Robotic-2 Areal Robotics

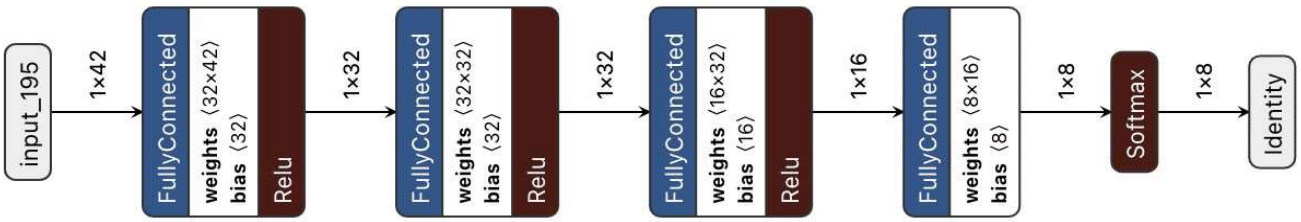
Project-2
ASU ID: 1222883272

LAB-4: Controlling Drone with Hand Gestures.

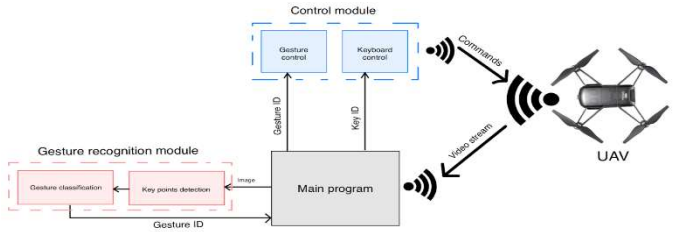
In this assignment, we will be controlling TELLO EDU using hand gestures with the help of OpenCV, Python built-in libraries.

Here, we will be controlling the TELLO EDU drone using human hand gestures. This will be done by taking the hand gestures as input to the drone. The hand gestures are estimated using the MediaPipe framework. Mediapipe is a framework mainly used for building multimodal audio, video, or any time series data. With the help of the MediaPipe framework, an impressive ML pipeline can be built for instance of inference models like TensorFlow, TFLite, and for media processing functions.

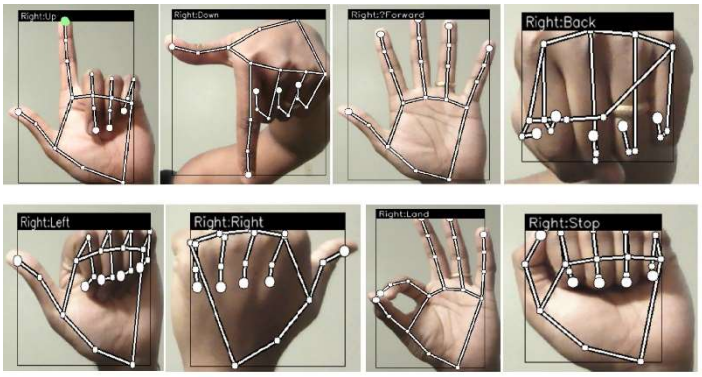
Gesture Recognition With MediaPipe: Utilizing MediaPipe Hands is a winning strategy not only in terms of speed but also in flexibility. MediaPipe already has a simple gesture recognition calculator that can be inserted into the pipeline. However, we needed a more powerful solution with the ability to quickly change the structure and behavior of the recognizer. To do so and classify gestures, the custom neural network was created with 4 Fully Connected layers and 1 Softmax layer for classification.



This simple structure gets a vector of 2D coordinates as an input and gives the ID of the classified gesture. Instead of using cumbersome segmentation models with a more algorithmic recognition process, a simple neural network can easily handle such tasks. Recognizing gestures by key points, which is a simple vector with 21 points` coordinates, takes much less data and time. What is more critical, new gestures can be easily added because model retraining tasks take much less time than the algorithmic approach.



The following gestures will work as the control conditions for the UAV.



- The above-mentioned drone applications have been implemented using python built-in libraries which are djitellopy, cv2, NumPy, Haarcascade. *[Code; Video]*