Below you will find instructions on completing a take home assessment. Please do not spend more than 6 hours working on this assessment, and please submit your response to mcantrell@parsyl.com within 7 days of receiving this document. Feel free to submit earlier.

Six hours is by no means enough time to do a perfect job. I expect you to do a less than perfect job. Focus on doing the best you can in the limited time, leaving time to describe in words why you did what you did, what else you would have done had you had more time, and why.

Instructions

Parsyl is engaged in monitoring refrigerators containing vaccines in the country of Wakanda (fictional name) with the goal of helping the country improve its vaccine supply chain. Vaccines are delivered first to a National distribution center, which Parsyl is currently not monitoring. From there, approximately every 3 months, vaccines are moved to a regional distribution center. From there, approximately every 2 months, vaccines are moved to a district distribution center. From there, approximately every 1 month, vaccines are moved to a health facility. Finally, each health facility has an outreach session approximately once per week, in which a health care worker takes vaccines from the health facility to various locations in the area, administering the vaccines to people in need. Note that each district is only affiliated with one region, each health facility with only one district, and that there are many health facilities per district, many districts per region, and many regions.

Parsyl devices are placed in refrigerators and record the time, temperature and humidity every 10 minutes, and light on an event-driven basis. Additionally, Parsyl devices are placed in transit with vaccines from each of the trips from region to district, district to health facility, and health facility to outreach sessions. However this transit data is not included in your take home assessment for simplicity.

One key way to understand the supply chain is through heat and cold alarms. When a vaccine experiences either a heat or cold alarm, the vaccine may be assumed ineffective.

A *Heat Alarm* occurs when a vaccine has temperature exceeding 8 degrees Celsius continuously for at least 10 hours.
A *Cold Alarm* occurs when a vaccine has temperature less than -0.5 degrees Celsius continuously for at least 1 hour.

Since vaccines are stored in refrigerators that Parsyl is monitoring, a refrigerator is said to have a heat or cold alarm under the same circumstances. When this happens, we want to notify the workers in-country so that they know the vaccines in said refrigerators may be compromised.

Light events occur when a Parsyl device detects a non-trivial amount of light. You may assume that light events occur in the attached dataset when refrigerators are opened.

Attached we have provided time series data associated with a number of refrigerators, along with contextual data about the refrigerators themselves. Each refrigerator is associated with a unique health facility location. In hierarchy.json we've included the hierarchical relationship amongst the regions, districts, and health facilities. In context_data.csv, we've included the make and model of the refrigerators.

Using this data, we ask that you

1. Create a model to predict the probability that a refrigerator will experience either a cold or heat alarm in the next week. Please share the code used to create the model, as well as the model itself. Please also answer
    a. How well does your model work? What are its strengths and weaknesses?
    b. What does your model tell you about riskfactors that impact alarms?
    c. If you had more time, what else would you like to have explored?
    d. Can you briefly describe how your model might be put into production and any concerns to be aware of?

Notes:

1. You may program in your language of choice, though we prefer Python.
2. Time data is in units of epoch milliseconds; temperature is in Celsius; humidity is in relative humidity.
3. Feel free to email questions to mcantrell@parsyl.com, though you should feel free to make assumptions where necessary so long as you clearly state them.