Predicting High Fire Risk Areas in Montreal

Key Concepts

Census Tract Areas (CTA)

Montreal Island is sub-divided into **540 areas known as CTA's**

These areas are used by the government to gather and summarize data

Fire Density

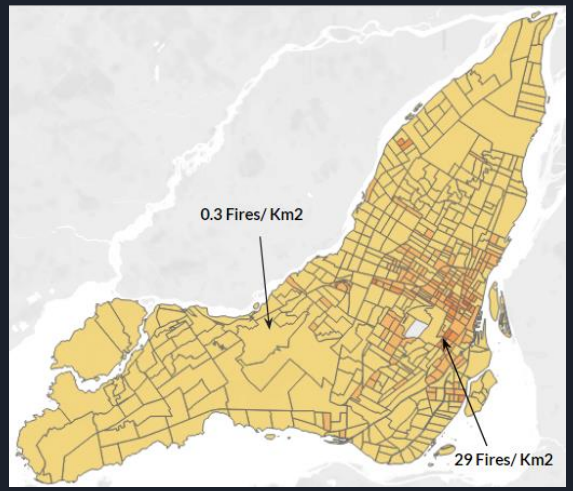
Fire Density: No. of fires per km^2

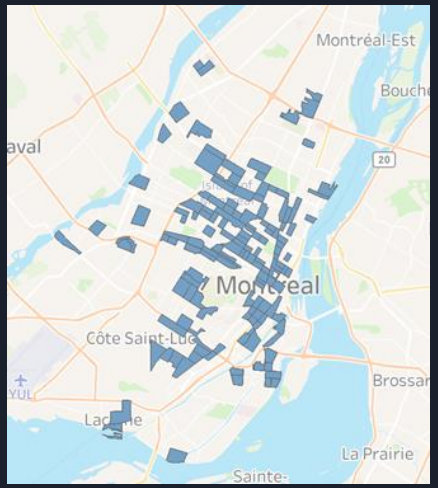
Allows comparison between areas of different sizes

High / Low Classification

High Fire Risk Area:
Fire Density > 8 fires/km^2

Low Fire Risk Area:
Fire Density < 8 fires/km^2





Data Sources and Features

Features Considered		
Montreal Fire Incidents Data		• Fires Past [12 Months] • Fires Past [6 Months] • Fires Past [3 Months] • Lags [1 to 12] • Month • Season
Montreal Census Tract Data		• Population Density • Average Population Age • Average Home Value • Median Income • % Homes Needing Major Repair • % Homeownership • % Pop aged 65+
Montreal Property Assessment Data		• No of units [Homes] • No of units [Condos] • No of units [Others] • Avg Constr Yr [Homes] • Avg Constr Yr [Condos] • Avg Constr Yr [Others] • Buildings Area [Homes] • Buildings Area [Condos] • Buildings Area [Others]

Note: Features are per km^2

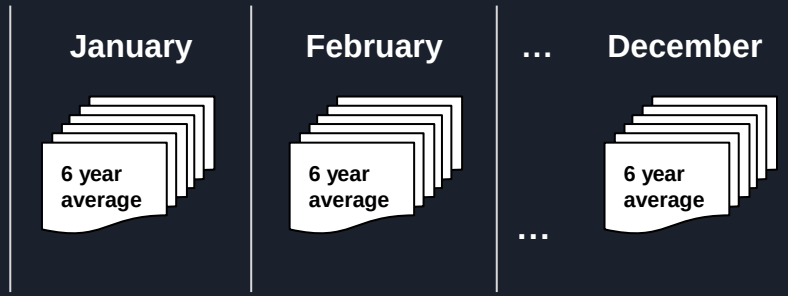
Features Selected*		
Incidents Features		• Fires Past [12 Months] • Fires Past [6 Months]
Census Features		• Population Density • % Homeownership • % Pop aged 65+
Property Features		• No of units [Condos] • Avg Constr Yr [Homes] • Avg Constr Yr [Condos] • Buildings Area [Homes]

*Selection based on feature importance scoring and hyperparameter tuning

Model Details

- **Model Used:** Random Forest and Logistic Regression

- **Baseline:**



- **Training *vs* Testing:**

2015-2021	2021-present
Training Period	Testing Period

Model Results

Our model highlights a subset of the 540 census tract areas, each month, capturing the high fire risk areas with the following success rate

Random Forest		Baseline
85% TPR	*VS*	59% TPR
18% FPR		18% FPR

- Metrics Definitions:
  - **True Positive Rate (TPR):** *% of actual high fire risk areas predicted*
  - **False PosItive Rate (FPR):** % of false high fires risk areas predicted
  - Results based on the testing data

Prediction for July 2021

Results on Interactive Dashboard