yang
Supervisor: Vishwanathan Mohan
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
Although most of the work in the food manufacturing industry can be carried out by robots, there are still some processes (such as laying out ingredients) that need to be carried out manually. Workers having to endure hot, humid and crowded working conditions, and factories often facing labour shortages.

The goal of this project was to design a visual system for the sandwich assembly robot. The system first preprocesses the image of the ingredients taken by the camera by removing distortion, fog and highlights. Then run the threshold segmentation algorithm to extract the ingredients parts (chicken, bacon, etc.) in the picture to form the mask of the food area. The processed mask was sampled into polygons, and the greedy algorithm was used to obtain the optimal placement position of each piece of food and the rotation angle of the robotic arm. Finally, according to the size of the ingredients and the distance between the camera and the ingredients, the sandwich volume is estimated to accumulate the calories of the whole sandwich, which is convenient for users to choose the right product when purchasing.

During the project, I evaluated various image segmentation algorithms including k-means, threshold, Watershed and CNN, combining recognition speed and effectiveness. And choose threshold in the end.

For the algorithm to calculate the placement, I also tried DDPG-based reinforcement learning algorithm, but the model did not achieve convergence after training, I think it may mainly because the action space was too sparse.

Fruit sorting using computer vision

Name: Peiqi Yang
Supervisor: Vahid ABOLGHASEMI
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
In agriculture, market demand is growing rapidly and farmers are increasingly pressed for time to deliver their produce to market. All aspects of production, picking, sorting, packing, and transportation are faced with time and cost issues. Grading fruit by hand has been one of the major challenges in agriculture due to its time-consuming and labour-intensive disadvantages. It is therefore necessary to start with the sorting process and develop a fruit grading function to help reduce the pressure on farmers, which is an essential part of the full automation of agricultural transformation. This project provides a network model for classifying the freshness and appearance of fruit through computer vision and image processing, using deep learning methods. The model is a CNN deep learning network based on the LeNet-5 model, a primary model of convolutional neural network with a small network structure. This project focuses on making adjustments to various parameters of the network to improve the accuracy of the recognition results, thus enhancing the reliability of this model. The network was trained and tested on a 360 fruit dataset, obtaining a model with an average training accuracy of 0.96-0.97 and a maximum of 0.9790, and an average testing accuracy of over 0.99 and a maximum of 0.9981. This project contributes to the promotion of full automation in agriculture, reducing the cost and time of human labour in classifying the freshness and appearance of fruit, while also reducing the cost of purchase for the average person.

Plant disease detection based on image processing/computer vision

Name: Jiayi Wu
Supervisor: Vahid Abolghasemi
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
Plant diseases have become one of the main threats in the development of agriculture and forestry today. These diseases not only affect the normal growth of plants, but also pose a threat to food safety. Therefore, it has become particularly important to identify and detect areas and types of plant diseases. In recent years, with the continuous development of deep learning technology, more and more scholars have started to study plant disease identification based on deep learning. By using computer vision and machine learning techniques to identify areas and species of plant diseases, time costs can be effectively reduced and agricultural production efficiency improved.

In response to current advances in plant disease research, many scholars have conducted comparative analyses of different image dataset types and disease recognition models. The results of these studies contribute to a better understanding of deep learning innovations in plant disease recognition. Several recent studies have shown that the use of deep learning models such as convolutional neural networks (CNNs) for the classification and recognition of plant disease images has become a hot research topic. With good performance and wide application prospects, these methods can identify and differentiate different plant disease types in a short period of time.

This project presents a comprehensive analysis of recent research advances in plant disease detection methods based on deep learning, and proposes a new solution for plant disease detection. The solution uses a ResNet model to automatically classify and identify different types of plant diseases. The experimental results show that the method has high accuracy and good robustness, and can quickly identify and distinguish plant disease images, providing important support and security for the production of agriculture and forestry.

Identifying Aircraft from above

Name: Yutao Li
Supervisor: Adrian Clark
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
Aircraft identification has been developed in various fields such as the airport surveliance, transport activity analysis, defense, and military applications for many years. However, it is tough for machine identify aircrafts automatically. Therefore, the goal of the project is to identify airplanes using bounding boxes with appropriate database downloaded from Google maps and state-of-art techniques. Then, preprocess the images by resizing them to a uniform size and normalizing the pixel values.
More specific, Python including library “OpenCV2” (Computer Vision) and “NumPy” (numerical python) is used as compiling language. After obtaining the datasets from Google, the ground truth images using painted program can be extracted for machine learning next. Then, segmentation module using HSV (hue, saturation, value) and functions in CV2 is developed to contour and box aircrafts. Although not all aircrafts are able to be detected, however, have reasonable accuracy of identification. Due to the fact that using conventional shape descriptors provids an effective and understandable way to determine whether a segmented region was an aircraft or not. This shows that deep learning methods such as convolutional neural networks are not always necessary.

Autonomous Driving with Turtlebot3

Name: Hu Qiaosheng
Supervisor: Gu Dongbing
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
With the development of science and technology, people are seeking an easy, safe and efficient way of living. Each of us imagines a future world in which people can travel with their hands free, simply by getting into a car, typing in their destination and the car carrying them to their destination. In today's society, there is a growing quest for an assisted driving that can reduce the number of mistakes humans make when driving. The machine is absolutely safe in most cases and will follow a set program in an orderly manner. His judgement decisions are not limited by the human mind and in most cases the machine is trustworthy. We sometimes have to admit that human judgement based on experience can lead to some serious consequences.Every day, we get caught up in traffic jams, especially in major cities such as Beijing and Shanghai, and driving in congested traffic can be a very draining task.
So we thought about the possibility of having a technology that could help us make decisions and take over control of our vehicles when we get stuck in congestion. Such technology seems to be possible in the modern world. We can do this using ROS, a robot control system, and OpenCV, a computer vision system. A small vehicle is given vision and a control system with the ability to sense and recognise roads.

Family Risk Assessment

Name: Shengzhe Qi
Supervisor: Faiyaz Doctor
Category: Computer Vision
Location: Remote NWU on Zoom

Abstract:
The aging population brings anxiety that is spreading widely with the rise of the internet, driving technological changes in society, and the continuous improvement of public facilities. A major challenge is to maintain the safety of older people in their homes in a timely and effective manner. This paper presents a tool for assessing risks in the home environment, making the assessment process easier and providing automatic recommendations related to fall and trip risks, utilizing the latest YOLOv8 recognition technology, fuzzy algorithms, and deep learning. The proposed framework is able to cope with most environmental situations in the home and is able to give family members appropriate recommendations for improvement in relation to the existing environment. The core of our framework is the YOLOv8 recognition algorithm model, combined with fuzzy algorithms to improve the accuracy and depth of recognition. Experiments have shown that the proposed model can achieve good performance compared to previous recognition methods while being faster to compute and more efficient to recognize. The model can be used to monitor real-time environmental changes in the home and support risk warnings and provide feedback.

Cloud Interconnectivity

Name: Panayiotis Erotokritou
Supervisor: Dr Martin Reed
Category: Cyber Security
Location: Lab 1 desk 6

Abstract:
Cloud computing is an upcoming “trend” and is considered to be the future of computing. It is at its early stages and has the ability to be very flexible as well as very expandable. This project focus is on setting up a cloud environment using the infrastructure as a service "Openstack" with three virtual machines. Two of the virtual machines are connected as nodes in order to share resources with the main machine, thus creating a cloud. The aim of the project is to evaluate the efficiency and security of the network instances in the cloud environment, as well as how secure is the network in the cloud.
To achieve this, at first the infrastructure of cloud has to be setup through the command line, with the use of Linux. Then, the virtual machines are configured one by one to form a cloud, which is accessed and managed by the horizon dashboard of Openstack. A network is set up and a network topology is created as well as the ability to launch an instance. Consequently, since the network is created, there are a set of experiments that are carried out. The results of the experiments demonstrate and express the effectiveness of the cloud environment in utilizing resources and achieving optimal network performance. The experiments also highlighted the importance of measuring the efficiency of network instances to ensure optimal performance and the effectiveness of security measures used for authentication and protection of the cloud.
In conclusion, this project demonstrated the potential of using virtual machines to create a cloud environment using "Openstack." The efficient resource utilization and optimal network performance demonstrated the effectiveness of this approach in cloud computing. Furthermore, the security measures implemented helped to protect the network from potential threats and attacks, highlighting the importance of security in cloud computing.

Modelling of Smart-Pharmacy Network With IoT Devices - Network Operation and Security Vulnerability Investigation

Name: Durga Wigton
Supervisor: Nick Zakhleniuk
Category: Cyber Security
Location: Lab 1 desk 9

Abstract:
In modern society, communication technology is used to improve all areas of everyday lives. The Internet of Things (IoT) is a network of inter-connected Smart devices with specific functionalities which transfer data across the network.

This project focusses on the following goals – to develop a TCAD model of the real-world IoT network using Cisco Packet Tracer, to demonstrate the operation of various IoT devices, and to investigate the security vulnerabilities of the IoT network used for medical applications and how they can be mitigated. The project specifically studies the IoT network in a Pharmacy environment with a range of specialised requirements including the safe storage of confidential patient information.

An investigation was carried-out to determine the effects of vulnerable passwords, open ports, insecure protocols and untrained staff on the security of data. The virtual environment Virtual Box was used to simulate an Attacker machine and a Smart Pharmacy device in order to demonstrate attacks using Kali Linux attack tools. Platforms, such as WordPress Security Scanner, and Nmap, were used to detect network vulnerabilities, and the results were searched in the Exploit Database. The attacker was able to access, manipulate and copy confidential patient files and use an injection attack to insert malicious code into files on the Smart Pharmacy network. The attacker then used the Hydra password cracker to demonstrate Dictionary and Brute-Force password attacks in conjunction with a custom-made password dictionary and the RockYou word list.

The project suggests the necessary preventive measures which should be implemented in the model IoT network to mitigate such security attacks and enhance defence of the network. The TCAD-based approach allows the cost-efficient analysis and emulation of various real-world IoT networks and the study of key aspects of their operation and security protection.

Machine learning for Anomaly detection

Name: Mateja Popovic
Supervisor: Martin Reed
Category: Cyber Security
Location: Lab 1 desk 25

Abstract:
Machine learning has become an assuring solution for detecting anomalies in large datasets. This has become especially important nowadays, since large companies are getting their data digitalized. I will be using a popular algorithm for anomaly detection called Isolation forest. This algorithm creates binary decision trees to split the data. It keeps doing this until each data point is isolated or the maximum depth has been reached. Isolation forest has many advantages compared to other algorithms. For example, it has an efficient execution since it can isolate anomalies quickly. This makes it faster than K means clustering. It is very scalable, it has been shown that it can handle big datasets very well. Also it can go much deeper into analysis than other algorithms as well as provide an anomaly score. Isolation forest has a good accuracy and it is very effective, which makes it a suitable tool for Cybersecurity and fraud detection.

The investigation of Security Protocols in Wireless Sensor Networks

Name: Kwesi Ababio
Supervisor: Cunjin Luo
Category: Cyber Security
Location: Lab 1 desk 26

Abstract:

Abstract:

Responsible for multiple areas of surrounding environmental measurements, Wireless Sensor Networks are a recent revolutionary field in the world of technology. From gauging the levels of congestion on the roads of big cities, to measuring the amount of damage caused by artillery on a missile test field, the uses of Wireless Sensor Networks stretch far and wide. They utilise several wireless communication protocols in order to communicate, such as Bluetooth, Wi-Fi, and NFC. However, the broad range of communication protocols used by this network also leaves a broad attack surface for any ill willed individuals or parties who wish to exploit the data transmitted through these networks, which depending on their usage, could prove critical if breached by the wrong people. It is therefore essential to provide secure protection in order to prevent such situations from happening.

In this research paper, I will be exploring the various methods of attacks used to exploit vulnerabilities in Wireless Sensor Networks as well as researching security protocols and how they mitigate them. I will also be demonstrating my findings using Network Simulation Software (GNS3 and OMNETT++) which will involve configuring a Wireless Sensor Network, attempting to simulate an attack on said network, as well as implementing security protocols to defend against the attacks.

Machine Learning for Security Anomaly Detection

Name: Michael Firman
Supervisor: Martin Reed
Category: Cyber Security
Location: Lab 1 desk 38

Abstract:
As the number of devices connected to the internet continues to increase, so does the rate of cybercrime. Because of this, the amount of data modern anomaly detectors must monitor has grown to the point that a new monitoring method is required. One prospected method is implementing machine learning into these anomaly detectors. This prospect has been discussed and tested previously as both literature and products. In this project, we look at the requirements of implementing a machine learning algorithm, in relation to classifying network traffic, as well as the performance and complexity of these requirements. We also discuss the prospect of implementing deep learning into an anomaly detector whilst comparing its performance to the that of a standard machine learning algorithm. To do this, we implemented four machine learning models, two feature reduction models, and a cross-validation method - as well as the deep learning model. These models were put through multiple tests to visualise the best performing candidate in each category. This code was written in Python using the following third-party libraries: Scikit-Learn; for implementing machine learning, TensorFlow (paired with Keras); for the deep learning model, and Matplotlib; used to visualise the results. After running these tests, I believe that the best configuration for implementing machine learning into an anomaly detector is a decision tree model with a forward selection model for feature reduction, and cross-validation. These models returned the best mixture of performance and complexity; allowing for short runtimes whilst still having a greater f1 score.

HTTPS proxy and cache

Name: Zihao Zhang
Supervisor: Dr Martin Reed
Category: Cyber Security
Location: Lab 1 desk 47

Abstract:
The project focuses on implementing https cache and proxy. The author used VMware to build three virtual machines to simulate real connections, with Windows as the client and Ubuntu as the proxy server and web server. Squid was used as a medium to realize the proxy function, and a CA certificate was added to encrypt the proxy and traffic. A simple web page was built on nginx to test if sensitive information is encrypted by TLS. The basic function of the client accessing the webpage via the proxy has been realized, and now the ssl bump is being configured for the https caching function. The latest experimental environment uses public IP addresses to simulate real network connections. The CA certificate issuing agency has provided a trusted certificate, and the proxy server's configuration file is being edited. The first task of the follow-up work is to ensure normal use of the https proxy function, followed by implementing the caching configuration of the ssl bump.

Secure APIs for Web Services

Name: Rachel Kerr
Supervisor: Mays Al-Naday
Category: Cyber Security
Location: Lab 1 desk 63

Abstract:
APIs play a crucial role in communication between services in microservices, making API security a top concern for developers and organisations. Microservices are becoming increasingly popular in the industry due to their scalability, flexibility, and maintainability. As microservices rely on APIs to communicate with one another, it is crucial to ensure that these APIs are protected from potential security threats. For this project, Prometheus, a widely used monitoring and alerting tool, was used as a case study, and was deployed on Kubernetes to explore the security of APIs in microservices.

During the project, a vulnerability was identified in the Prometheus HTTP API, which could potentially be exploited through a man-in-the-middle (MITM) attack. To demonstrate this vulnerability, the project involved developing a Golang-based application, which was deployed on Docker to simulate a MITM attack on the API. The application was successful in manipulating the HTTP requests sent to the API, highlighting the need for robust security measures.

To mitigate this security concern, the project also involved developing a Golang-based alarm application that monitors the data sent to and returned by the API. The application was deployed on Docker and flags any suspicious data in real-time, providing a proactive response to potential security threats.

Overall, this project emphasises the critical importance of securing APIs in microservices. By deploying Prometheus on Kubernetes and demonstrating a real-world vulnerability in the HTTP API, the project provides valuable insights into the security challenges that organisations face. The alarm application offers a practical solution to detect and address potential security threats in real-time.

Security in Network Functions Virtualisation

Name: Matthew Freshwater
Supervisor: Dr. Mays Al-Naday
Category: Cyber Security
Location: Lab 1 desk 64

Abstract:
Modern networks rely on Service Function Chaining (SFC) for reliable delivery of network services, which makes monitoring performance challenging. Anomaly detection is crucial for identifying unexpected changes in network behaviour. This project proposes an approach for anomaly detection in SFC using Prometheus, to monitor CPU and memory usage.

The project aims to focus on these metrics on a container-by-container basis, to precisely pinpoint anomalies on the network.
To test this, a Toy SFC example is setup using ICN Nodus – a Network Controller for Kubernetes that addresses multiple network use cases – on a Kubernetes cluster. The network is tested at a ground level which is assumed to be anomaly free to create a baseline. Further testing involves, sending malicious packets are pushed through the network for Prometheus to highlight metrics relating to CPU and memory usage that are higher than normal. In cases where these metrics are higher the alert manager will flag this up.

Overall, the project demonstrates the potential of using Prometheus to monitor CPU and memory usage of CNFs and detect anomalies in SFC. This can help operators ensure the reliable and efficient operation of their networks, and quickly respond to unexpected changes in network behaviour.

Designing a platform for stock analysis

Name: VEDANT KOTWAL
Supervisor: Dr. Juntao Yu
Category: Data Analytics
Location: Lab 3 desk 1

Abstract:
With the way the world is and the current dependence on stocks and assets there is an increasing dependence on investment and long term income strains are becoming more and more popularised. A platform has been created to try and guide people with expendable incomes on how to use their money. The platform has numerous features in which the user can analyse datasets and interpret the data in numerous different manners. This can be visualised with the usage of many graphs. The platform has it's own customisable aspects to it, especially with uploading your own data and outputting it as your own file set. The platform aims to provide educational material to inform and teach users how to invest and further understand the different types of investment. Not only is this a tool in which stocks and data can be analysed but it aims to be a platform in which it refines a user's skills.
This platform aims to change and ease a user into the experience of investing and tries to teach them how to think like and learn about the markets.

Pass-by data connectivity for road haulage

Name: TIANYOU ZUO
Supervisor: Stuart Walker
Category: Data Analytics
Location: Lab 3 desk 8

Abstract:
Nowadays, data transmission in road transport is becoming more and more important, not only because with the development of science and technology, more and more cars appears on the road, but also with the development of economy, physical distribution has become a major economic activity in the world. Therefore, tracking and information sharing in road traffic becomes a key factor. Data transmission in road haulage, not only to obtain vehicle status, but also to ensure the safety of road haulage, improve the efficiency of traffic management, and reduce road congestion and traffic accidents
Pass-by data connectivity can be achieved through various technologies such as radio frequency identification (RFID), cellular networks, and vehicle-to-vehicle (V2V) communication. With these technologies, vehicles can exchange information about their location, speed, and cargo status, allowing for better coordination and optimization of logistics operations.
Additionally, pass-by data connectivity can also enhance safety on the road by providing drivers with real-time information about traffic, weather conditions, and potential hazards. This can help prevent accidents and improve the overall reliability of logistics operations. As the technology continues to advance, it is expected to become an increasingly important tool for logistics companies looking to optimize their operations and deliver goods more effectively

Network Epidemic Modelling

Name: Nathan Lawrence Steven Emsden
Supervisor: Dr David Richerby
Category: Data Analytics
Location: Lab 3 desk 13

Abstract:
The Covid-19 pandemic has highlighted the continued need for the study of epidemiology by health organisations and researchers around the world, so that there are tools and strategies in place for consideration when the next health crisis occurs.

Network epidemic modelling takes the compartmental models from epidemiology such as the basic SIR (Susceptible, Infectious, Recovered) model, in combination with Network Graphing techniques that model individuals as vertices on the graph, with contact between them as the edges. Used to build a simulation model of an epidemic that can be used to study how a epidemic spreads within a population, and how various preventative measures affect the spread.

For my project, I build a continuous time Markovian chain network epidemic model, based on the SEIR (Susceptible, Exposed, Infectious, Recovered) compartmental model that is extended to include isolation compartments. My goal is to have it representative of the Track and Trace system used in the UK.

Finally, I implement a genetic algorithm to perform hyper-parameter optimisation for the simulation. In an attempt to match simulation data to real world Covid data from the UK.

EEG signal analysis

Name: Yunkai Ji
Supervisor: Junhua Li
Category: Data Analytics
Location: Lab 3 desk 20

Abstract:
As a non-invasive method, EEG signals can be used to explore the mechanism of human brain perception of different stimuli. The goal of my project is to use statistical methods to explore the difference between comfort and discomfort of EEG signals in touch, hearing, and temperature perception. I first removed the artifacts from the eeg in the preprocessing step which is followed by the feature extraction. Then I use short time Fourier transform to extract the power features and use the phase lag index to extract the connection matrix and its associated brain connectivity features including clustering coefficient, characteristic path length, local efficiency and global efficiency. I utilized the statistical methods to analyze the data. The statistical methods include ANOVA and T-test. These significantly different connections and channels found using different characteristics, as well as the difference of the power spectral density between conditions in different bands are visualized. I found different stimuli can cause different changes for the characteristics of EEG signals. These findings can inform us about the understand of human perception.

Applications in Data Clustering

Name: KaiShen Yew
Supervisor: Panagiotis KANELLOPOULOS
Category: Data Analytics
Location: Lab 3 desk 25

Abstract:
Nowadays, businesses will rely on new innovations which will produce new products as many as possible to try to attract more customers but it will leave them frustrated as there are too many options and also companies have no idea on which type of customers they should target for product sales. This is where the machine learning plays an important part and few algorithms will be applied to discover some hidden patterns in their customers' purchasing behaviours. By doing this, it will help the companies make a suitable marketing strategy and improve decision-making in the future. This can be done by applying customer and it is used to segmenting the customers with similar behaviours into one group and dissimilar behaviours will be in different groups.
In this project, clustering algorithms are being implemented to group the customers and the results obtained from different clustering algorithms will be compared. Elbow method is being used to find the number of clusters most suitable to the dataset. However, there is no accuracy for cluster analysis because you use it when you don't know the clusters.

Secure Execution of Programs on Processor Cores

Name: Kaiwen Zhu
Supervisor: Singh, Amit K
Category: Data Analytics
Location: Remote NWU on Zoom

Abstract:
This paper introduces a lightweight defense method against thermal covert channels (TCCs), which leverage temperature sensors to spy on the temperature fluctuations resulting from power consumption in multi-core systems. An attacker can manipulate the power consumption of a secure core to encode and send sensitive data to a non-secure core through temperature changes. TCCs can compromise data security as they can evade conventional isolation mechanisms and leak data. The proposed defense method does not need any hardware modification or significant performance overhead. The main idea is to generate a noise signal in the non-secure zone by randomly altering the power consumption of chip, which disrupts the original temperature signal, and narrows its output range. This raises the error rate of decoding the temperature signal and stops the attacker from acquiring any meaningful sensitive data. The paper demonstrates the effectiveness of the method through experiments on a real multi-core platform, showing that it can raise the error rate to over 90% and effectively thwart TCC attacks under various scenarios.

Plant Monitoring System

Name: Magnus Nwaokeleme
Supervisor: Dr Ana Matran-Fernandez
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 1 desk 1

Abstract:
iPlant is a plant monitoring project that aims to provide a user-friendly solution for plant monitoring and care. The project involves using various sensors such as moisture sensors, temperature sensors, and humidity sensors that are placed in the soil and around the plant to monitor the environment and the plant's health. The sensors continuously measure the soil moisture levels, temperature,and humidity, and transmit the data to the iPlant app via Bluetooth or Wi-Fi.

The iPlant app then processes the sensor data and provides users with real-time updates on their plant's health, growth progress, and care needs. For example, if the app detects that the soil moisture levels are too low, it will send a notification to the user to water the plant. The app can also provide custom care schedules based on the specific plant species and user preferences.

In addition, the iPlant app includes a database of plant species that users can select from when setting up their plant profile. This database includes information such as the plant's ideal temperature range, humidity level, and light requirements, which can be used to customize the care schedule for each plant.

Overall, the iPlant project aims to make plant care more accessible and enjoyable for everyone, regardless of their level of expertise. With its user-friendly interface and advanced sensor technology, iPlant can help users create healthy and thriving indoor and outdoor plant environments.

Exploring CHERI RISC-V on FPGAs

Name: Oliver Irvin
Supervisor: Sangeet Saha, Klaus Mcdonald-Maier
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 7 desk 35

Abstract:
Capability-Enhanced RISC Instructions (CHERI) is a joint research project of SRI International and the University of Cambridge that involves revisiting fundamental design choices in both hardware and software to dramatically improve system security by extending conventional hardware Instruction-Set Architectures (ISAs) with new architectural features. It works by introducing fine-grained memory protection and highly scalable software compartmentalisation.

As the world of computing has developed over decades, security of programming languages and software has not kept pace as well, resulting in vulnerabilities over time. There has been vast research into the nature of system bugs that has contributed to the production of CHERI, particularly relating to the frequency of memory and software issues over the years. For example, Microsoft estimates that 70% of the weaknesses they have patched between 2006-2018 were memory safety issues. MITRE considers buffer overflows to be the third most dangerous software issue.

CHERI introduces 'capabilities' which are adapted versions of standard 64-bit memory address pointers that are 256 bits in length, the extra bits containing security enhancements such as bounds limits info, privileges info and validity tags. CHERI takes aspects of previous capability system designs as well as its own modern development to enable its deployment in currently-used software and hardware. The scale of CHERI's design and efficiency has not before been seen without development starting from scratch.

As well as common processor architectures, CHERI is being prototyped for FPGAs, ARMv8-A processors and RISC processors. CHERI aims to be deployed seamlessly to existing systems across the world, causing as little interruption and remaining as lightweight as possible. The goal of my project is to explore the functionality of CHERI in a RISC-V system environment. I am creating programs and documentation that demonstrates the effectiveness of CHERI's implementation, comparing its handling of software to otherwise unprotected systems.

Monitoring and Control system for entry and exit of domestic silo cereals

Name: Zhaoyang Yu
Supervisor: Kolozali Sefka
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 5

Abstract:
My project is “Monitoring and control system for entry and exit of silos”. The system has the following modules: temperature control module, display module, alarm module, setup module and wireless data transmission module. The LED will start flashing when the detected temperature is above or below the upper or lower limit set by the user. LCD1602 will display the temperature in real-time.

When the system detects that the temperature is above the upper limit, the LED lights will flash and the DC motor will run. When the temperature drops below the lower limit, the LED will blink and the relay will operate. When humidity exceeds the upper limit, the buzzer will sound an alarm and the DC machine will begin to reverse. When the humidity drops below the lower limit, the buzzer sounds an alarm and the DC motor turns positive.

Data can be uploaded to the cloud. This enables users to view it on any device. And cloud databases store historical data.

Monitoring and Control System of Domestic Silo Cereals

Name: Zijie Xu
Supervisor: Li Junhua
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 6

Abstract:
Through out the project, four modules are used, a wet temperature detection module, a control module, an alarm module and a display module. The specific working principle is as follows: the operator first inputs the upper and lower temperature and humidity limits value, when the detected temperature is greater than the upper temperature limit, or less than the lower temperature limit, the LED light turn on as alarm , DC motor 1 works to simulate cooling or heating. Similarly, when the detected humidity is less than the lower humidity limit or greater than the upper humidity limit,a buzzer will sound and DC motor 2 will operate to simulate lowering or raising the humidity. The DHT11 detects and updates the surrounding humidity and temperature values every two seconds and then transmits the data to the computer, which displays the images.

In addition, I will create a car to let the entire project become creative and complicated.

A smart doorbell

Name: Xiaopeng Feng
Supervisor: Kun Yang
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 9

Abstract:
This project presents a smart doorbell with advanced embedded, socket communication, and facial recognition technologies that enhance the functionality of smart homes. The smart doorbell incorporates the NVIDIA Jetson Nano development board for processing and features a high-quality camera that supports both password and facial recognition unlocks. Additionally, the doorbell is equipped with a wireless network card that enables seamless communication with the homeowner's device via a wireless local area network (WLAN) connection.

The development process involved designing the hardware to integrate the camera and wireless network card, followed by developing software to enable password and face unlock features. Next, the face recognition models were trained using the FaceNet algorithm and convolutional block attention module (CBAM). Finally, the hardware and software components were integrated into a reliable system.

Extensive testing demonstrated the exceptional reliability and stability of the smart doorbell, which seamlessly transmitted text and file information without any errors. These impressive results demonstrate the potential of the doorbell to improve safety and convenience in the home. Homeowners can easily communicate with visitors using the doorbell and their computer, as well as unlock the door using a password or a clear photo taken by the camera.

The smart doorbell offers an extremely high level of convenience and functional versatility, making it an ideal solution for those wishing to improve the intelligence of their homes. In addition, the research on face recognition investigated the effectiveness of introducing CBAM into the FaceNet algorithm. The results showed that this approach can improve the correct recognition rate of faces wearing masks, which has significant implications for the algorithm's application in real-world scenarios. With this improvement, the FaceNet algorithm can provide more accurate recognition of faces, even when people are wearing masks.

Smart Doorbell

Name: Mihail Iliev
Supervisor: Kun Yang
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 28

Abstract:
Smart doorbells have quickly become very popular due to their convenience and security features, allowing homeowners to communicate with visitors remotely using smartphones and other devices. However, many of the options currently on the market have some drawbacks, from unreliable connectivity and paid versions to access all features, to privacy issues and high risks of being hacked.

My smart doorbell, based on Raspberry Pi, provides an efficient and reliable way to monitor your home while keeping your privacy and security intact, thanks to the Raspberry Pi using a Linux distribution as its operating system.

My doorbell incorporates a speaker, USB microphone, push button, motion sensor, Pi camera, and a small 3-inch LCD screen.

When a visitor presses the doorbell button, a bell sound is played for 5 seconds, and the homeowner is instantly notified via WhatsApp with a link to a video call, enabling real-time communication. The USB microphone, speaker, and Pi camera are all enabled during this time, allowing for clear two-way communication.

The video call happens through Jitsi Meet, which is an open-source video service. The WhatsApp messages can happen thanks to the use of Twilio, which is a service used for engagement platforms. The doorbell would also be able to detect motion at the front door, which is useful for security purposes. While the doorbell is not in use, the camera is on all the time and records anything happening at the front door.

Overall, my doorbell aims to offer an affordable, customizable, and effective smart solution for homeowners who want a seamless setup in minutes without the need for additional apps, which can be time-consuming and potentially unsafe.

the arrow that always comes back

Name: xianqian zheng
Supervisor: John Woods
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 30

Abstract:
Nowadays, the price of the arrow is quite expensive than before. If we still use the one-time arrow, it will cause a great waste of money. However, It is quite difficult to find the arrow embed itself into grass. Based on this situation, we need to develop a project aim at locating and recovering the shoot arrow. Based on the structure of WPT (wireless power transfer), I build up a circuit consisted of small transmitter, resonant coil pair and a rectifier to drive the buzzer locating the arrow. Compared with other methods about Equipped the arrow with the magnetic directional sensors or calculating the arrow location by using wide-view images from the camera, my method has little influence on flying performance of the arrow. What's more, due to its convenience and passive ID tagging, it will be wildly used in items positioning in the near future.

Personalized Helper Drone

Name: Jordan Forbes-Amos
Supervisor: Anirban Chowdhury
Category: Electronics, Embedded Systems and Hardware Design
Location: Lab 8 desk 41

Abstract:
Abstract

The objective of this project is to manufacture drones using 3D printing technology. The quadcopter consists of various components including motors, ESCs, propellers, flight controller, battery, radio controller, power distribution board, battery charger, voltage regulator, LED light, Bluetooth beacon, Bluetooth receiver, Arduino board, and buzzer.
The drone frame and the glass's structure are designed using 3D modelling technology and is manufactured using 3D printing techniques. This can be accomplished by using software such as Solidworks or Fusion360 to design and slice the model before printing.
The Holybro Kakute H7 V1.3 Mini Flight Controller is a microcontroller that features advanced sensors like MPU9250 and BMP280. It uses a complementary filtering algorithm to calculate the drone's attitude, making it ideal for mini-drone applications that require high accuracy.
The drone can communicate with a pair of glasses worn by the user using Bluetooth technology. Upon establishing a connection between the two devices, the user can remotely control the drone's flight through the glasses and receive real-time updates regarding altitude and battery life. Furthermore, the user can activate the drone's LED light or buzzer through the glasses, providing greater flexibility and control over the drone's functionality.

Keywords: 3D printing, Bluetooth communication, Drone frame design, Holybro Kakute H7 V1.3 Mini Flight Controller

Singing Tesla Coil

Name: QianYu He
Supervisor: John C. Wood
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
This project explores the development of a singing Tesla coil with the use of field-programmable gate arrays (FPGAs), including the circuit and hardware design aspects. The objective of this research is to create a desktop-level stereo system that can be connected to a computer and spark with the music, resulting in a visually engaging and entertaining experience. The report discusses the design and implementation of the system, including the use of FPGAs for real-time signal processing and control of the coil's spark generation. Additionally, the project highlights the various challenges and considerations that were taken into account during the development process, such as the selection of appropriate components and circuit layout. The results demonstrate the successful creation of a functional and responsive singing Tesla coil stereo system, which provides a unique and captivating addition to any home or entertainment environment. This project contributes to the growing field of FPGA-based electronics design, showcasing its potential for creative applications in entertainment and beyond.

Fallen Detection Device

Name: Zichen Chao
Supervisor: Vahid Abolghasemi
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
The project is to build a device that has the function to detect many health data of the old people and also inform the relatives in time. With the increasing intensity of work, young people may have less time to take care of their elders. The device is designed to ensure that young people have access to the safety of the elderly The device can acquire the temperature and the heart rate in real time.The device can detect the situation when the old fall down, at the same time, the buzzer of the device will work to inform the people around there are people in danger and this message will also be sent to the relatives in distance. The data will be transmitted to the relatives' phone.
The whole device is based on the STM32C8T6, which has the feature of low -cost and low power consumption. In the peripheral module, I will use posture calculating module MPU6050 to judge if the person has fallen. And wifi module will also be used to transmit the data to the relatives' phone.

Battery-less loT Device works With Energy Harvesting

Name: Wenlu Yu
Supervisor: Hossein Anisi
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
Blind people face many challenges and risks when traveling in urban environments, especially when crossing roads or walking on sidewalks. They need a reliable and convenient device that can help them avoid collisions with vehicles and pedestrians. This project aims to design a passive watch that can warn blind people of nearby vehicles and pedestrians by vibration. The watch has several advantages over existing solutions, such as canes, guide dogs or smartphone apps, which are either cumbersome, expensive or require active operation.
The watch is powered by a solar panel and uses an Arduino ultra-low power processor as the main control chip, which enhances its energy efficiency and durability. The watch employs millimeter wave radar technology to detect vehicles and personnel sensing radar technology to detect pedestrians, achieving comprehensive safety monitoring. The watch has two modes: road mode and charge mode. In road mode, the watch vibrates when it detects vehicles approaching from any direction within a certain distance. In sidewalk mode, the watch vibrates when it detects pedestrians approaching from behind or from the opposite direction within a certain distance. Users can switch between the two modes by lifting the solar panel pad.
When the watch senses vehicles or pedestrians approaching, it vibrates to alert blind people. The vibration intensity and frequency vary according to the distance and speed of the approaching objects, providing more information for blind people to make decisions.
The novelty of this design lies in integrating various technologies harmoniously, creating a product that has multiple functions, easy operation, low power consumption and environmental protection, meeting the needs of blind people's travel safety. The project also considers the user's comfort and aesthetics by designing a lightweight and stylish watch that can be worn on any wrist size.

Self Charging Vehicles

Name: Quanyi Hong
Supervisor: John Woods
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
This project aims to construct a wireless charging car that can run infinitely in a loop. When the car consumes battery power during operation and the system detects low battery, the car uses GPS signal navigation to return to the charging station, and continues to run after the battery is fully charged. In this project, the car is equipped with an Arduino development board, GPS module, voltage detection module, and WIFI communication module, which are used to control the car's movement, obtain the car's position and remaining battery information, and exchange information with external devices. In the wireless charging part, a non-tapped ZVS circuit is first used to convert the DC power supply into AC power that can be transmitted wirelessly. The transmitting coil and the receiving coil maintain magnetic coupling resonance, ensuring that the wireless energy transmission can be maintained even when the receiving and transmitting ends are far apart or misaligned.

Gesture Based Control of an Unmanned Aerial Vehicle

Name: Kexin Zhang
Supervisor: Huosheng Hu
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
With the rise of low-cost Unmanned Aerial Vehicle (UAV) among the general public, simplified control methods for UAVs have become a hot topic of interest for researchers.
This project designs a UAV control system based on gesture recognition, integrating technologies such as OpenCV and mediapipe computer vision, and Gazebo simulator aircraft, to achieve a real-time, simple and fun UAV control system simulation. The system is developed based on python and consists of three parts: ground station module, UAV module and vision module. The drone module uses a quadcopter, which is implemented by Gazebo for simulation, and indoor scenes are chosen for the flight scenarios. In addition, the robot model is layered so that users can add the structures and sensors they need; the vision module treats the PC camera as an on-board camera for the UAV; the ground station module is based on ROS to enable communication between the ground control terminal and the simulated UAV, allowing mutual motion control and status feedback as well as image transmission and display between the two. The video and images acquired by the PC camera are recognised and processed using OpenCV and Mediapipe to form the corresponding control commands.The user's current action is transmitted to the ground station, and then sent to the UAV to realize the somatosensory control of the UAV. The change from remote control to Gesture control system enhances the joyment of UAV operation.

The arrow that always comes back

Name: Aodong Mei
Supervisor: John Woods
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
Wireless energy transmission is a novel technology that has gained significant momentum in recent years and is increasingly being integrated into everyday human activities. Among the various wireless energy transfer systems, those based on magnetically coupled resonant coils, such as wireless charging, have found wide applications.

In response to the research trends in this area, this project investigates the two-coil wireless energy transfer system and the four-coil wireless energy transfer system. The project proposes applying these two systems to an archery range to facilitate the detection of lost arrows, thus reducing cost.

The operational workflow involves attaching the receiving coil to the arrow and transmitting an AC signal using a handheld signal generator. As the receiving coil moves left and right relative to the transmitting guide rail or the transmitting coil, the amount of energy captured by the receiving coil decreases. The buzzer or the LED on the receiving coil can generate circuit information and then be used to find the lost arrow.

The central focus of this project is on magnetic resonance occurring between the coils. Specifically, a resonant LC circuit is present at both the power transmitting end and the load receiving end. The magnetic field coupling generated during the system's operation enables the transmission of electric energy and the maintenance of high transmission efficiency. The project establishes the accuracy of the method by analyzing the detection principles of the two-coil system and the four-coil system through simulation and validates the feasibility of the approach through experiments. The results show that the energy transmission distance of the four-coil system is approximately 40cm, while that of the two-coil system is about 8cm, with both systems achieving an efficiency of approximately 70%. They are all great for helping people find lost arrows.

A wearable health monitoring device

Name: Tianyi Wang
Supervisor: Vahid ABOLGHASEMI
Category: Electronics, Embedded Systems and Hardware Design
Location: Remote NWU on Zoom

Abstract:
Recently, due to significant improvements in healthcare and public health, people attach increasingly more significance of their health, which has led to a growing demand for reliable and easy-to-use wearable health testing devices.
The aim of this study is to design a wearable health monitoring device that analyses multiple physiological indicators of the user to determine the user's current health condition and give appropriate health suggestions.
In this study, after receiving the raw data from the sensor, the microprocessor calculates the user's heart rate based on the number of peaks in photoplethysmography (PPG) signals within the specific period and calculates the blood oxygen saturation based on the relation between the signal and the blood oxygen saturation. When the measurement is completed, the microprocessor generates a web page containing the health report, which can be accessed by the user when the user and the microprocessor connect to the same local area network.
This study has designed the health monitoring device that collects multiple physiological indicators, including heart rate and blood oxygen saturation, uses the database to store the raw data and generates the health report with health suggestions for the user.
The wearable health monitoring device in this study can be used as a daily health monitor for the family, and it provides early detection of illnesses and have a positive meaning for maintaining people's health.

Food ordering system based on SpringBoot front-end separation

Name: Chen Li
Supervisor: Jianhua He
Category: Internet of Things
Location: Lab 1 desk 44

Abstract:
The project is develop a campus ordering website for students and faculty at a particular university.

Users can use their email and mobile phone number to register an account to order food easily.The homepage of this website will recommend different types of food.

This system also includes the corresponding background management system, merchants can realize the modification of commodity information, user order management, and display their income, which dish is more popular, platform super administrator can see all the statistical information, can see what kind of goods or services are more popular with consumers,and also can realize the management of all suppliers.

Smart Water Control

Name: Eduard Alexandru Stere
Supervisor: Anisi, Hossein
Category: Internet of Things
Location: Lab 8 desk 1

Abstract:
With the rapid development of our society, it has become apparent that sustainability is a major factor that is often ignored. The United States Environmental Protection Agency states that everyone can cut down on at least 20% less water, which computes to roughly 62 liters of water per day per person, of saved water. [1]

This project aims to provide a water management system that enables users to control, track, and use water safely and responsibly while maintaining convenience through the help of a connected IoT device.

One of the main features of this project, is a web interface that enables in-depth statistics about one's water usage habits through graphs and price estimations. The interface also controls critical settings of the water tap.

The system contains a range of sensors and relays, that actuate the flow of water based on different types of requests.

a) Boolean requests (on/off) coming from home assistants such as Google Home, Apple HomeKit and Amazon Alexa
b) Custom intent-based requests, as well as specific quantities & specific temperatures. These requests are picked up by the embedded microphone.
c) Specific quantities & temperatures. These requests are sent through RFID tags that are initialized through the web interface.
d) Boolean presence requests coming from the ultrasonic distance sensor. Once physical presence has been sensed, the water will flow until the presence is not detected anymore.
e) Time based requests coming from the web interface scheduler. Jobs can be scheduled through the interface, so that water will turn on and off between specific time periods.

This project has been built with "reality" in mind, therefore it is the real-life representation of a vanity unit, with all the necessary hardware attached to it.

[1]: https://www.epa.gov/watersense/statistics-and-facts

Airport passenger access monitoring system

Name: Feifan Ren
Supervisor: Barros Michael
Category: Internet of Things
Location: Lab 8 desk 3

Abstract:
In important situations such as conference rooms, airports or important installations such as aircraft and lifts, the number of people inside needs to be monitored and controlled. The purpose of this project is to achieve basic functions of airport passenger access monitoring system. RFID is a convenient and efficient way to identify people and can be used to sort and count them. By reading the information inside the RFID, it is possible to determine the type of person and record the time and order of entry and exit, and to count the current internal capacity and determine the danger according to the proportion of current and maximum capacity. When a danger is detected, an alarm message is sent to the manager's mobile phone for timely control and adjustment. In addition, the display screen shows the current number of personnel, making it easy for users and managers to access statistics and plan ahead. Considering the diversity of the actual application scenarios, the design adds functions such as temperature and humidity detection of the environment and displays data in real time on the screen as a reminder.

Smart Doorbell Software Package

Name: Ahnaf Mahmud
Supervisor: Kun Yang
Category: Internet of Things
Location: Lab 8 desk 14

Abstract:
This project aims to create a software package that can be used to implement a smart doorbell system. The project makes use of modern technologies such as Flutter for cross-platform app development, Firebase for backend services and WebRTC for video communication with minimal latency.

In the real world scenario, a Raspberry Pi or an Android based IoT device is used to run the doorbell software. The software is designed for smart doorbell systems with front camera and touchscreen display. A custom Linux operating system has been made for the Raspberry Pi, which launches a Chromium browser in kiosk mode running the doorbell software.

The companion app can be installed on Android and iOS devices, which the owner uses to communicate with the visitor once the doorbell is pressed. The software has been designed with security in mind. The custom OS for Raspberry Pi does not allow a user to navigate outside of the doorbell environment. On Android systems, the OS's app pinning feature can be used to achieve the same functionality. There is also password protection to ensure that any unauthorised person cannot disable doorbell mode.

For the WebRTC communication, a coturn server has been deployed on AWS to ensure reliability across different networks.

Patient Health Monitoring using Internet of Things

Name: Joshua Abraham
Supervisor: Hossein Anisi
Category: Internet of Things
Location: Lab 8 desk 15

Abstract:
The Internet of Things (IoT) has the potential to revolutionize healthcare by enabling continuous patient monitoring and remote health management. The main objective was to develop a patient health monitoring system using IoT that can provide real-time health data to healthcare professionals and caregivers. The system will consist of various sensors that will read and collect data of major vital signs such as heart rate, body temperature, and oxygen saturation. These sensors are connected to the ESP32 microcontroller board, which collects, analyses and transmits the data to the Arduino IoT Cloud.

The cloud-based platform will allow the vitals to be displayed through a web browser or mobile app which would provide insights to healthcare professionals no matter where they are. The system can also provide alerts via email to caregivers in case of abnormal readings or emergencies. The Arduino IoT Remote app used is user-friendly and accessible to patients of all ages and backgrounds.

The benefits of this system include improved patient outcomes, reduced healthcare costs, and increased patient satisfaction. Patients will have greater control over their health, and healthcare professionals will be able to provide personalized care based on real-time data. The remote monitoring capabilities reduces the need for hospital visits and allows patients to stay in their own homes. Overall, this project has the potential to significantly improve patient health outcomes and revolutionize the way healthcare is delivered.

Modelling of Smart-Home Networks With IoT Devices - Network Operation and Security Vulnerability Investigation

Name: Kang Wang
Supervisor: Dr Nick Zakhleniuk
Category: Internet of Things
Location: Lab 8 desk 20

Abstract:
With the advancement of information technology and people's pursuit of quality of life, smart homes have gone from being out of reach to being within reach and are gradually becoming an integral part of the technology-assisted people's lives. This project involves designing and simulating a smart home IoT network using Cisco Packet Tracer. The focus was on developing the TCAD-based model of the home area with various IoT devices and systems to provide various smart management functions of the living environment, such as automatic temperature control, watering, fire suppression, and access control. Another important goal of the project was to investigate security vulnerabilities in IoT networks, which are of paramount importance in such applications as smart homes. Realisation of this task involved in-depth analysis of the recently published research literature on the subject, and implementation of different types of security attacks and demonstration of successful defence against them using some resources from the Packet Tracer and the Virtual Machine environment and testing our original ideas. We have simulated penetration tests, and proposed protection measures to prevent potential attacks that could compromise user information and cause damage. The findings highlight the potential of IoT technology in providing convenient and efficient home automation, while emphasizing the importance of implementing strong security measures to protect against cyber threats. Overall, this project demonstrates the possibilities and challenges of implementing IoT technology in a real-world context using TCAD-based approaches.

Design of international traffic signal lights

Name: SIMENG QIAO
Supervisor: Yu Juntao
Category: Internet of Things
Location: Lab 8 desk 21

Abstract:
My chosen topic is the design of intelligent traffic lights. This design uses STC89C51 chip to complete, the language used is c language, through the microcontroller to achieve functions. This design uses independent key modules, buzzer modules, etc.The main display is the situation of traffic lights at Chinese style intersections.
Function demonstration (remote control): Mainly showing the transition between traffic lights at intersections.In addition, there are five functions.
1. In emergency mode, the buzzer sounds
2. Night mode, yellow light permanently on
3. Switching intersections
4. Reduce time
5. Increase time
In addition, I have added a separate button module to simulate the passage of vehicles, while displaying traffic statistics on the screen. Drivers and pedestrians can also learn the time and temperature of today from the screen. So that it can achieve smooth traffic at intersections.

Design of intelligent temperature detection and control system

Name: XINGYU LUAN
Supervisor: Matran-Fernandez,Ana
Category: Internet of Things
Location: Lab 8 desk 22

Abstract:
First of all, it can display the current time and the ambient temperature and set the upper and lower limit thresholds, which is the most basic function. When the system is powered on, the current ambient temperature and the set temperature thresholds are displayed. We can modify the value of time and the upper and lower limit thresholds of temperature by pressing the button. We see, pressing the K1 key will enter the time setting, and then enter the temperature threshold setting interface, every click, switch the threshold setting (upper and lower thresholds) interface, press the third time, will automatically return to the main interface, and so on. When entering the temperature threshold design interface, K2 and K3 keys can be used to add or subtract the threshold value. Here, we only set the integer part of the temperature, and we do not need the decimal part. In this way, we use three keys to achieve the time and temperature upper and lower threshold setting, which is the basic function of the temperature detection and control system. It also has a constant temperature function. When the upper and lower limits are set, the system will compare the current temperature with the set upper and lower limits. If the temperature is higher than the upper limit, the heat dissipation will be turned on for cooling, and the alarm will be given at the same time; If the temperature is lower than the lower limit, turn on the heating, and alarm; If the current temperature is between the lower limit and upper limit, turn off the heat dissipation, heating, and alarm. Thus the temperature can be controlled in the range of the threshold value. And it will delay the stop time for each fan and heater.

Investigation into the Network Operation and Security Vulnerabilities of IoT Smart Home Networks

Name: George William Messenger
Supervisor: Dr Zakhleniuk, Nick
Category: Internet of Things
Location: Lab 8 desk 23

Abstract:
This project is devoted to demonstrating operation of the Internet of Things (IoT devices and investigating the Network Security and Vulnerabilities of a typical 'Smart Home' network made up of various (IoT) devices. To do this we designed and implemented a simulation model of the Smart Home IoT network using Cisco Packet Tracer, which contained reactive systems of IoT objects and monitors, connected by a Home Gateway. We then analysed and implemented various Security Scenarios based on vulnerabilities within the model, and present solutions to prevent exploitation of these vulnerabilities. To achieve this we used a combination of the security features present in Packet Tracer, along with a Hyper-V Virtual Machine (VM) environment to simulate various Network Security attacks. The Smart Home network model demonstrates security features like the Cisco Adaptive Security Appliance (ASA) firewall as well as WPA-PSK wireless security. The ASA feature allows us to implement mitigation methods such as Access Control Lists. In conjunction with this, the Hyper-V VM model allows us to take a closer look at a single connection and simulate Network attacks including; password cracking, packet sniffing, and Denial of Service (DoS).

Enhancing Productivity through Virtual Assistant-Enabled Smart Mirror

Name: Praise Uadiale
Supervisor: Dr. Alba Garcia Seco De Herrera
Category: Internet of Things
Location: Lab 8 desk 24

Abstract:
The Internet of Things (IoT) is a rapidly expanding field within technology, encompassing physical objects that are connected to the internet and capable of collecting and transferring data without manual intervention. One of the most popular IoT applications is the smart mirror, which offers both convenience and futuristic appeal. However, current smart mirrors are limited in their functionality and typically require integration with third-party voice assistants like Alexa for advanced operations. The recent proliferation of Generative AI and Large Language Models presents an opportunity to reimagine the role of voice assistants as co-piloting tools for increasing productivity. While existing voice assistants like Siri, Alexa, and Google Assistant have their limitations, a smart mirror equipped with state-of-the-art generative AI has the potential to offer more flexible and productive use cases. This project aims to explore how productivity can be enhanced using a smart mirror that leverages the latest in generative AI technology, thus, providing a more effective solution than existing voice assistants.

Internet of Things for Home Automation

Name: Hamad Almarri
Supervisor: Martin Reed
Category: Internet of Things
Location: Lab 8 desk 25

Abstract:
Home automation (HA) can provide a range of benefits, from convenience in controlling the home devices, efficiency in saving time and energy, to accessibility for people with disabilities, making it an important technology for modern homes. HA and the Internet of Things (IoT) are closely related concepts, and combining them can support the home automation system to achieve its purposes. IoT refers to the interconnectivity of devices and systems via the internet, allowing them to exchange data and information in real-time. In the context of home automation, this means that all the devices in the home that are connected to the internet can communicate with each other, allowing for a more integrated and efficient home automation system. This projects aims to design and build an IoT-based home automation system, and provides temperature/light controlling service for homes. The Message Queuing Telemetry Transport (MQTT), which is standard client server publish/subscribe messaging protocol for the IoT, is implemented to organise the information exchange between the devices in home. The control system is designed where its main components are the broker and two clients. The broker, which is implemented by a Raspberry Pi, filters all the received information and distributes them to the subscribed clients. The first client is a web server which allows a remote access to control the home environment. The second client, which is a microchip ESP8266, is connected to a temperature sensor and the actuators to control the home devices. This project demonstrated the ability to design an affordable and manageable IoT-based home automation system.

Modelling of Smart-Home Networks and Security Vulnerability Investigation

Name: Xiaopeng Chen
Supervisor: Cunjin Luo
Category: Internet of Things
Location: Lab 8 desk 26

Abstract:
The smart home is a smart residence that is formed by remotely controlling various smart electrical devices in the home remotely by means of commands through a control system. The smart homes bring comfort and convenience, but also a variety of security attacks and threats from virtual networks. In this project, the study of the operation of the simulated smart-home networks will be based on a scenario-based approach. The project will utilize Cisco's packet tracer to develop and simulate advanced models of IoT networks. It is a good way to show the connectivity between IoT devices based on the developed scenarios and to demonstrate how individual IoT devices work. Additionally, the project will investigate the security vulnerabilities of smart-home networks, including threats such as malware, hacking, and unauthorized access. I will be simulating an attack on an established network against the 'EternalBlue' vulnerability and using Kali Linux to penetrate an IoT device. The test will be divided into a penetration attack phase and a post-penetration attack phase. The penetration phase looks for the 'EternalBlue'-related exploitable modules and then executes the attack. The post-infiltration phase will extract the rights from the target machine and obtain the administrator password, and then create the user and enable the remote desktop service. Therefore, this article builds and simulates a model of a smart home network based on real-life scenarios, and then analyses and simulates smart home network vulnerabilities, and finally suggests measures on how to eliminate or reduce security threats.

Pipeline processing and monitoring of IoT data

Name: Chao Gao
Supervisor: Mays Al-Naday
Category: Internet of Things
Location: Lab 8 desk 31

Abstract:
This advanced IoT project focuses on efficient and easy data collection, transformation, and monitoring from multiple IoT devices. With this project's system, we can easily access environmental data detected by the STM32, such as temperature, humidity, smoke, natural gas, light, and air quality. The system can also convert analog data from smartphone input in different formats into the same format as the real data and store it in the same database. Additionally, historical data records can be viewed and data thresholds can be set within the web application.
The project workflow is as follows:
1. The project includes two IoT devices, a smartphone, and an STM32 MCU.
2. The STM32 MCU collects sensor data and converts it to JSON format, while the smartphone requires users to edit comma-separated key-value pair data using EasyMqtt software.
3. EasyMqtt sends the data through a communication modem MQTT broker to a Data Translator program, which subscribes and converts the data to JSON format.
4. The JSON data from STM32 and Data Translator is transmitted through a communication modem to the MQTT broker and then forwarded to a Tomcat server.
5. The Tomcat server analyzes and stores the data in a MySQL database. Additionally, the project has a web application for monitoring and analyzing data collected from IoT devices. This application is accessible via a URL and offers an easy-to-use interface for viewing sensor data and setting alerts based on user-defined conditions.
In summary, this project can be used for monitoring home environments and managing data pipelines. Besides reflecting the efficiency and characteristics of the pipeline processing, the smartphone component can also be used to easily test the proper functioning of threshold alerts.

Hotel Booking System For Companies

Name: Batikan Altun
Supervisor: Sangeet Saha
Category: Internet of Things
Location: Lab 8 desk 32

Abstract:
There are many companies in the world, and there are hundreds of people working in these companies. These employees must travel nationwide for meetings, conferences, or work-related matters. Imagine a company employee booking hotels for hundreds of people. The employee must contact the hotel for each reservation. This creates a new workforce for the company, namely, a loss of money, and a heavy workload and a loss of time for that employee. In such a workload, it is almost impossible not to have glitches. Wrong hotel reservations, wrong dates, and wrongly paid money can put the company in a difficult situation.

The portal I made will be a sigh of relief for companies and employees. In line with the criteria entered among hundreds of hotels in the portal, employees can easily make hotel reservations without dealing with the hotel. The user who made the hotel reservation will receive a confirmation e-mail. This e-mail will also automatically go to the booked hotel. If the user wants to make a reservation for more than one user, the employee can do so either from the portal admin or by being authorized by the portal. Someone with authority can see the entire list of people working in the company. The Portal admin can also do all these procedures if the company's employee wants to avoid making a hotel reservation. Another essential feature the portal provides employees is the option to change or cancel. The user can easily make any changes through the system, and this is sent to both the user and the hotel via e-mail. If the user wishes to cancel the reservation, they can do so via the portal without contacting the hotel.

Intelligent temperature and humidity monitor system

Name: JIANYU YANG
Supervisor: Stuart Walker
Category: Internet of Things
Location: Lab 8 desk 33

Abstract:
With the development of IOT, our life has intertwined with the internet. My project is to use a cost-effective component to design a intelligent temperature and humidity sensor and it could be monitor in real-time.

The DHT11 is a sensor which could collect the humidity and temperature and my main controller is STC89C52. When the DHT11 collect the data of temperature and humidity, it would send the data to STC89C52 and transfer the data to MQTT broker by ESP8266 module. And the MQTT broker will send the data to Wechat-mini program. And then We could monitor the data from Wechat in real-time.

The core of my project is MQTT protocol, which is lightweight communication protocol based on TCP/IP protocol. It uses publish/subscribe mode to transfer the message. The subscriber can subscribe a topic from MQTT broker and if the topic subscribes successfully, the MQTT broker would send the message to all subscribers. According to this, we can achieve remote monitor.

Now the data temperature and humidity only could be view in MQTT broker, but we still could monitor it In Ali platform, the Wechat mini-program is still under development.

Intelligent Air Detector

Name: Yiming Yin
Supervisor: Hossein Anisi
Category: Internet of Things
Location: Lab 8 desk 36

Abstract:
Air is one of the most important resources, but many pollutants in the air are difficult to perceive with the naked eye. This device plays a crucial role in various situations. The device can be used at home or installed in a vehicle to keep detection of air quality and atmospheric pressure. It can also be used when exploring unknown spaces that may contain dangerous gases, reducing the dangers involved in exploration.

The project includes hardware, software and a cloud-based dashboard. The hardware includes a detection module, buttons and LED lights for simulating electrical appliances. It is also equipped with an OLED and TFT screen to view various air values in real-time. The device is also designed with an alarm system and an anti-touch function.

The device is equipped with a WIFI module so that the data is uploaded to the software and the dashboard. The software not only allows you to view the real-time data detected by each module, the current position and apparent temperature, but also to control the led lights and the alarm system. It is also possible to record the time of each login to the software, and a login page ensures user data security.

In the dashboard not only possible to see real-time data and control hardware, but also possible to see changes in the data through graphs, and a database has been designed so that the data for the day can be displayed by selecting the date.

With air quality issues becoming increasingly prominent, intelligent air detectors can both keep people away from air pollution or dangerous areas and also direct people to environmental issues and take positive action. The Intelligent air detector will have a profound impact on environmental protection, education and healthcare while improving people's quality of life.

Garbage Monitoring System

Name: Omar Abdalazim
Supervisor: Dr. Manoj Thakur
Category: Internet of Things
Location: Lab 8 desk 38

Abstract:
The garbage monitoring system is an innovative project designed to revolutionize waste management. The system aims to address the challenges faced by waste management companies in efficiently collecting and disposing of waste. The primary objective of the proposed system is to promote a cleaner and healthier environment by ensuring that waste is collected and disposed of efficiently. The system utilizes advanced technology such as ultrasonic sensors, temperature and humidity sensors, and GPS modules, integrated with Arduino-based ESP32 boards, to track the location and status of garbage bins. The proposed system is designed to provide real-time data to garbage collection companies, allowing them to optimize their waste collection routes and schedules. The system includes an application built using Next.js for the frontend and backend with Prisma ORM and Railway for a serverless MySQL database. The app provides users with a user-friendly interface to monitor bin locations, their status, and capacity. The proposed system offers a practical solution to the challenges faced by garbage collection companies. Overall, the garbage monitoring system is a significant contribution to the field of waste management, and it has the potential to benefit both the environment and society. The garbage monitoring system is a practical and innovative solution that can improve waste management efficiency and promote a cleaner and healthier environment.

Fitness Bracelet

Name: nazih nassar
Supervisor: Xiajoun zhai
Category: Internet of Things
Location: Lab 8 desk 40

Abstract:
With constant need of innovation in our life and with IOT being the new trend in this generation, automation and sensors around us doing functions for us, I decided to comply with the trend and build a smart bracelet. My bracelet although made by just myself in a year, it will be compact enough to fit on your wrist, it will have multiple capabilities step count, distance travelled, calories burned and heart rate with a screen showing the live data. Moreover, it will come with a website to view the live data and previous captured data to be able to track your progress and plan further improvement. This was all implemented using the Esp32 as the microcontroller to control the data, mpu6050 to implement the step-counting algorithm and max30100 for the BPM value. Furthermore, using the Wi-Fi feature on the Esp32 to send data to a real-time database implemented on google firebase. Finally displaying my values on a website which is created using Next.js and tailwind for a smooth experience.

Production Output Monitoring System

Name: Sui Zhe Tay
Supervisor: Amit Singh
Category: Internet of Things
Location: Lab 8 desk 44

Abstract:
The need for efficient and streamlined manufacturing processes is more important than ever due to various factors such as global competition, rising labour and energy costs, consumer demands for high-quality products at low prices, and the need to reduce environmental impact. This is where Product Output Monitoring Systems come into play. My project is to design such a system with the aim of monitoring the production output of a manufacturing by using an infrared sensor and suitable software tools and programming languages. This system is built using a combination of high-level programming languages including Django, VueJS, Quasar Framework, and Arduino Uno. The system enables the tracking of production output in real-time, allowing for early identification of any issues or delays in the production process. With this system, manufacturers can better optimize their production process and reduce wastage, ultimately leading to increased profitability. The system has a user-friendly interface that allows for easy navigation and enabling users to gain insights into their production output easily.

Internet of Things for Environment Monitoring

Name: Qirun Song
Supervisor: Kun Yang
Category: Internet of Things
Location: Remote NWU on Zoom

Abstract:
The project aims to realize an environmental monitoring system applicable to various scenarios. The system is designed to be affordable and monitor environmental parameters within the given location. It mainly consists of two parts, namely wireless sensor network based on ZigBee wireless communication protocol and PC-side front-end software developed based on Python.
The wireless sensor network includes different types of nodes: coordinator and end node. The coordinator is the manager and the core of the network, responsible for starting and maintaining the network. The end nodes collect environmental parameters through sensors and send them to the coordinator through ZigBee wireless communication technology. The coordinator sends the collected data to PC through serial communication after receiving it.
The main functions of the front-end software include displaying real-time environmental parameters, saving the data read from the serial port, and data visualizations by statistical graphs.

The Ever-changing Pepper Assistive Robot - Combined with ChatGPT and the Internet of Things

Name: Lurui Xie
Supervisor: Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Agri Food Lab desk 0

Abstract:
The increasing number of older people and those living with long-term diseases in the UK has put significant pressure on the healthcare sector and social care system. The shortage of personnel and the COVID-19 pandemic have made the situation worse. According to this situation, my project: The Ever-changing Pepper Assistive Robot - Combined with ChatGPT and the Internet of Things, aims to develop and improve Robotics and Autonomous Systems (RAS) technology to alleviate the pressure on healthcare personnel and caregivers, and provide a better quality of life for elderly and disabled people. The project is developed in Ubuntu 22.04, using python2.7, python3.10, and javascript (node.js) programming languages, as well as Pepper's own supporting software Choregraphe and NAOqi 2.5 python SDK. Google's Dialogflow and OpenAI's ChatGPT (GPT-3 and GPT-3.5) are also used.
The project achieves functions in two aspects: Internet of Things and personalized care. In terms of the Internet of Things, Pepper integrates with Philips Hue Bridge and Philips light bulbs, enabling users to control the lights through voice commands to Pepper. The Personalized care aspect of the project comprises various functionalities, including entertainment (such as opening YouTube on Pepper screen and dancing to music, playing Bingo games), cloning and changing sounds, face and emotion recognition, email assistance, chat robot (Pepper can connect Dialogflow and ChatGPT (GPT-3 and GPT-3.5) and play different roles to chat with users), and navigation (Pepper can play the video of how to get to the destination for users on its screen).
This project is helpful to relieve medical pressure, develop RAS technology, free human resources from repetitive and time-consuming work, let relevant employees focus on more valuable work, and finally improve patient care.

Robotic Companions for delivering Health and Social Care

Name: Oliver Ford
Supervisor: Dr Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Agri Food Lab desk 0

Abstract:
With an ageing population, other catalysts and given the current situation the NHS is struggling with the amount of patients. This is historically due to a lack of resources, a situation made worse by the Covid-19 pandemic, Brexit and periodic economic crises. As sufficient numbers of nurses and health care staff is unlikely, targeted robotics would help alleviate the pressure on the NHS. The aim of this project, as with staff, with humanoid robots we can observe, predict (estimate) & determine what kind of care is required for identified patients based on face recognition & pose/gesture detection & estimation. With face recognition we can use it to help provide personal care to different patients, as the robot can be made to use it to determine which patient/person is in front of it. With pose estimation it is able to correctly determine the action of the patient and accordingly the care/action needed for their specific need at that specific moment, to detect what person is currently doing to estimate what their future actions will be, to provide the best course of action to help. Using Object recognition & Human/Object Interaction it creates a cognitive humanoid to act as a personalized caregiver.

Long Range Drone

Name: Barin Odusi
Supervisor: Manoj Thakur
Category: Robotics and Mechatronics
Location: Lab 1 desk 24

Abstract:
In modern-day, drones are now widely used in many different industries, including delivery, surveillance, mapping, and terrain surveying. However, the range of most drones currently available in the market is limited by the line of sight, which can seriously hamper drone operations and bore pilots. Although longer-range drones are available, most amateurs and enthusiasts cannot afford them.
This study suggests a different, more affordable drone communication solution utilising LoRa modules and a Raspberry Pi to solve this issue. Long-distance communication capabilities are provided by LoRa modules without the requirement for expensive hardware like the DragonLink UHF system. We can develop a dependable and economical drone communication system that can provide real-time telemetry data and control signals over great distances by using the Raspberry Pi as an interface between the flight controller and the LoRa module. it is designed to ensure a seamless connection between the drone and the pilot. The Raspberry Pi and LoRa use cellular data and radio waves to communicate with the drone. By integrating these 2 modes of communication, I am providing a stable and reliable link between the drone and the ground station by creating redundancies.
The report will outline how to set up the communication system, including how to connect the Raspberry Pi and LoRa module, configure the software, and test the system's functionality. Hobbyists and enthusiasts may build an affordable, long-range communication system for their drones by using the procedures described in the study. This will allow them to increase the range of their drone operations and investigate new drone application possibilities.

Smart Charging Car

Name: Yang Jialong
Supervisor: Dr. Thakur, Manoj P
Category: Robotics and Mechatronics
Location: Lab 10 desk 5

Abstract:
The smart charging car is an innovative solution that combines advanced technologies such as ultrasonic ranging, infrared tracking, wireless charging, and motor drive systems to create an efficient, intelligent, and versatile transportation platform. This car uses an ESP32-DevKit development board as its main control unit and is powered by a 3.7V lithium battery, providing a balance between performance and energy efficiency.
The smart charging car features a unique charging system, which uses a single module for both voltage regulation and charging. This system connects the battery to a 5V charging and discharging module, ensuring a regulated 5V output while sharing the charging interface and output port. This streamlined design enables easy charging through a single TypeC port, facilitating simultaneous downloading and charging operations. Additionally, the car is equipped with a wireless charging module integrated into its structure, allowing for seamless and convenient wireless charging capabilities.
The motor drive system of the smart charging car employs a DRV8833 chip, capable of driving two motors with each motor requiring two PWM inputs for speed regulation. This configuration results in a total of eight PWM inputs for four independent motors, providing precise control over the car's movement.
The smart charging car offers two control methods: automatic control and remote Bluetooth control. The automatic control mode utilizes the onboard ultrasonic ranging module and infrared tracking module to monitor the returned signals, enabling automatic tracking navigation and obstacle avoidance. The remote Bluetooth control mode allows users to connect their smartphones to the car's development board via Bluetooth and control the vehicle through a dedicated app. This app grants users control over the car's forward, backward, and 360-degree rotation movements.
In conclusion, the smart charging car integrating ultrasonic ranging, infrared tracking, and wireless charging technologies to deliver a powerful, adaptable, and user-friendly solution. The innovative design and advanced control options make it an ideal choice for a wide range of applications, from personal transportation to research and development projects.

3D soft gripper

Name: jorge lopez catalan
Supervisor: Ali Kafash Hoshiar
Category: Robotics and Mechatronics
Location: Lab 10 desk 21

Abstract:
As we approach the future, the development of soft grip robotic arms has revolutionized the robotics industry by enabling robots to handle delicate objects that were previously impossible to grip using traditional grippers. Industries are advancing by leaps and bounds, including the robotics sector. There are many types of robotic arms, but those that use a soft grip system are increasingly in high demand as they allow us to use a type of grip like a human hand or human fingers. This new technique makes it possible to grasp delicate objects that could not be grasped with a classic robotic gripper. Furthermore, these advances represent a revolution in the robot industry and its applications.
The project's aim is to develop a robotic gripper made of soft materials.The gripper is made with 3D printed parts for the rigid structure and Ecoflex material for the fingers. The main function of the fingers is to inflate so they can flex and grip light objects. This curvature is produced by the design of the internal structure of the finger and the air produced by the air pump. This gripper allows the DoBot robot arms to engage in different programmed actions, such as moving the robot around and can be implemented in the manufacturing and medical field due to their delicacy which can be picked up safely with soft grippers. This opens the door for precise, automated pick and place for fields mentioned above.

Earthworm robot for search, rescue and recovery

Name: Steven Smith
Supervisor: Anirban Chowdhury
Category: Robotics and Mechatronics
Location: Lab 10 desk 25

Abstract:
The Development of artificial earthworms and how they mimic the locomotion strategy of natural earthworms was researched for this project. Many different aspects have been researched to try and successfully recreate the strategy of these worms, such as their peristaltic gait movements, deformation tactics, rotation techniques and anchoring. These features being replicated in a soft robot help them manoeuvre effectively throughout their environment and achieve specific tasks similarly to how a biological earthworm would.

Through analysing the data that was produced before, further areas of development can be discussed to further the progress of artificial earthworms. The importance behind this research is due to the productiveness of a robotic earthworm, if successfully developed they could help in multiple different sectors. Especially in jobs where: inspecting, searching, maintaining, rescuing and recovering are involved. Furthermore, Additional studies into this niche field of robotics could benefit a broad number of industries in taking technological steps into a more advanced future with their solutions.

The ultimate purpose of this project is to simulate an organic earthworm and its linear movement locomotion to gain a better understanding of how I can progress to benefit this field of work. A user interactive menu has been produced to allow for manipulation for the basic 2d model, currently the code is being implemented into a 3d model to display all that was achieved throughout this project.

EMG Based Control of a Hand Exoskeleton

Name: Foteini Papadogianni
Supervisor: Dr Anirban Chowdhury
Category: Robotics and Mechatronics
Location: Lab 9 desk 6

Abstract:
This project aims to develop a control system for a hand exoskeleton using surface electromyography signals (sEMG) acquired from the muscles of the forearm. The exoskeleton is designed to assist people with impaired hand function due to neurological disorders, such as stroke or spinal cord injury. By interpreting the sEMG signals, the control system differentiates them into different hand movements such as flexion and extension and controls the exoskeleton accordingly. This project also investigates various feature extraction methods and classifiers to find the optimal combination for accurate control of the hand exoskeleton. The results of this project can advance the development of cutting-edge rehabilitation devices, specifically designed to aid those with limited hand function to perform daily tasks.

Humanoid Robot to play Tai-Chi sport

Name: Jamane Barrett
Supervisor: Huosheng Hu
Category: Robotics and Mechatronics
Location: Lab 9 desk 8

Abstract:
Millions of people have already participated in the global sport of TAI-CHI. Just imagine how many more could enjoy this centuries old martial art if it could be taught anytime and anywhere. This project aims to bring this idea to life by creating a Nao TAI CHI instructor.

The fusion between human and machine teaching is inevitable. Robots can be stored and called upon at a moment's notice. The developed Nao tai chi instructor enables users to practice and learn tai chi from the comfort of their own home. This makes the sport accessible for those who are physically unable to make it to a class. Tai chi can be used for rehabilitative purposes as well, which means that people with motor skill issues are able to learn a sport that can help with their breathing and exercise their muscles.

The Nao tai chi instructor will teach students TAI-CHI form 24 which is a specific set of movements within the martial art. The student will be able to issue voice commands to the robot to select one of three choices, i.e., the full 24 movements, an individual movement, or see a full demonstration. The Nao tai chi instructor will also teach the student verbally, telling them when to breath in and breath out and how to properly preform the action. To achieve this each move has been positioned by hand in choregraph and then tested in a virtual environment before programming the real-life robot.

A learned approach to design flow outlet in endoscopic systems

Name: Syed Zain Hasan
Supervisor: Prof. Ali Kafash Hoshiar
Category: Robotics and Mechatronics
Location: Lab 9 desk 9

Abstract:
Complexity and growth of data in healthcare show that artificial intelligence (AI) will increasingly be applied within the field. The major category of application for this project would be a simulation of fluid within a medical system. Utilising technology called machine learning, a statistical technique for fitting models to data and to 'learn' by training models with data. Drawing up a medium to describe the flow of liquid through tube sets, adaptors & endoscopes as such output can be predicted from inputs & the effect of parameters can be shown such as velocity and pressure. Training data will be generated by using COMSOL, Computational fluid dynamics (CFD) software than using the method of the neural network, allowing us to classify and clutter the 'features' at a high velocity. It should show the capability to function as an endoscopic assistant tool, improving surgical treatment while minimising any risk which could harm the patient. This research will focus usability of CFD to be used as supplementation to traditional procedures; providing scope in technological progress and showing potential on how it could benefit more lives.

Mecanum Wheel

Name: Rares Florin Badea
Supervisor: Dr Ali Kafash
Category: Robotics and Mechatronics
Location: Lab 9 desk 11

Abstract:
Mecanum Wheel (Swedish wheel) an innovative kind of wheel which allows the prototype to move in any direction its controlled, the robot permits the user to easily move it around, especially for wheelchair users. Furthermore, the robot is particularly designed to incorporate easier mobility which results in an increase in the users' s independence and mobility.
As for industrial use, a variety of designs were installed with a forklift in recent years. Their multidirectional maneuver and practical application attain the reason why industrial companies are investing more in these robots, even though the cost of production is frequently remarkably high. Simulation for this project was initiated in different cases, all having in common the important task to move in tight and narrow areas. The experiments were made in association with the Arduino Mega board. Swedish wheel simulation expresses a fundamental idea for the motion of the rollers as they revolve around the wheel. The ideal motion of the vehicle is used to calculate the speed of each roller and its direction. Additionally, the forces produced are implemented to calculate the overall motion of the wheel.
SolidWorks(CAD software) operates in real-world conditions which optimize the products reducing costs for production and keeping the environment free. Mecanum wheel is designed with precision and dexterity with the set of tools from SolidWorks.

3D printing for mechatronic and Robotics applications

Name: Jonathan Otieno
Supervisor: Dr Anirban Chowdhury
Category: Robotics and Mechatronics
Location: Lab 9 desk 13

Abstract:
I have developed a 3D printed surveillance drone for security on a reserve with long-range flight capability using Raspberry Pi 4G telemetry data. The drone's size and shape are customizable, and it can be made from specific materials for various applications. Equipped with a Raspberry Pi computer, camera, and 4G connectivity, it can stream real-time footage to a remote operator. The drone's job is to monitor reserves for suspicious activity and potential threats such as poachers, its long-range flight capability enables it to cover extensive areas. The drone is cost-effective and efficient providing real-time monitoring and threat detection capabilities, making it an ideal surveillance solution for various applications.

Magnetic Levitating Quadcopter

Name: Ryan Pope
Supervisor: Ali Hoshiar
Category: Robotics and Mechatronics
Location: Lab 9 desk 15

Abstract:
This research and design project aims to create a magnetic levitating quadcopter.
The quadcopter will use a four-winged carbon fibre drone body fitted with a motor on each wing, driving a purpose-built disk containing the necessary magnets on each motor
To achieve levitation, a repelling magnetic force is generated through the phenomenon of electromagnetic induction, where high-speed rotating magnets induce eddy currents in the surface of an aluminium plate. These eddy currents, in turn, produce a magnetic field that interacts with the magnetic field of the magnets, resulting in a repelling force that allows for levitation.
To maximise the magnetic field strength, the magnets used are arranged as Halbach magnet arrays. Halbach arrays are a special configuration of permanent magnets that can generate a strong and uniform magnetic field on one side, while cancelling out the magnetic field on the other side. Halbach arrays are particularly suitable for magnetic levitation applications because they can produce very strong repelling forces.
An Inertial Measurement Unit (IMU) is used to stabilise the quadcopter. This continuously monitors the quadcopter's orientation and motion, providing feedback to an Arduino Nano. The Arduino Nano communicates with the IMU and the motors, changing the speeds of the motors to compensate for any disturbances, adjusting the individual magnetic output force from each wing to ensure stable levitation.
The project seeks to explore the feasibility and effectiveness of utilising magnetic levitation technology for a drone type quadcopter, and to develop a prototype that can demonstrate its viability. The prototype will be designed and fabricated using 3D printing, and will be evaluated in terms of its levitation stability, by measuring the device's position and orientation over time and comparing it to the desired position and orientation.

Drone Inspection for Fruit Quality in Indoor Vertical Growing Systems

Name: Zhang Hong Lu
Supervisor: Dongbing Gu
Category: Robotics and Mechatronics
Location: Lab 9 desk 17

Abstract:
Main features:
. Drone navigation
. Computer vision
. Convolutional neural network(CNN)

About the project:
Deliver the DJI Tello drone to automatically navigate in a closed vertical growing system.
The drone takes photo of the fruits (the fruits are detected with OpenCV) and saves them on a PC.
These images will be processed by a trained CNN model (with Yolov5) and be labelled depending on the maturity (unripe, ripe and overripe).
A daily report will be generated after the process.

Human Adaptive Manipulation of Baxter Robot

Name: Yanlong Chen
Supervisor: Huosheng HU
Category: Robotics and Mechatronics
Location: Lab 9 desk 19

Abstract:
Traditionally, the robots in factories require users to do programming for their operation. Nowadays, the robots are gradually deployed at homes and will be used by general public who have no programming skills. Therefore, it is necessary to develop new control strategy to simplify the robot control. Instead of programming, the robots should be able to understand human's gesture and take necessary actions. This project aims to develop a teaching by showing method to control the robot via gestures.
A camera will be used to recognise human hand and body movements and then control the robot to repeat similar movement. In this way, the robot can be used in care homes to support the elderly people. The workload of caregivers can be greatly reduced.
The project will be divided into two stages. The first stage is to use the camera and Openpose to analyse the human gestures and obtain the joint coordinates which are then processed and calculated to determine the robot motion. The second stage uses Denavit-Hartenberg (DH) analysis to analyse the kinematic equations of the robotic arm. The coordinates of the robot in the Cartesian coordinate system are obtained by calculating the data of the linkage and joints of the robot arm. The robot's path to multiple locations in the coordinate system is also set. The different movements captured by the camera are used to control the Baxter robot's arm to replicate the arm behaviour.

A telepresence robot for the elderly care

Name: Ruonan Si
Supervisor: Huosheng Hu
Category: Robotics and Mechatronics
Location: Remote NWU on Zoom

Abstract:
The project aims to develop a robotic system capable of conducting normal communication with the elderly people to support their daily life as a companion, i.e., a static conversational robot.

It is developed by using Python and the Baidu AIP platform and implements voice interaction and natural language processing. It can autonomously acquire voice information through the computer's own devices (e.g., microphone, speakers) and analyze it to determine the current physical and mental state of the elderly. In addition, the developed dialogue machine is equipped with dialogue management and knowledge base management functions so that it can provide targeted care services to the elderly according to their needs, such as medication reminders and emotional reassurance, thus effectively improving the quality of life of the elderly people at home.

The project will be widely tested in the future stage so that its functionality and stability can be improved and adapted to the needs of the elderly people in different health and living conditions.

Cognitive Robotic Companions for delivering Health and Social care

Name: ruoyu gao
Supervisor: Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Remote NWU on Zoom

Abstract:
So far, social care in England has come under increasing pressure. Providing care for older adults with ageing-related impairments requires considerable resources and public funding is failing to match demand.
On the one hand, the present pandemic has made us aware of the tremendous stress put on the healthcare system, some of which can be alleviated through robotics and automation. On the other hand, using robotics has been suggested as one way to help improve the quality of UK social care and manage increasing pressures on services. At the same time, advances in both hardware, software and cognitive capabilities of robots can serve as force multipliers for elderly assistance. This project focus the deployment of humanoid (Pepper) robot in the newly opened smart home and local care homes/hospitals which aim to act like nurse or a companion for old people or patience and can reduce the workload of the nurse and other staff in social care. The project both exploit built in features in Pepper like People Perception, Speech recognition/generation, Peppers tablet and extend it with new modules related to learning, memory, interaction, user modelling. Finally, the project realized the integration of voice interaction module, face learning and recognition module, structured Web scrap module of professional medical knowledge, tablet interaction module and entertainment interaction module.

Warehouse Robotic Manipulation

Name: Hanchen Zhang
Supervisor: Dongbing GU
Category: Robotics and Mechatronics
Location: Remote NWU on Zoom

Abstract:
In recent years, with the rapid development of e-commerce, smart manufacturing, logistics, and the increase in labor costs, more and more logistics companies are trying to use warehouse robots for operations. Robotics transforms warehousing, revolutionizing logistics with profound efficiency gains.
This project is to develop a mobile manipulator for warehouse pick and place applications. The mobile platform is a mobile robot named Turtlebot3 Waffle, linked with a manipulator (Open Manipulator) for pick and place operation task. The on-board camera can be used to identify objects for manipulation. The robot can map its environment, navigate automatically, identify objects and grasp them.
To be more specific, I built a simulated warehouse environment in Gazebo where a robot conducts mapping, navigation, object recognition, and grasping tasks. Due to the large warehouse area, I chose Google's laser-based SLAM Cartographer algorithm for mapping, which is based on optimization methods and can improve mapping accuracy and backend optimization efficiency compared to the commonly used filtering-based Gmapping algorithm. During navigation, the robot relies on A* and DWA path planning algorithms to plan the optimal path, avoiding obstacles along the way. Additionally, equipped with a Realsense d435 camera, the robot can perform object recognition using yolov5 and use MoveIt! to control the robotic arm to grasp and place recognized Coke bottles and cans in predetermined locations. The novelty of my project lies in the fact that all designs and implementations are based on Gazebo, which is both a challenge and an innovation.
As I am taking an online course at Northwest University, I do not have a physical Turtlebot to work with, so this project involves configuring the ROS 1 operating environment under Ubuntu 18.04 and simulating and testing it under the Gazebo simulator.

Warehouse Robotic Manipulation

Name: Haochen Shi
Supervisor: Dongbing GU
Category: Robotics and Mechatronics
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Abstract:
In recent years, warehouse logistics automation has become a hot research topic in the field of artificial intelligence. In traditional warehousing logistics work models, companies require a large number of employees to identify and sort goods, which can impose a significant economic burden on the enterprise. Moreover, manual handling of goods poses risks, low efficiency, and high error rates, greatly affecting work quality, whereas robots can accomplish all related tasks more efficiently and safely. Therefore, this article introduces Warehouse Robotic Manipulation, which is a warehouse logistics robot simulation design solution based on ROS. The robot implements autonomous navigation, path planning, obstacle avoidance, and item handling functions by utilizing tools provided by ROS.

Regarding specific implementation, this project uses the Gmapping algorithm for 2D laser SLAM to estimate the robot's position and orientation and build an indoor map in real time. We achieve the robot's autonomous navigation and accurate positioning by utilizing ROS's navigation and robot control libraries. The author uses the Time Elastic Band (TEB) algorithm to solve the path planning problem in navigation, generating trajectories that are as short as possible in time, distance, and away from obstacles while satisfying the robot's motion dynamics constraints. Moreover, we use the Moveit package to plan and execute suitable paths for the robot arm's grabbing action after setting the target position and orientation. Finally, we use a moderately performing lightweight network GG-CNN to enable the robot to recognize and process various items in the Realsense camera's image.

The experimental results demonstrate that the robot can efficiently perform tasks in a warehouse environment, improve logistics efficiency, and adapt to complex scenarios and environmental changes. Additionally, the robot's design features flexibility and scalability, enabling customization and improvement based on specific needs. In summary, Warehouse Robotic Manipulation has broad application prospects and research value.

Smart Robot for Smart Farms-Harvesting 'fruits' of Robotic Labor!

Name: Ruoting Liu
Supervisor: Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Remote NWU on Zoom

Abstract:
Robots are gradually replacing manual labor in various industries to achieve simple and repetitive operations. In agriculture harvesting robots can effectively improve farm work efficiency while reducing labor costs. The prerequisite for harvesting is to identify crops and select cutting sites.

The accurate detection/localization of the stem cutting point of the tomato wine is essential for the robotic arm to harvest the tomatoes. This project mainly studies how to locate the stem and cutting point and uses YOLOv7 algorithm. This method starts by labeling existing tomato photos and inputting the labeled images into the YOLOv7 network for training. The trained weight file is used to identify and locate the field images, and the cutting site is determined based on the shape of the tomato string. This network is currently the only detector capable of exceeding 30 FPS with high accuracy and therefore real-time detection can be achieved.

In the future,the detection systems can also be used for scouting, fruit counting and yield estimation hence leading to a data driven crop management framework, benefiting the grower.Through 5G, image recognition technology, and big data systems, the harvesting robot can "calculate" the distance between the crop fruit and the machine in seconds, and transmit relevant instructions to the robot arm to achieve rapid harvesting.

Finding my way--A Brain Inspired Robot Navigation System

Name: Xingke Mi
Supervisor: Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Remote NWU on Zoom

Abstract:
The health care system is under immense pressure due to the rising percentage of the aging population and increase in the number of people with long term illnesses, the shortage of caretakers and the recent spread of COVID-19. Robotic companions can have significant impact in health care delivery, by providing both physical assistance (transporting objects, monitoring, and logistics management) and social assistance. However, care homes and hospitals are complex unstructured environments with a number of dynamic obstacles, for instance, humans moving around or space reorganized frequently. In day-to-day lives, cooperation and goal-directed reasoning with other agents is very important in any space, whether it is home space or workspace. A robot must be capable to spontaneously anticipate what it is doing and how it would affect others in that environment.From O'Keefe, researchers have gradually understood the ability and process of mammalian spatial cognition by studying the brain's response to the environment. They discovered the mammalian navigation system in the brain and inspired by this, this research on the path planning of mobile robots based on biological cognition began. Based on pepper robots, the project develops a spatial map learning and navigation system based on multi-modal landmarks. By simulating human cognitive activities to the environment, robots can adapt to maps when the world changes; they can sense the movement of dynamic disorders (humans, animals) and take this into account when planning navigation; and the project also plans robots to navigate to targets through visual and auditory instructions. The project can be used in hospitals, nursing homes, homes, etc., to help take care of those who cannot move around freely to carry out simple tasks. This is a new topic with many social care applications.

Biologically Inspired Collaborative robot arm control for transplanting Lettuce seedlings in Smart Farms

Name: Tianyue Qin
Supervisor: Dr Vishwanathan Mohan
Category: Robotics and Mechatronics
Location: Agri Food Lab desk 0

Abstract:
The agricultural production process is confronted with a range of challenges such as labor shortage, repetitive work, and low efficiency. This project describes the automation of transplanting lettuce, a crop that is susceptible to damage during transplantation. To ensure the production of high-quality agricultural products, the development of a robotic system characterized by systematic stability presents a unique challenge.

The project is based on two parts: Firstly, taking inspiration from biological models, a Passive Motion Paradigm (PMP) model was developed by generating data and training a neural network. This model successfully achieved lettuce picking and placing on a CR10 6-axis robot with an accuracy of less than 2mm. Secondly, the entire project is executed under Ubuntu 20.04 and ROS 1 systems. Gazebo is used to accurately reproduce the dynamic environments a robot may encounter in hydroponic farms. The ROS visualization tool Rviz was utilized to enable the CR10 to execute neural network-derived path planning, resulting in more refined and precise movements.

At present, the motion model component of the project has achieved the expected results, while further improvements to the simulation of the robotic arm are planned for the future. The study is currently applied to the transplantation of lettuce in hydroponic farms. However, the proposed method may provide valuable insights for the transplantation and harvesting of similar crops.