Bachelor Projects
Identifying the number of plants and their sizes in an Agriculture field using Machine learning
Identifying the number of plants and their sizes in an Agriculture field using Machine learning

**Objective**

- To be able to monitor progress and health of an agriculture field through pictures that are taken every week using a fixed camera or a drone.
- Image recognition and machine learning will be used to identify
  - The number of plants (to determine if any plants have died)
  - The size of each plant (to monitor the progress and later compare it to progress in other fields and other years)

The project is part of an intelligent agriculture tool that we hope could develop into a product

The project contains scientific challenges that can produce a research paper
Identifying the number of plants and their sizes in an Agriculture field using Machine learning

Basic Idea

Start with picture of the field

- Divide the picture in segments and identify markers if possible
- Identify crop lines (using machine learning)
- You may need to rescale the pictures so that all plants are of the same relative size (far plants look smaller)
- You may need to identify the plant type using Machine learning or the user can enter plant types
- Take each segment and identify each plant using machine learning
- Count the number of plants
- Calculate the size of each plant
- Relate each plant to its picture a week earlier and calculate growth factor
Identifying the number of plants and their sizes in an Agriculture field using Machine learning

**Tasks**

- Review the use of machine learning in agriculture
- Review Work done with similar objective
- Learn openCV image processing tool
- Identify machine learning techniques that can be used to solve the project challenges
- Build Algorithm and code to identify markers in the field
- Build Algorithm and code to identify crop lines
- Build Algorithm and code to rescale and rotate image for easier identification
- Build Algorithm and code to count plants
- Build Algorithm and code to identify each plant size
- Come plan size to plan size a week earlier
- Store the results
- Testing
- Write thesis
Identifying plant health status in an Agriculture field using Machine learning
Identifying plant health status in an Agriculture field using Machine learning

Objective

- To be able to identify the plant health which includes possible diseases and possible bug attacks using images of the plant leaves
- Image recognition and machine learning will be used to identify
  - Leave color
  - Spots on the leave (size, number and color)
  - Number of infected leaves
  - Type of disease

The project is part of an intelligent agriculture tool that we hope could develop into a product

The project contains scientific challenges that can produce a research paper
Identifying plant health status in an Agriculture field using Machine learning

Basic Idea

- Start with picture of the plant
- Rotate and rescale in the best way possible
- Adjust light

- Identify leaves (using leave boundary and training on this type of plant)
  - Count the number of leaves
  - Identify the color grade of each leave
  - Rotate and rescale each leave
  - If possible identify bad leaves

- For a single leave
  - Identify spots of different color
  - Identify the color of each spot
  - Identify the possible plan disease
Identifying plant health status in an Agriculture field using Machine learning

Tasks

- Review the use of machine learning in agriculture
- Review Work done with similar objective
- Learn openCV image processing tool
- Identify machine learning techniques that can be used to solve the project challenges
- Build Algorithm and code to identify leaves
- Build Algorithm and code to rescale and rotate leaves for easier identification
- Build Algorithm and code to identify the number of leaves and their color
- Build Algorithm and code to identify possible diseased leaves
- Build Algorithm and code to identify different color spots on the leave
- Build Algorithm and code to identify disease type
- Compare with status of previous week and action taken if any
- Store the results
- Testing
- Write Thesis
Data Analysis of the Environmental Factors effect in Agriculture
**Data Analysis of the Environmental Factors effect in Agriculture**

**Objective**

- To relate plant growth and status to temperature, light humidity, watering, and carbon dioxide level inside a greenhouse.
- Sensor will be planted inside a greenhouse in the GUC and machine learning will be used to build a relation between the sensor readings and the plant status (plant status will be collected manually).

The project is part of an intelligent agriculture tool that we hope could develop into a product.

The project contains scientific challenges that can produce a research paper and can later be a starting point for a master's degree.
The basic idea of a green house is to control the climate for optimal plant growth.

The idea is to measure climate parameters such as temperature, CO2, Humidity and take actions such as increase ventilation decrease light, decrease CO2 and so on.

To be able to do this we need to do several things:

- Insert sensors inside a green house and connect them to the net
- Build a data collection and storing system
- Store actions taken by experts at each condition
- Store the plant status versus each condition
- Use machine learning to build relation between the sensor reading and the plant status
Data Analysis of the Environmental Factors effect in Agriculture

Tasks

- Review the use of machine learning in climate control inside green houses
- Review Work done with similar objective
- Install sensors inside a GUC green house (sensor will be supplied by Innova Techolgy)
- Connect the sensor to server
- Build a database to store the sensor reading
- Identify machine learning techniques that can be used to solve the project challenges
- Run the sensor of a given time interval
- Build Algorithm and code to identify relate Climate parameters to action and plant status
- Testing
- Write Thesis
Smart City Crowd Monitoring using Machine learning
To use images taken from a video camera at given location to identify people their direction and how close they are to each other. This information is used to identify crowded areas and to identify the popularity of certain location or the problems associated with certain location. It can also be used to determine the social status of the crowd (e.g groups of young people, couples, families with kids).
Smart City Crowd Monitoring using Machine learning

basic idea

- Start with picture of the Location at given time (possibly the U or the platform at GUC)
- Rotate and rescale in the best way possible
- Adjust light

- Use image recognition and machine learning to identify people in the picture

- Use machine learning to identify clusters of people
- Relate the clusters of people to picture at previous time instance and determine the crowd flow
Smart City Crowd Monitoring using Machine learning

Tasks

- Review the use of machine learning in traffic and crowd management in Smart Cities
- Review Work done with similar objective
- Learn openCV
- Identify machine learning techniques that can be used to solve the project challenges
- Build Algorithm and code to identify persons in picture
- Build Algorithm and code to identify a person direction and seep in video
- Build Algorithm and code to identify clusters of people in a location
- Build Algorithm and code to display crowd cluster size and direction
- Build Algorithm and code to identify crowd type (group of young people, family, couple, …etc)
- Build Algorithm and code to identify average crowded location
- Testing
- Write Thesis
Smart City Car movement analysis using machine learning
Smart City Car movement analysis using machine learning

**objective**

To use images taken from a video camera at given Egyptian street location to identify vehicle type (car, truck, bus, bike), vehicle direction and vehicle speed. These information will be used to identify near accident situation, Street status, and points of crowd. It is important to adopt this to Egyptian Streets and car types.
Smart City Car movement analysis using machine learning

Basic Idea

- Start with a video frame from a video camera
- Use Machine learning and image recognition to identify vehicles and their orientation
- Use machine learning to identify vehicle type (e.g. yellow for cars, red for taxi, blue for Micro bus, green for toktok)
- Use previous video frames to know car speeds
- Identify humans and their relative position to the cars
- Use car directions and speeds to identify possible collisions
- Build statistics about the location
Smart City Car movement analysis using machine learning

Tasks

- Review the use of machine learning in traffic and crowd management in Smart Cities
- Review Work done with similar objective
- Learn OpenCV
- Identify machine learning techniques that can be used to solve the project challenges
- Build Algorithm and code to identify vehicles
- Build Algorithm and code to classify vehicle types
- Build Algorithm and code to identify Humans
- Build Algorithm and code to identify vehicles speed and direction
- Build Algorithm and code to identify Possible problems
- Test
- Write Thesis
Indoor proximity localization using Machine learning
In most indoor localization applications such as museums, we are not interested in the accurate location of the person but rather in what item he/she is close to (in its proximity).

The objective to transom this problem into a typical Machine learning classification problem were signal received from various blue tooth transmitters are used to classify the user location as close to certain item.
Indoor proximity localization using Machine learning

**Basic idea**

- A number of Bluetooth receivers will be distributed all over the museum.
- These receivers will be connected using WiFi.
- These receivers will scan regularly for available Bluetooth phones.
- Each phone will transmit a beacon every fixed time interval (beacon is a low power signal).
- Signals associated with a certain mobile are collected at server and machine learning is used to find which item he or she is close to.
- Information about the previous location and the phone Gero can be used to increase accuracy.
Indoor proximity localization using Machine learning

Tasks

- Review the work on Proximity localization.
- Build an initial simulator for proximity localization.
- Review the work on using machine learning for localization.
- Build the anchor node using ESP 32.
- Collect the data at the server.
- Use machine learning to classify the user location.
- Return the data to the phone.
- Compare with other Proximity localization approaches.
- Testing.
- Write Thesis.
Indoor Coordinate localization using Machine learning
Indoor Coordinate localization using Machine learning

**objective**

- Some Indoor localization application such as indoor navigation require accurate calculation of user location. These techniques usually depend on using Radio Signal Strength Indicator (RSSI) from several anchor wireless nodes to calculate the user location. Because the signal suffer from wireless features such as shadowing and fading obtaining accurate location is a challenge and require complex calculation.

- The objective of the project is use Machine learning to learn the function that translate RSSI from a large number of anchors to location defined by coordinated. Several other factors such as previous location and navigation map could be used to enhance the location calculation.
Indoor Coordinate localization using Machine learning

**Basic idea**

- A number of Bluetooth receivers will be distributed all over the building.
- These receivers will be connected using WiFi.
- These receivers beacon from mobile phones or devices and record the RSSI for each device.

Typically trilateration is used where signal strength is translated to distance. The distance from three anchors is used to calculate the position of mobile by solving equations representing the intersection of three different circles.

Because of shadowing and fading, the distance calculation is not accurate.

Accuracy could be increased by considering more anchors, but the calculation becomes very complex.

Using machine learning neural network could be used to learn the relation between RSSI and location.
Tasks

- Review the work on trilateration localization.
- Build an initial simulator for trilateration localization.
- Review the work on using machine learning for localization
- Build the anchor node using ESP 32
- Collect the data at the server
- Learn neural networks
- Use neural network to replace the calculation of location using trilateration
- Use neural network to replace the calculation of location using more than three nodes
- Compare the accuracy and speed of the calculation with traditional methods
- Write Thesis
Sensor based Human Movement analysis using machine learning
Sensor based Human Movement analysis using machine learning

objective

- The objective of this project is to attach a number of motion sensor to a human body and use machine learning to translate their reading to information about the movement of the person
Sensor based Human Movement analysis using machine learning

Basic idea

- Attach a wireless motion sensor (already designed at the GUC to a human body)
- See if more sensor can be added to the same wireless node
- Collect the reading of the sensor using wireless node (Wi-Fi)
- Use machine learning (typical Neural network to build a model for the person movement by translating the sensor readings to actual movement
- Relate the readings of different sensor to provide a detailed movement information specifically for athletes
Sensor based Human Movement analysis using machine learning

Tasks

- Review the work on body sensor
- Review the existing design and reproduce several nodes from the same design
- If possible create a case and mounting for the motion sensor
- Test the motion sensor using calibrated movement (e.g., linear movement, circular movement, pendulum movement, ...)
- Attach the sensor to human body and record a video of the movement as well as reading of the sensors
- Build a simple model of the movement from the video
- Use machine learning to build a relation between sensor readings and the video movement
- Testing
- Write Thesis
Video camera Human Movement analysis using machine learning
The objective of this project is to transform movement of person in video to model where this movement can be analyzed. This can be done using a combination of markers and machine learning recognition of the body joints.
Video camera Human Movement analysis using machine learning

Basic Idea

- Record a video of an athlete
- Divide the video into frames
- Manually create markers at the joints of the athlete

- Manually connect the joints in a way that represent the athlete movement and create a model that represent the athlete
- Use the original video as an input and the resulting model as the output

- Use neural network to build a model that takes as an input a picture and produce as a output the movement model
- There are several challenges related to the type and structure of the neural network to be used in the project
Video camera Human Movement analysis using machine learning

Tasks

- Review the work on Human pose detection using machine learning
- Learn neural network, convolutional neural network and recurrent neural network)
- Learn open CV
- Take video of motion of athlete and divide it into frames. Focus and center the athlete
- Manually create markers at the athlete joints . Preferably indifferent color
- Create a body model out the markers (by connecting the markers using a simple code)
- Use neural network to create a model that model that can automatically detect the athlete joints and connect them
- Test the model
- Write Thesis
Lora SDR Implementation and analysis using GNU Radio
LoRa SDR Implementation and analysis using GNU Radio

**objective**

- LoRa is one of the most important transmission protocols in IoT.
- GNU radio has a software defined version of the LoRA physical layer implement
- The objective of the project is to first install and run the LoRa GNU radio on GUC USRPs, then investigate if they can be run from the cloud, and last add physical layer and MAC layer modification to the model.
Lora SDR Implementation and analysis using GNU Radio

Tasks

- Study the LoRA physical and Mac layer protocols
- Learn GNU radio principals
- Install the GNU radio LoRa on GUC USRPs
- Compare GNU LoRa to GUC implemented LoRa
- Investigate installing the GNU lora on a virtual machine in the cloud lab
- Add protocol modification to GNU LoRa
- Testing
- Write thesis