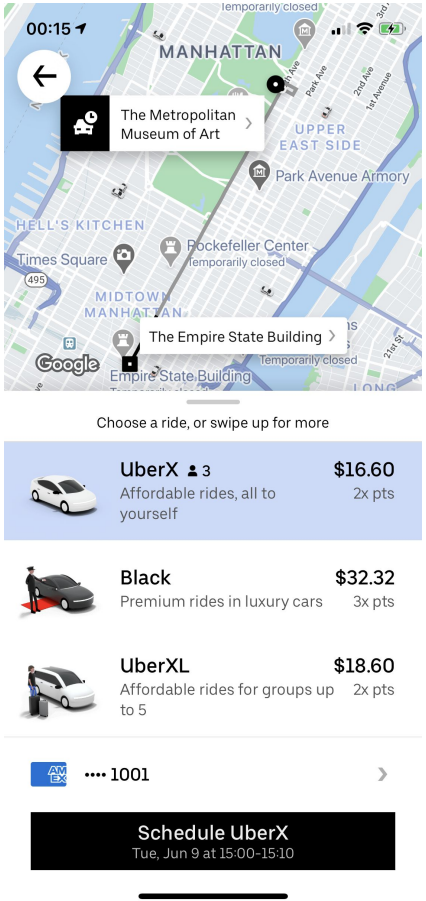
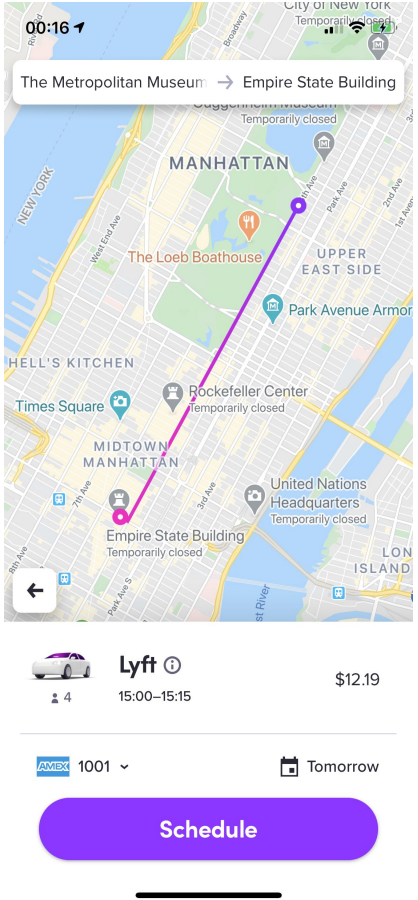
NYC Taxi Price Estimator

Know before you go. No math, no surprises.

Motivation & Problem

- Problem:
  - We usually do not know cost for a taxi ride ahead of time
  - Unable to compare taxi fare with price estimates provided by ride-hailing apps to plan ahead
- Scenario:
  - My friend and I are visiting NYC, and we plan to visit The Metropolitan Museum of Art in the morning and go to Empire State Building at 3pm tomorrow. Should we take a taxi, Lyft, or Uber?





Data

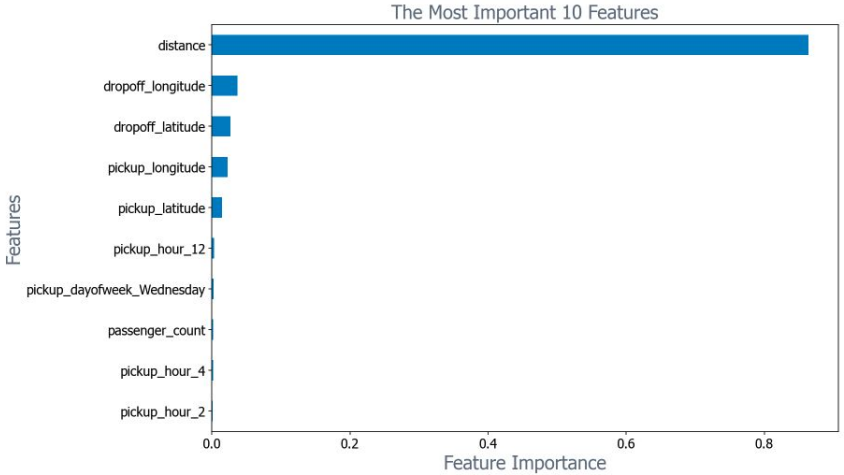
- Source:
  - Kaggle Competition: New York City Taxi Fare Prediction
- Dataset:
  - train.csv: input features and target for taxi trips in NYC from 2009 to 2015 (~ 55M rows)
- Features:
  - pickup_datetime - timestamp value indicating when the taxi ride started
  - pickup_longitude - pickup longitude coordinate
  - pickup_latitude - pickup latitude coordinate
  - dropoff_longitude - dropoff longitude coordinate
  - dropoff_latitude - dropoff latitude coordinate
  - passenger_count - the number of passengers in the taxi ride
- Target:
  - fare_amount - dollar amount of the cost of the taxi ride
- Subset Data:
  - Filtered data by a specific year (configurable)
    - Default: the most recent year - 2015
- Feature Engineering:
  - Extracted from pickup_datetime
    - Day of Week
    - Hour
  - Dropped pickup_datetime
- Train Test Split:
  - Performed stratified sampling on hour and day of the week for training and test sets
  - Number of total observations and test set ratio are configurable
    - Default # of observations: 50,000
    - Default test set ratio: 0.3

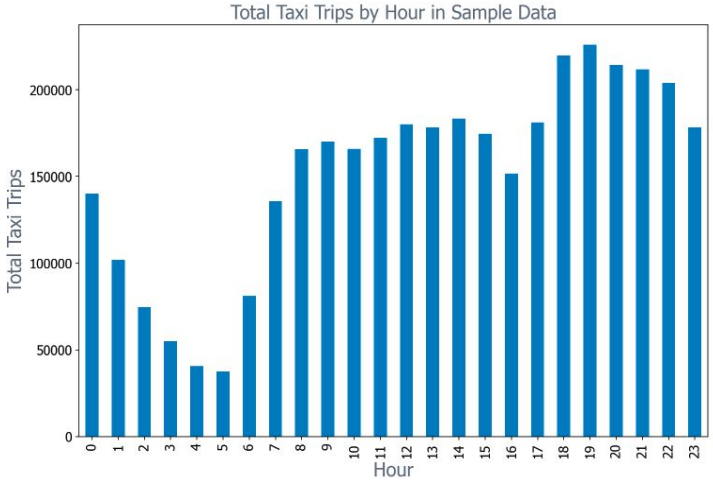
Model & Performance

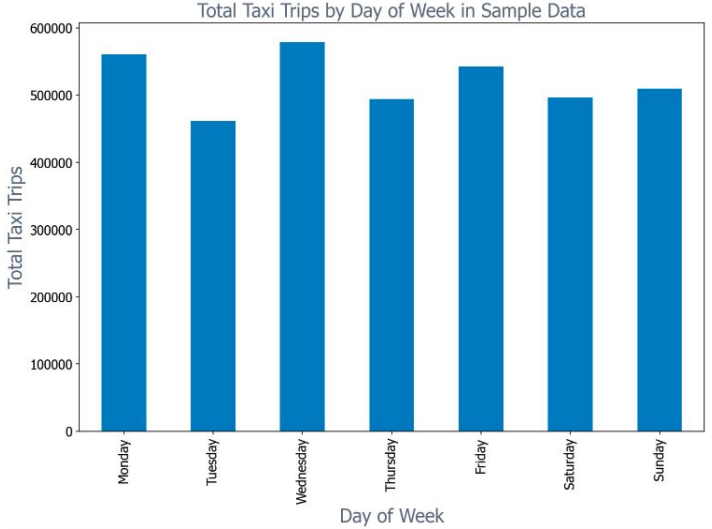
- Model: Random Forests
  - Reasons:
    - Convenient feature importance for inference and easy to interpret
    - Robust to outliers in predictor space
    - Computationally scalable: build trees in parallel
    - Automatically discards irrelevant predictors
  - Used default parameters
- Baseline Performance
  - Basic estimate based on just the distance between the pickup and dropoff points
  - RMSE of $5-$8 depending on models
- Performance on Test Set:
  - **RMSE: $2.69**
  - MAE: $1.73
  - R-squared: 0.89
- Success Criteria in Project Charter:
  - Achieved ML performance metric criterion
    - RMSE has to be less than $4 for the app to go live
  - Unable to evaluate business success metric:
    - the app used to estimate 100 trips per day

Insights

- Distance and locations are the most important features
- Pickup hours seem to be more important than day of week, probably because the difference in traffic volume by hour > difference in traffic volume by day of week
- Findings agree with taxi fare rules: Taxi fare = $2.50 initial charge. Plus 50 cents per 1/5 mile when traveling above 12mph or per 60 seconds in slow traffic or when the vehicle is stopped







Thank You!

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