IS672 – Introduction to Deep Learning

Project #1 / Due 5-Oct-2023

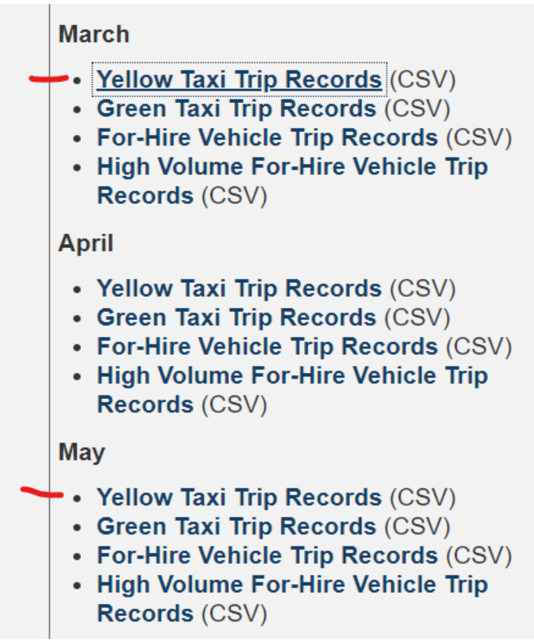
Performing Exploratory Data Analysis (EDA) on data is of paramount important for every Data Scientist / Data Analyst. Exploratory Data Analysis is often used to uncover various patterns present in the data and to draw conclusions from it. EDA is the core part when it comes to developing a Machine Learning model. This takes place through analysis and visualization of the data which will be fed to the Machine Learning Model. A Machine Learning Model is as good as the training data - you must understand it if you want to understand your model.

Prior commencing your efforts on coding, you must install the following libraries:

- pip install -q tensorflow_data_validation [visualization] (**)
  - https://pypi.org/project/tensorflow-data-validation/
- pip install apache-beam [interactive]
  - https://beam.apache.org/get-started/quickstart-py/
  - https://pypi.org/project/apache-beam/
- Install the GraphViz library
  - https://www.graphviz.org/download/

Perform an **explanatory data analysis** (**EDA**) on **NYC's Yellow Taxi Trip Records** from **2020**. Although there will be no need to build a model based on the data provided, you are asked to look for issues in the data and find correlation among the various variables in order to improve ride time predictions.

Create the training dataset on data based on March of 2020, and evaluation dataset on data based on May of 2020. https://www1.nyc.gov/site/tlc/about/tlc-trip-record-data.page



March

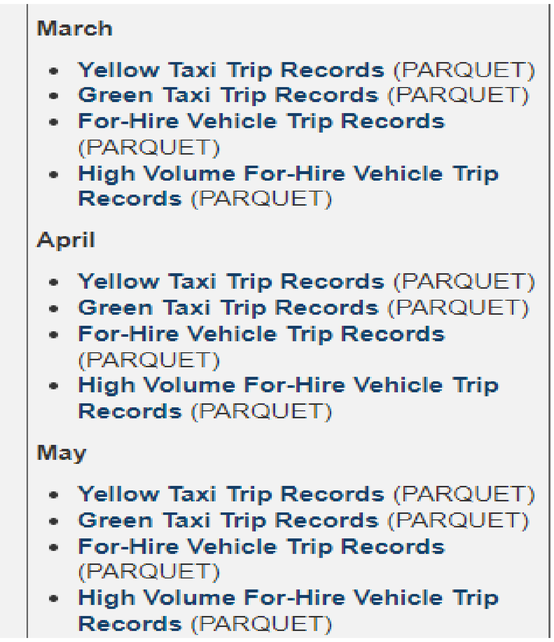
- Yellow Taxi Trip Records (CSV)
- Green Taxi Trip Records (CSV)
- For-Hire Vehicle Trip Records (CSV)
- High Volume For-Hire Vehicle Trip Records (CSV)

April

- Yellow Taxi Trip Records (CSV)
- Green Taxi Trip Records (CSV)
- For-Hire Vehicle Trip Records (CSV)
- High Volume For-Hire Vehicle Trip Records (CSV)

May

- Yellow Taxi Trip Records (CSV)
- Green Taxi Trip Records (CSV)
- For-Hire Vehicle Trip Records (CSV)
- High Volume For-Hire Vehicle Trip Records (CSV)



March

- Yellow Taxi Trip Records (PARQUET)
- Green Taxi Trip Records (PARQUET)
- For-Hire Vehicle Trip Records (PARQUET)
- High Volume For-Hire Vehicle Trip Records (PARQUET)

April

- Yellow Taxi Trip Records (PARQUET)
- Green Taxi Trip Records (PARQUET)
- For-Hire Vehicle Trip Records (PARQUET)
- High Volume For-Hire Vehicle Trip Records (PARQUET)

May

- Yellow Taxi Trip Records (PARQUET)
- Green Taxi Trip Records (PARQUET)
- For-Hire Vehicle Trip Records (PARQUET)
- High Volume For-Hire Vehicle Trip Records (PARQUET)

Note: I understand, NYC's portal with Yellow Cab's Trip Data has made an important change.
They no longer provide '.csv' files, instead 'parquet' file format is the dominant one.
There are two options to read a 'parquet' file within Python:

1_ Convert 'parquet' file to 'csv'.

Here is a link to convert a parquet file to csv file (within a Windows-10 machine):
https://phoenixnap.com/kb/install-spark-on-windows-10

2_ Read 'parquet' file via Pandas' read_parquet method.

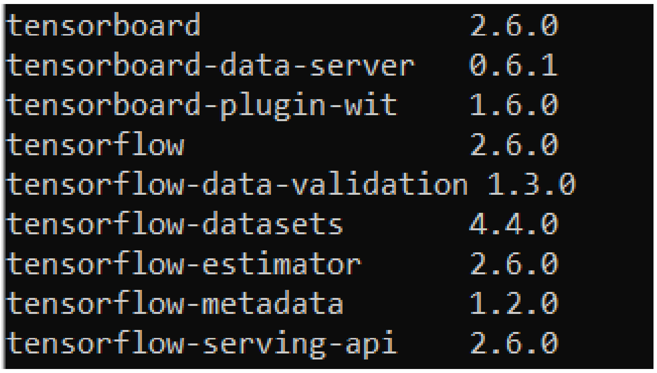
e.g. df = pd.read_parquet('yellow_tripdata_2020-03.parquet', engine='fastparquet')
Make sure you have installed the 'fastparquet' library.

Write **Python** scripts in order to complete the following tasks along with their output. All work should be done and submitted in a single **Jupyter Notebook.**

1) Prep the data in order to be ready to be fed to a model.
   Look for missing, null, NaN records.
   Find outliers.
   Transform data – all entries should be numeric.
2) List all types of data, numeric, categorical,…
3) Perform EDA on data
   Utilize both:
   - Classic approach in EDA (Pandas, Numpy libraries)
   - The TFDV (TensorFlow Data Validation) module with the powerful graphical statistics generated (apache beam library…)

   Present dependencies and correlations among the various features in the data.
   List the most variables (Feature Importance) that will affect the target label.
4) Be aware of the time-window selection for the data.
   March 2020 was when COVID19 pandemic broke up in the US.
   Needless to say, every industry and business initiatives were impacted drastically.
   Starting March 2020, the NYC Taxi industry has established a 'new normal'.
   << Extra Credit >>:
   - January 2020 data presents the 'baseline' of what the NYC Taxi business used to be.
   - Compare the data of Jan-2020 vs Mar-2020.
   - Present your findings.

(**) Highly recommend to have installed the whole gamma of TensorFLow's module.
Here is a 'base' list of them:



```
tensorboard                  2.6.0
tensorboard-data-server      0.6.1
tensorboard-plugin-wit       1.6.0
tensorflow                   2.6.0
tensorflow-data-validation 1.3.0
tensorflow-datasets          4.4.0
tensorflow-estimator         2.6.0
tensorflow-metadata          1.2.0
tensorflow-serving-api       2.6.0
```