Computer Science Department
CS675 – Introduction to Data Science (CRN: 74028)
Fall 2023
Project #3 / Due 19-Dec-2023

Implement a Time Series Forecasting model in Python, by using the FBProphet module.

The forecasting model should be able to predict **New York City's Electricity Consumption** (see below) by using Facebook's Prophet model. Prophet is a procedure/model for forecasting time series data based on an **additive** model where non-linear trends are fit with yearly, weekly, and daily seasonality.

You should test your forecasting model in three (3) distinct datasets. On <u>Daily</u>, <u>Monthly</u>, and <u>Yearly</u> Mean electric consumption.

Daily data:

Dataset contains daily electric consumption for all five (5) boroughs of New York City. https://data.cityofnewyork.us/Housing-Development/Electric-Consumption-And-Cost-2010-April-2020-/jr24-e7cr

Monthly Mean data:
Take the above (daily dataset) data and average it out based on each month.

Yearly Mean data:
Take the daily data and average it out based on each year.

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, or Python (.py) file.

1) Since the time unit (day, month, year) varies from dataset to dataset, make your code agnostic of the input. In other words, have your code to determine the unit of the time series.

2) Then, train your model (on the respective dataset) and predict the Electric Consumption (EC) values from the last date of the dataset into X units of time into the future.

      a) Should the unit of time be day, then predict the EC for 100/200/365 days into the future.

b) Should the unit of time be month, then predict the EC for 1/6/9 months into the future.
c) Should the unit of time be year, then predict the EC for 1/10/20 years into the future.

3) Tune your FBProphet model on the following parameters:
    a) **Forecasting growth**: Plausible values = logistic; linear; flat
    https://facebook.github.io/prophet/docs/saturating_forecasts.html
    b) **Seasonality**: Add manual seasonality by using the add_seasonality method. Test it with various values for 'period' and 'fourier_order'.
    https://facebook.github.io/prophet/docs/seasonality,_holiday_effects,_and_regressors.htm
    c) **Trend Changepoints**: Tune the 'n_changepoints' and 'changepoit_prior_scale' arguments/parameters
    https://facebook.github.io/prophet/docs/trend_changepoints.html

For each model, print the predicted values in a tabular format and draw a line graph showing both historical data and the future.

4) Evaluate all models by providing their respective **MAE** (Mean Absolute Error) and **MAPE** (Mean Absolute Percentage Error), as well as R^2 (use Python's sklearn's respective metrics and/or R's).

Here are details about the daily dataset (timeseries). You need to manually create the monthly and yearly timeseries.
Daily NYC Electric Consumption: <<NYC Open Data >>
 https://data.cityofnewyork.us/Housing-Development/Electric-Consumption-And-Cost-2010-April-2020-/jr24-e7cr

Devel...	Boro...	Acco...	Loca...	Mete...	Mete...	TDS #	EDP	RC C...	Fund...	AMP #	Vend...	UMI
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 03	AMR		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 02	AMR		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 03	AMR		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 03	INTERVAL		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 02	INTERVAL		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WYCKOFF...	BROOKLYN	WYCKOFF...	BLD 03	INTERVAL		163	272	K016300	FEDERAL	NY00501...	NEW YOR...	98
WOODSON	BROOKLYN	WOODSON	BLD 02	NONE		182	285	K018200	FEDERAL	NY00501...	NEW YOR...	98
WOODSON	BROOKLYN	WOODSON	BLD 01	NONE		182	285	K018200	FEDERAL	NY00501...	NEW YOR...	98
WOODSIDE	QUEENS	WOODSIDE	BLD 18	INTERVAL		33	316	Q003300	FEDERAL	NY00500...	NEW YOR...	98
WOODSIDE	QUEENS	WOODSIDE	BLD 19	INTERVAL		33	316	Q003300	FEDERAL	NY00500...	NEW YOR...	98
WOODSIDE	QUEENS	WOODSIDE	BLD 17	AMR		33	316	Q003300	FEDERAL	NY00500...	NEW YOR...	98
WOODSIDE	QUEENS	WOODSIDE	BLD 07	AMR		33	316	Q003300	FEDERAL	NY00500...	NEW YOR...	98
WOODSIDE	QUEENS	WOODSIDE	BLD 15	AMR		33	316	Q003300	FEDERAL	NY00500...	NEW YOR...	98

< Previous   Next >   Showing Electric Consumptions 1 to 13 out of 362,630

Extra Points: Predict Electric Consumption for each of the 5 Boroughs (independently)!