Time it! 

Empower off-line devices with GPS

Background:

This project aims to predict travel times based on historical traffic data, time of the day, and weather conditions. The project is inspired by a series of questions I have always asked myself while using a navigation app *"How are these applications able to predict travel time so accurately? How do they factor signal wait times? How does weather play a role in it?"* Most notably, *"Will these applications be able to do it without live data?"*

There is a well-known relation between speed, time, and distance, but over long distances, the above-mentioned deviating minor factors and varying speed limits on multiple roads along the route might play a significant role that will disrupt the traditional relationship to make it less of a linear relationship.

Data Source:

For our analysis, we were able to find the traffic data from the **City of Montreal Open Data Portal** website and **Weather Canada**. The traffic data ranges from Jan to July 2019. Weather data was extracted on an hourly basis and aligned with the traffic data itself for each trip.

Data Source links:

Trips 2019: http://donnees.ville.montreal.qc.ca/dataset/temps-de-parcours-sur-des-segments-routiers-historique

Segments: http://donnees.ville.montreal.qc.ca/dataset/segments-routiers-de-collecte-des-temps-de-parcours

Weather: https://climate.weather.gc.ca/index_e.html

Real-Time Application:

The predictive model we derived from this can be useful in empowering offline map applications. *Google Maps* do offer the option to download the maps and use it for offline navigation, but often it does not provide a travel time option. In comparison, other major navigation applications do not work at all without an internet connection.

During my past experience in the Car-Rental industry, I often encountered tourists on a limited budget inquiring about GPS devices with the car rental. Since GPS devices are becoming obsolete and often comes with an extra cost, such a predictive model can provide a decent GPS application that can empower their smart devices with a one-time application download.

Future Work:

I used python's library *networkx* to visualize a distance-based weighted network of all the road segments we included in our model. The *networkx* built-in module *shortest_path* will help users navigate multiple road segments to reach A to B.

The future goal is to integrate the predictive model into this road network and create a function that will take the starting point and the user's ending point. It will then extract local date and time from the device. Weather conditions can be stored into the application every few days with an update for the next couple of weeks whenever data is available for the device, or it can prompt the user to select the weather conditions from the list to predict the travel time.

I believe I can potentially improve the regression models by using neural networks or reinforcement learning, but due to time and knowledge constraints at this point, I will leave it for future work.

Note: ***The notebooks are very detailed and has all the required information regarding the code, data wrangling and modeling work.***

For any questions or feedback, please reach out to me at safi.u.khan@outlook.com.

Thank you for reading!

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