



Project Title: Detect Cancer from Histopathology images

Project Supervisor: Mohammed Abdulghani

Synopses:

Cancer is a dangerous disease and it should be detected as soon as possible. It is possible to detect cancer using histopathology images. Cancer cells differ from regular cells so we can build an image classification model to detect if the person has cancer or not. All data images should be collected by the student from the hospital. Different techniques of Artificial Intelligence will be used

- The user can detect from the image where it's cancer or not.
- Help the patient to diagnosis the cancer early..

Expected Student Background:

- Basic information for Artificial Intelligence (Deep Learning)
- Basic of Image processing and Computer Vision.
- Knowledge of Python, R or Matlab.

Project Requirements:

- Setup Python, R or Matlab

Important:

The required components to develop such system must be provided by the students. Most of the tools needed to develop such system available online for free. However, any additional costs needed to purchase the software tools must be provided by the students. The university **might** cover the expenses for such purchase.

What will you learn?

Development of the main techniques in deep learning and the main research in this field. Help researcher to design and implement deep neural network systems. Be able to identify new application requirements in the field of computer vision. Also be able to structure and prepare scientific and technical documentation describing project activities.



Project Title: Traffic Flow Detection(Crowd or Not, Car Accidents) in Erbil

Project Supervisor: Mohammed Abdulghani

Synopses:

In Erbil every road has a surveillance camera. By collecting data from the cameras, a deep learning system will be designed to detect car accidents automatically. All data should be collected and notated by the student.

- *The system detects the flow of the road where it's crowded or not.*
- *Help police stations to detect car accident automatically.*

Expected Student Background:

- Basic information for Artificial Intelligence (Deep Learning)
- Basic of Image processing and Computer Vision.
- Knowledge of Python, R or Matlab.

Project Requirements:

- Setup Python or R or Matlab

Important:

The required components to develop such system must be provided by the students. Most of the tools needed to develop such system available online for free. However, any additional costs needed to purchase the software tools must be provided by the students. The university **might** cover the expenses for such purchase.

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Development of the main techniques in deep learning and the main research in this field. Help researcher to design and implement deep neural network systems. Be able to identify new application requirements in the field of computer vision. Also be able to structure and prepare scientific and technical documentation describing project activities.



Project Title: *Design of Arduino Based Smart Traffic Light System*

Project Supervisor: *Dr. Yasir Hashim*

Synopses:

This project developed Smart Street traffic light System. The system will develop and design depending on Arduino Mega platform. This project will work to give priority to the more crowded street to use the road. The system incorporates the concept of sensor detection to sense the presence of street conditions and ON or OFF the lights automatically depending on these conditions.

Expected Student Background:

- Good programming background is recommended.
- Basic knowledge in electronics.

Project Requirements:

Design the electronic circuit described above using Arduino based boards (more than one) considering

- Using appropriate sensors & devices to achieve the purpose.
- Write well-documented Arduino code to achieve functionality.

Important:

The required components to build such system must be purchased. The type and quality of such components must be based on agreement with the supervisor. The university **might** cover the expenses for such purchase. However, there is no guarantee and is subject to the availability of funds. In this case, it's the students' responsibility to obtain the required components.

What will you learn?

This is a great chance to learn practical electronics and coding real-time applications to achieve a useful function. The project is just a prototype but could be expanded into something more serious in the future



Project Title: *Design of IOT Monitoring System of Water level in Rivers*

Project Supervisor: *Dr. Yasir Hashim*

Synopses:

This project will develop Monitoring System of Water level in River based on IOT. This project will design to check the level of water in river and send information by local internet network to all persons beside the river and the emergency agencies concern with this issue. The system incorporates the concept of sensor detection to sense the presence of river conditions and send information automatically depending on these conditions.

Expected Student Background:

- Good programming background is recommended.
- Basic knowledge in electronics.

Project Requirements:

Design the electronic circuit described above using Arduino based boards (more than one) considering

- Using appropriate sensors & devices to achieve the purpose.
- Write well-documented Arduino code to achieve functionality.

Important:

The required components to build such system must be purchased. The type and quality of such components must be based on agreement with the supervisor. The university **might** cover the expenses for such purchase. However, there is no guarantee and is subject to the availability of funds. In this case, it's the students' responsibility to obtain the required components.

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Project Title: *Design of Digital IC Testing System*

Project Supervisor: *Dr. Yasir Hashim*

Synopses:

This project will develop a Digital Integrated Circuits (IC) Testing system based on Arduino Uno platform. This project will design to check the 74 series ICs and separate the faulty one. These testing system will depend on the principle of testing of 74 digital ICs by applying digital signals on the inputs and read the outputs even if the configuration is different among all 74 ICs.

Expected Student Background:

- Good programming background is recommended.
- Basic knowledge in electronics.

Project Requirements:

Design the electronic circuit described above using Arduino based boards (more than one) considering

- Using appropriate sensors & devices to achieve the purpose.
- Write well-documented Arduino code to achieve functionality.

Important:

The required components to build such system must be purchased. The type and quality of such components must be based on agreement with the supervisor. The university **might** cover the expenses for such purchase. However, there is no guarantee and is subject to the availability of funds. In this case, it's the students' responsibility to obtain the required components.

What will you learn?

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Project Title: Autonomous flying Quadcopter with Obstacle Avoidance

Project Supervisor: Dr. Abubakar M. Ashir

Synopses:

An autonomous flying Quadcopter projects involves design and construction of a quadcopter capable of flying from home location to a target destination and back to the home position. It is capable of flying at low altitude and can navigate through its terrain with capability of detection and avoidance of an obstacle in its flying path. The project will comprise of both mathematical design and physical construction of the quadcopter to achieve the set objective. The quadcopter will be integrated with advanced proximity sensors and GPS mode to make it self-aware of its location and approaching objects or obstacle in its path. A graphical user interface will also be developed to visualize the flight path and provide some key buttons for sending commands to the copter remotely when needed.

Expected Student Background:

- Basic Arduino-like programing skills.
- Basic of embedded system design
- Basic understanding of sensors operations
- Basic skills in electronics
- Data acquisition
- Local Area Network Basics

Project Requirements:

- Built a flying Quadcopter.
- Design and construction of the quadcopter mechanical frame
- Installation and integration of sensors and GPS module, propellers and motors.
- Installation and configuration of the Flight Controller (FC).
- Interfacing and integration of Arduino microprocessor with FC and other sensors and modules
- Installation of IP camera
- Design of GUI for flight path visualization
- Programming of the Arduino Microcontroller



Important:

Autonomous flying objects are new technologies that are increasingly gaining a lot of interest from military to businesses. Military have used drones for intelligence gathering, disaster management, combats etc. Most recently businesses have invested a lot in developing this technology to develop business solution like delivery drones which can deliver goods to customer remotely with great efficiency. Students involve in the project will be in the forefront of involving in an evolving technology

What will you learn?

The project provides a sound platform to build a system from ground up.

- It equips participant knowledge of physical system design and installation.
- Data acquisition and from the real system using Arduino IDE platform
- How to configure Local Area Network for data relaying to remote servers
- Development of GUI
- Programming of Arduino microcontroller
- Image acquisition and visualization
- Working with GPS modes and position tracking
- Mechanical design



Project Title: English-Kurdish Machine Translator Using Long Short-Term Memory Network (LSTM)

Project Supervisor: Dr. Abubakar M. Ashir

Synopses:

A machine translation is a subfield of Natural Language Processing (NLP) which is a major part of Artificial Intelligence. The main objective of machine translation is to create learning model (algorithm) capable of translating text or speech from one language to another. To achieve this in this project, a recurrent neural network with an optimized structure for sequence to sequence data learning (LSTM) will be utilized. The LSTM will be trained with large data containing words of similar meaning from the both languages in consideration (English and Kurdish). Through the learning process and tuning of network's hyper-parameters, the algorithm is expected to be able solve problems associated with weak translator such as avoidance of mechanical substitution of words in one language for words in another, recognition of whole phrases and their closest counterparts in the target language, use of appropriate words in one language when the target language have no equivalent words or the word have more than one meaning.

Expected Student Background:

- Basic of MATLAB or PYTHON programming
- Basics of Artificial Intelligence
- Basic Neural Networks.
- Database and data structures in programming languages.

Project Requirements:

- Large data collection and storage
- Understanding of deep learning algorithms for sequence to sequence data
- Design of a LSTM networks architecture.
- Training of the LSTM networks on a large data
- Design of a simple graphical user Interface (GUI) for testing the network
- Fine tuning the network parameters



Important:

The project is of great important to any student interesting in any field related to artificial intelligence. It introduces students to some of the very basics and fundamental components of research in the field of Artificial Intelligence. Students will learn how to formulate problem and built a network (algorithm) specifically conceived to tackle such problems. Students get to learn how to build a more complex software applications in stages that are intelligent and can be operated in real-time.

What will you learn?

The project is a springboard to understating.

- It equips participant knowledge of Artificial Intelligence.
- Database collation and data structuring
- Develop an algorithm from ground up with PYTHON or MATLAB
- Development of Web GUI
- Training of Neural Networks
- Effects of parameters on algorithm performance
- Learn advanced programming with python or matlab



Project Title: Handwritten Character Recognition using Deep Learning

Project Supervisor: Dr. Abubakar M. Ashir

Synopses:

Deep learning is a specialized form of a machine learning that provides a more in-depth approach to how machines are train to mimic human reasoning. Applications of these artificial intelligence algorithms are gradually taking over our communication and internet-based spaces. They provided enormous help in in the field of robotics, data mining, character recognition, language translation, predictions and decision making by machines. The project applies the knowledge of artificial intelligence to create a deep learning model algorithm that is trained with MNIST database of handwritten character. The trained model will be tested by being supplied with handwritten characters it has not seen before. It is expected to predict the handwritten character based on its previous knowledge. Standard training and cross-validation approaches will be adhered to, for system performance evaluations. PYTHON or MATLAB programming languages will be used to read, train and test the deep learning algorithm to be created.

Expected Student Background:

- Basic of PYTHON or MATLAB programming
- Artificial Intelligence Course.
- Basic of Image acquisition skills.
- Basic knowledge of Deep Learning Algorithms

Project Requirements:

- Install and Prepare PYTHON or MATLAB IDE editor.
- Download and preparation of MNIST Handwritten digits database.
- Modelling of Deep Learning Algorithm.
- Generating the model codes
- Training of Deep Learning Model with MNIST Database
- Test and Evaluation of the built model



Important:

Database MNIST to be used will be provided by the supervisor. If MATLAB is chosen as the platform, licensing will be the responsibility of the students. While PYTHON is open-source and does not require licensing. Adequate support will be provided to the participants by the supervisor.

What will you learn?

- Learn advanced programming skills using PYTHON and MATLAB.
- Learn working with large database
- Modelling of Deep Learning algorithm
- Training of DL Algorithm
- Testing and Evaluation of an algorithm



Project Title: Vocabulary Builder Application (iOS)

Project Supervisor: Dr. Mohamad Aldabagh

Synopses:

Would you like a bigger vocabulary? If you're like most people, the answer is yes. Then again, if you're like most people, you don't have the free time to enroll in a course or work your way through the dictionary. But you can use your smartphone as a powerful tool to learn new words, increase your vocabulary and strengthen your command of the English language without devoting blocks of time to the task. These apps make learning new words painless or even fun. This project attempts to develop a Vocabulary Builder app on iOS platform that can provide easy way to learn a new word and provide us a fun game to test our vocabularies.

This project includes the following:

- Using SwiftUI to design nice UI, which can be easy to use by users.
- Create iOS database for training a user to new words
- Programming skills to visualize the data to graph.

Expected Student Background:

- Knowledge about Swift Programming Language.
- GOOD programming background is recommended, especially for the iOS platform
- OOP programming skills is also recommended
- Knowledge of Firebase and APIs.
- Knowledge of iOS material design tools
- Basic mobile Apps development skills.

Project Requirements:

- A MAC computer to install Xcode Software.
- An iOS mobile device is recommended to test and implement the application.
- Design of UI by using Xcode. • Skills to create iOS database and visualize the data



What will you learn?

This is a great chance to learn how you can develop an iOS application that can help us to improve our Vocabularies in the English Language. Development of iOS Apps that involves many activities such as design-friendly UI with using material design tools, iOS database, and using OOP programming skills to complete the App. This is your chance to practice research, design, and implement a mobile application based on requirements.



Project Title: Speed-Reading Application (Android)

Project Supervisor: Dr. Mohamad Aldabagh

Synopses:

Speed reading is the process of rapidly recognizing and absorbing phrases or sentences on a page all at once, rather than identifying individual words. Most people read at an average rate of 250 words per minute (wpm), though some are naturally quicker than others. But, the ability to speed read could mean that you double this rate. There are many ways to increase your speed-reading rate. however, most of the existing apps nowadays only support the English Language or other left-to-right languages. This project attempts to develop a speed-reading app that can support right-to-left languages such as Kurdish and Arabic Language.

This project includes the following:

- Using Android material design to design nice UI, which can be easy to use by users.
- Create android database for training a user
- Programming skills to visualize the data to graph.

Expected Student Background:

- GOOD programming background is recommended.
- OOP programming skills is also recommended
- Knowledge of Firebase and/or SQLite.
- Knowledge of android material design tools
- Basic Android Apps development skills.

Project Requirements:

- A computer to install Android Studio Software.
- An android mobile device is recommended to test and implement the application.
- Design of UI by using XML.
- Skills to create android database and visualize the data



What will you learn?

This is a great chance to learn how you can develop an android application that can help us to increase our skills of speed-reading. Development of Android Apps that involves many activities such as design-friendly UI with using material design tools, android database, and using OOP programming skills to complete the App. This is your chance to practice research, design and implement a mobile application based on requirements.



Project Title: Central Pharmacy System

Project Supervisor: Muhammed Anwar

Synopses:

Central Pharmacy System is a System helping other pharmacies to know the drugs that is available in this system, any pharmacy that wishes to find any drug contains the rare ones can find there. This System helps the local pharmacies to keep themselves up to date about the sensitive drugs that may expire soon and they don't want to have them in their own store this may help the pharmacies a lot because they will not care about the expiration date and other problem. This system will protect The pharmacies form losing money by providing them access to the central pharmacy system which all the expensive and sensitive drugs can be found there.

- *The pharmacies are updated with all new drugs added to the system.*
- *Easy access the rare drugs.*
- *Protecting pharmacies from having expire drugs.*
- *System requires an active internet connection.*
- *This system is central for one city.*

Expected Student Background:

- Php, Javascript, bootsr.
- Knowledge of SQL and/or SQLite.

Project Requirements:

- Setup and install xamp.
- SQLite database.

Important:

The required components to develop such system must be provided by the students. Most of the tools needed to develop such system available online for free. However, any additional costs needed to purchase the software tools must be provided by the students. The university **might** cover the expenses for such purchase.



What will you learn?

Development of web based system that involves many activities such as design friendly UI . This is your chance to practically research, design and implement an project related to your based on requirements.



Project Title: Keratoconus Detector App

Project Supervisor: Muhammed Anwar

Synopses:

Keratoconus Detector Application is a System helping the patients to know about their diseases in early stage, doctors need to check patients using pentacam app to see either the patient has keratoconus or not. using this app is costing a lot of money for the patients and require space to install that application even for the doctor it is too expensive to buy system like that. This App helps the doctors and patients to test on their mobile phone without paying any money. Finding keratoconus in early stage is a big help for the doctors to prevent the disease from going further.

- *The patient will be aware of their eyes.*
- *Easy to use.*
- *The application can be used by any user download the app.*

Expected Student Background:

- Basic Android Apps development skills.
- Knowledge of SQL and/or SQLite.
- Neural network

Project Requirements:

- Setup and install Android Studio.
- Design of UI by using XML.
- SQLite database.

Important:

The required components to develop such system must be provided by the students. Most of the tools needed to develop such system available online for free. However, any additional costs needed to purchase the software tools must be provided by the students. The university **might** cover the expenses for such purchase.

What will you learn?

Development of Android Apps that involves many activities such as design friendly UI . This is your chance to practically research, design and implement an project based on requirements.