EE250 Final Project: End-to-end IoT System Richard Oh, Ellen Ko

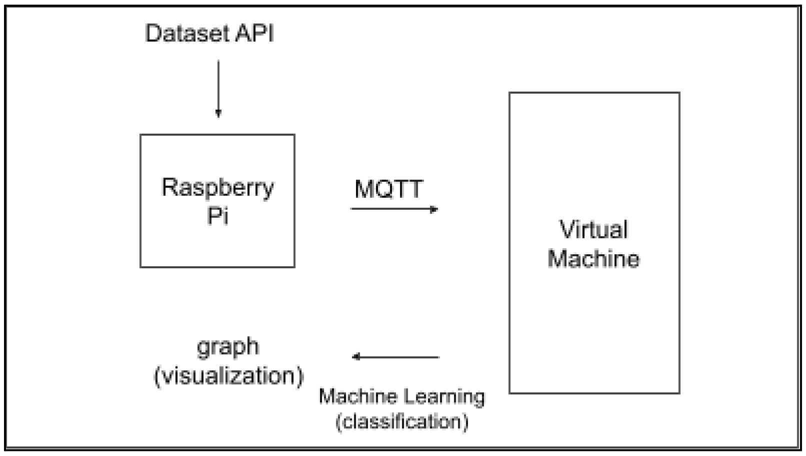
GitHub Repository: https://github.com/ohrjh10/Richard_Oh_Ellen_Ko_EE_250_Final_Project

Objective:
Our objective is to build our own end-to-end IoT system using multiple concepts from the labs. An end-to-end IoT system is defined as one or more physical nodes connected to a central node for data collection, processing, control, or visualization.

Brief Outline:
The proposed plan for this project is to design a Machine Learning algorithm associated with the use of API and MQTT protocols. The Raspberry Pi will be used as one physical node for this project, and its functionality is to load the API data set (server side) and send the obtained data set to the second physical node, the Virtual Machine (client side). During this process, the data set will be stored in a .csv file, which is a functionality of the Python file on the client side. The Machine Learning code located in the Virtual Machine will then be able to classify the data set and give us a visualization of the result with the Jupyter Notebook application.

Components:
Physical nodes used: Raspberry Pi, Laptop(Virtual Machine)
Protocols, techniques used: MQTT, Machine Learning
Data Collection: data will be collected from a virtual sensor, which will use public data API from https://openweathermap.org/api (Weather API)
Machine Learning aspect: classification of weather based on the data collected by the weather API. The Machine Learning code will classify whether the weather is moderate or not
Node-to-node communication: The Raspberry Pi sends the data from the API to the VM
Visualization: the scatter plot of the classification will be shown towards the end of the demo

Block Diagram:



Reflection:

Limitations and lesson learned: An assumption made during the Machine Learning process was that humidity and temperature are factors that affect the weather to a great extent compared to other factors such as wind speed or visibility. However, the data set collected from cities in real life suggests that the weather patterns cannot just be classified using two parameters, as weather patterns are considered extremely inconsistent. Therefore, the original scatter plot shown at the start of the Jupyter Notebook did not show a general trend and thus made it harder to classify the data set we obtained from the weather API. In the end, this resulted in a low accuracy of the Machine Learning model. This made us recognize that the Machine Learning model could be improved by adding more parameters in order to see a general trend of the parameters and the end result weather condition. In addition, having more data points could lead to an increase in the accuracy of the model as more data points can be used for training and testing.

External Sources referenced:

Weather API - openweathermap. (n.d.). Retrieved May 6, 2023, from https://openweathermap.org/api

IJRASET Journal for Research in Applied Science and Engineering Technology. (n.d.). Retrieved May 6, 2023, from https://www.ijraset.com/research-paper/prediction-and-classification-of-weather-using-ml