Reducing Costs at The RIDE

The RIDE delivers significant impact to lower-mobility people in the Boston area by providing accessible alternatives to public transportation:
- ~2M annual trips
- $100M annual operational costs
- Operates 365 days a year
- From 5AM to 1AM
- In 58 cities and towns

**SEARCH: IM/725/700**

** HOW? **

- **Best Garage Locations**
  - Reduce time between garage and pick-up

- **Cancellation Predictions**
  - Probability of cancellation for every trip

**DATA**

- ~1.8M Rows
- 44 Columns

**TRIP DATABASE OF 2018**

- Client ID
- Pick up/Drop off Time
- Pick up/Drop off Location
- Equipment

**GARAGE LOCATION PROBLEM**

- Process
  1. Bypass bias in demand due to existing garage locations
  2. Create frequency of first/last trips given time of the day
  3. Sum these weights for all trips at the postcode level
  4. Incorporate weights to the objective function
  5. Run the optimization solver

**Formulation**

- Objective
  - Minimize Operational Costs

- Constraints
  1. Satisfy every demand point
  2. Given number of garages
  3. Size of garages
  4. Exclude downtown Boston zip codes
  5. Certain locations are fixed

- Decisions
  1. Assign garages to a location
  2. Assign demand to a garage

**Delivered results from data generation algorithm**

- **January**
  - Interview & Matching with MBTA

- **February**
  - Data & Scoping

- **March**
  - Exploratory Analysis

- **April**
  - Formulated garage problem
  - Designed preliminary cancellation models

- **May**

- **June**
  - Finalized garage problem
  - Evaluated the garage problem solution on the native MBTA engine
  - Evaluated impact of cancellations model

- **July**

- **August**

**CANCELLATIONS PREDICTION**

**Features**

- **Trip Features**
- **Weather Features**
- **Client Features**

**Models & Results**

- **SELECTED MODEL**
  - Model: Neural Network
  - Out of Sample AUC: 0.79

- Other Models:
  - Optimal Trees: 0.70
  - XGBoost: 0.63
  - CART: 0.63
  - Random Forest: 0.60

**Results**

- **$5.8M**
  - Reduction of total costs

- **6.5%**
  - Reduction of "dead head"

- **$1.1M**
  - Reduction of total costs

- **~80%**
  - Prediction Accuracy

**NEXT STEPS**

- Relocate garages according to the results of the optimization problem
- Operationalize the cancellation prediction model
- Explore different policies regarding trips with high cancellation risk

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1. Data from: https://www.ncdc.noaa.gov/cdo-web/