Assignment
Capstone Final Project

Introduction:

Now that you have completed going through the course content of the IoT training, it is time to build a Machine Learning based Industrial IoT project. This is a real-world scenario where IoT is being used to solve the problems.

Building the capstone project for this course will help you understand real word problems and how you can provide customized IoT solutions to Industrial customers such as Mr. Nigel.

So before we dive into what you have to implement, as a part of the capstone project, let's understand what led to the requirement of this project.

Real-World Scenario:

As you remember from the first module, during the manufacturing of the tablets at Mr. Nigel's company, the temperature of the tablets has to be maintained between -40 and -30 degrees Celsius. Just a few months ago, the government declared the following rules for manufacturing these tablets.

1) While the manufacturer is allowed to maintain the temperature of the tablets between, -40 and -30 degrees Celsius, the temperature of the tablets should never remain between -33 and -30 degrees for longer than 20 minutes at a time.
2) Also, the manufacturer should maintain a log of when the cooling chamber for the production of the tablets is opened.
3) These rules should be implemented within a month of their declaration. Failing to comply would lead to cancelation of the pharmaceutical production permit.

While the government declared these rules to ensure that the medicine produced at all pharmaceutical companies, was good enough to be used by the general public, these rules put Mr. Nigel's company in a bit of a pickle.

Implementing such stringent measurements was no easy task.

While the other employees in the company were panicking over the possibility of losing their jobs, Mr. Nigel was perfectly calm.

Mr. Nigel had been using the Bolt IoT platform for more than a year now and had also been researching about machine learning. With the help of his knowledge of the Bolt IoT platform and machine learning, he was able to quickly come up with a method to implement the new stringent rules set by the government. He implemented the solution within 2 days and ensured that his company did not lose its pharmaceutical production permit.

Amazing is it not?

Well, you will be happy to know that you have learned everything Mr. Nigel needed to know to implement this system, and you will be building this system as a part of the Capstone project.

Project Objectives:

The pharmaceutical companies use a cooling chamber which is similar to a refrigerator to keep the tablets and maintain the temperature in the required limits. However, since you most probably don't have a cooling chamber which can maintain a temperature in the range, of -40 to -30 degrees Celcius, you can instead use a regular refrigerator at your home for this project.

NOTE: You have to take photos and screenshots while doing each objective in the project.

The objectives of the Capstone project are as follows.

a) Build the circuit for temperature monitoring system, using the Bolt and LM35 sensor.
   You have already learned how to do this in Module 3 of the course, you can repeat the circuit connection for the system.
b) Create a product on the Bolt Cloud, to monitor the data from the LM35, and link it to your Bolt.
c) Write the product code, required to run the polynomial regression algorithm on the data sent by the Bolt.
   With this objective in mind, Mr. Nigel managed to satisfy the first condition set by the Government. Using the prediction data, he was able to take early action, whenever the graph predicted that the temperature would be maintained within the -33 and -30 degrees Celsius range for longer than 20 minutes.
d) Keep the temperature monitoring circuit inside your fridge with the door of the fridge closed, and let the system record the temperature readings for about 2 hours.
e) Using the reading that you received in the 2 hours, set boundaries for the temperature within the fridge.
f) Write a python code which will fetch the temperature data, every 10 seconds, and send out an email alert, if the temperature goes beyond the temperature thresholds you decided on in objective 'e'.
g) Modify the python code, to also do a Z-score analysis and print the line "Someone has opened the fridge door" when an anomaly is detected.
h) Tune the Z-score analysis code, such that, it detects an anomaly when someone opens the door of the fridge.
   As you may have guessed, this objective helped Mr. Nigel set up a system which knew that the fridge door was open, without any extra hardware. Remember that in your case, you might have to keep the door open for about 10 seconds to see the results.

Submitting the Project:

To finish the capstone project you have to make a PDF document with all the photos and screenshots. All the photos and screenshots should be grouped as per the objective, and along with title as the objective for each one of them, and submit it by uploading it in the PROGRESS TRACKER section on your Internshala dashboard.