DATA MINING COMPETITION

Southwest Properties

MCDA 2023-2025

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KNOW OUR TEAM

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Student at MCDA

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Student at MCDA

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Student at MCDA

Jerry Caleb
Student at MCDA

Kritika Koirala
Student at MCDA

- 1,500+ Apartments
- 50+ Years Experience
- Platinum Member Status
- Comprehensive Development
- Inspiring Environments
- Lasting Relationships

WHAT'S THE PROBLEM ?

WHAT'S THE PROBLEM ?

01.

Manual Data Collection

02.

Infrequent Dashboard Updates

03.

Dependency on Human Labour

INTRODUCING

SW Estate 360°

is a **centralized platform** to enhance rent forecasting and insights on properties.

- Automated Data Collection
- Streamlined Data Pipelines
- Optimized and Improved Insights
- Accurate Rental Forecasting

Automated Scraper and Crawler

Real-time Dashboards

Insightful Rental Forecast

In-House Developed APIs

Upcoming Projects Alert

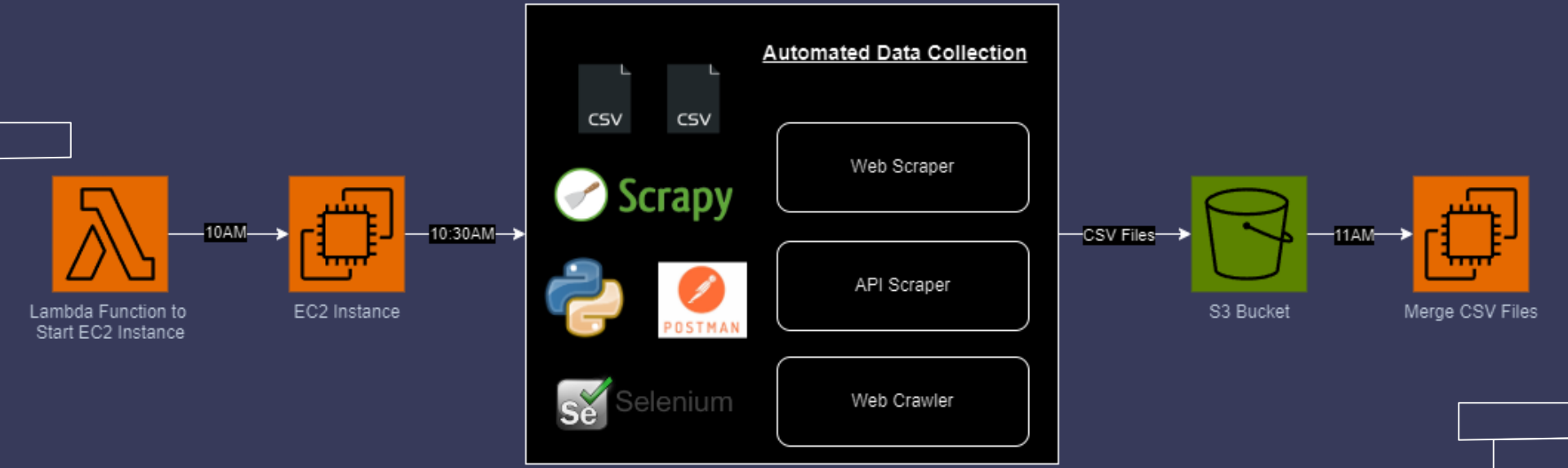
SW Estate 360°

is a centralized platform to revolutionize rent forecasting and insights on properties.

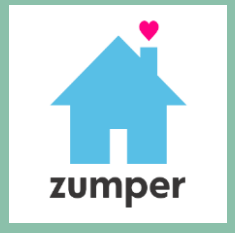
- Automated Data Collection
- Streamlined Data Pipelines
- Optimized and Improved Insights
- Accurate Rental Forecasting

Automated Scraper and Crawler

Automated Scraper and Crawler - Architecture



WEBSITES SCRAPED



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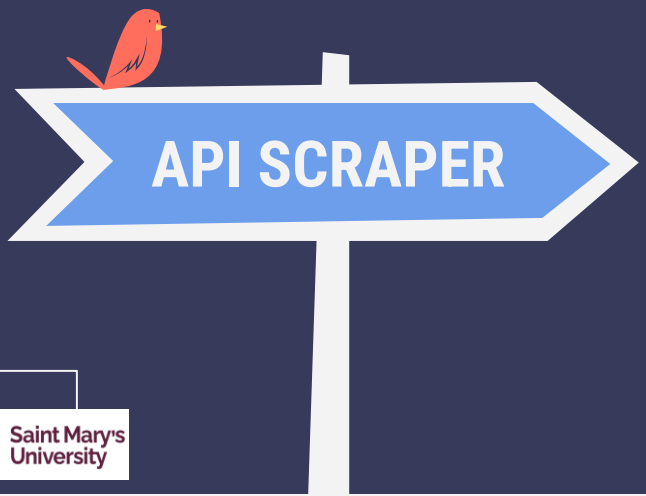
API scraping is the process of extracting data from application programming interfaces.



Recorded on screencapture.com

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Web scraping is the technique of extracting data from websites.

Recorded on
screencapture.com

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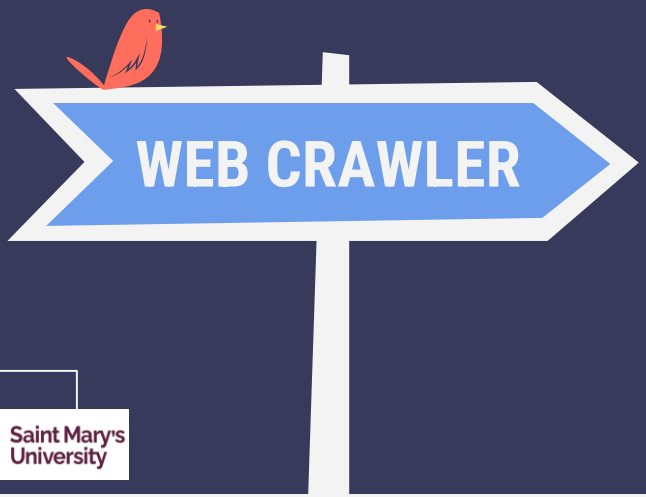
Web crawling is the process of systematically browsing the internet to index web content.



Recorded on screencapture.com

Real-time DashBoards

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Overview Dashboard

Listings Dashboard

Competitor Analysis Dashboard

Parking Dashboard

Upcoming Projects Dashboard

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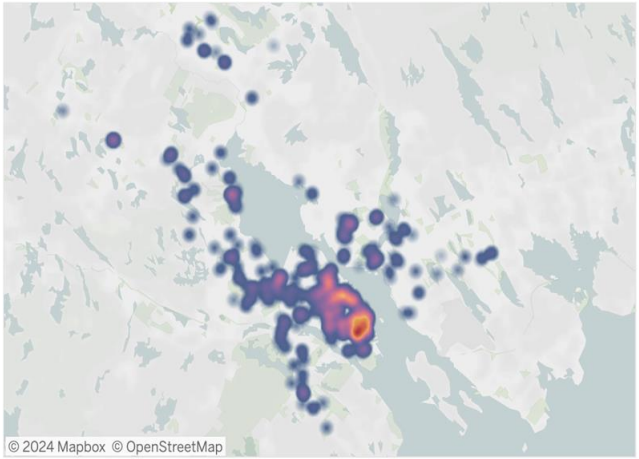
Heat Map (Rent/sqft)



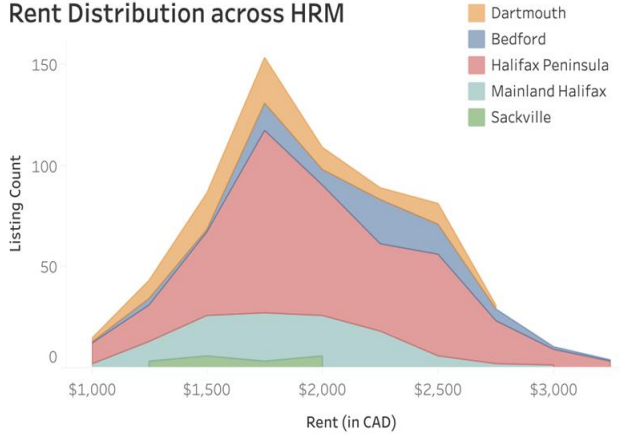
Total Listings
621

Average Square Feet
872.7 Sq Ft

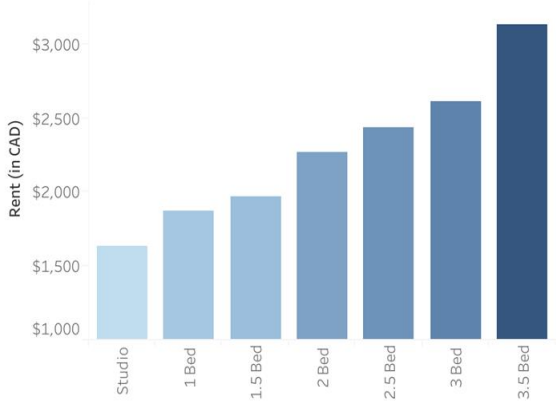
Average Rent Per Bedroom
$ 2,078

Minor Region
- [x] (All)
- [x] Armdale
- [x] Bedford Basin
- [x] Burnside
- [x] Clayton Park
- [x] Cole Harbour
- [x] Dartmouth Downto...
- [x] Downtown
- [x] Hammonds Plains
- [x] Lower Sackville
- [x] NorthEnd
- [x] SouthEnd
- [x] Spryfield
- [x] WestEnd
- [x] Wooside

Rent Distribution across HRM



Average Rent Per Bedroom



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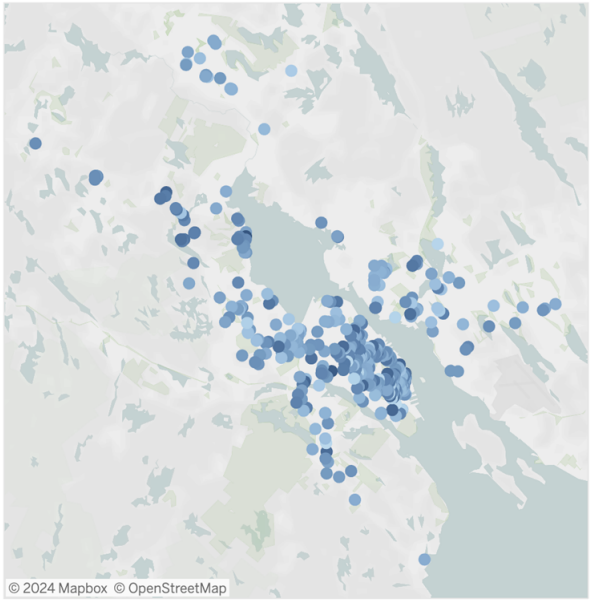
Available Listings



Total Listings	
621	
Average Rent	Average Square Feet
$ 2,078	872.7 Sq Ft
Average Bedroom	Average Bathroom
1.551	1.22
Average Parking Cost	
$ 117.1	
Paid Parking Count	Free Parking Count
413	208

Number of Bedrooms
- ☑ (All)
- ☑ 1 Bed
- ☑ 1.5 Bed
- ☑ 2 Bed
- ☑ 2.5 Bed
- ☑ 3 Bed
- ☑ 3.5 Bed
- ☑ Studio

Number of Bathrooms
- ☑ (All)
- ☑ 1.00
- ☑ 1.50
- ☑ 2.00
- ☑ 2.50

Water Dimension
- ☑ (All)
- ☑ Available
- ☑ Not Available

Heat Dimension
- ☑ (All)
- ☑ Available
- ☑ Not Available

Parking Type
- ☑ (All)
- ☑ Free Parking
- ☑ Paid Parking - With Cost
- ☑ Paid Parking - Without Cost

Electricity Dimension
- ☑ (All)
- ☑ Available
- ☑ Not Available

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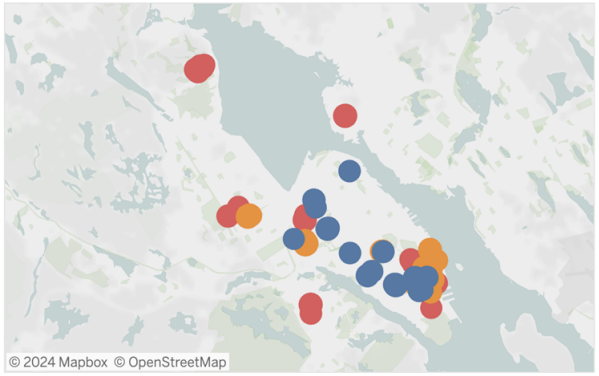
Property Management Listing



Average Rent	Rental Increment Per Year
$ 1,900	6.88 %

Total Properties
76

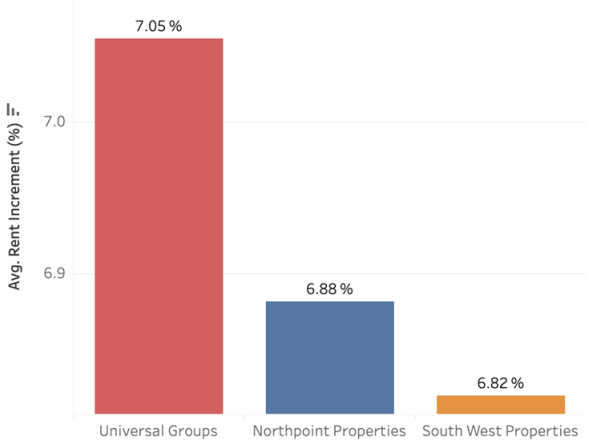
Rental Increment

2022	4.77 %
2023	12.89 %
2024	9.94 %

Rental Increment by Region

Major Region	Minor Region	
Bedford	Bedford Basin	7.14 %
Dartmouth	Burnside	6.55 %
Halifax Peninsula	NorthEnd	7.08 %
	Downtown	7.03 %
	WestEnd	6.88 %
	SouthEnd	6.85 %
Mainland Halifax	Armdale	7.48 %
	Clayton Park	6.79 %

Yearly Rental Increment



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Upcoming Projects Dashboard

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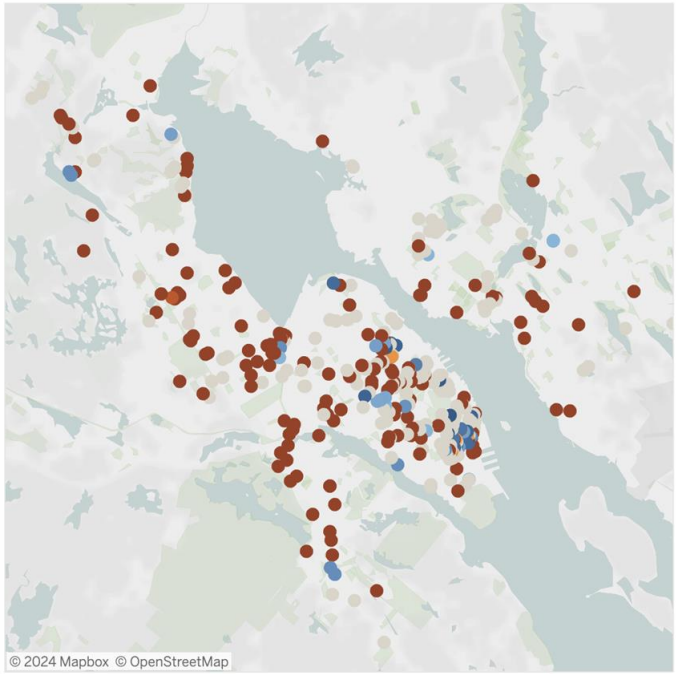
Free Parking Count in HRM	Paid Parking Count in HRM	Average Parking Cost
208	413	$ 117.1

Spatial Distribution of Parking Costs in HRM



Parking Cost

$ 0 — $ 180

Average Parking Cost (in CAD)

Major Region	Minor Region	
Bedford	Hammonds Plains	$100.00
	Bedford Basin	$87.50
Dartmouth	Burnside	$50.00
	Dartmouth Downtown	$50.00
	Cole Harbour	$25.00
Halifax Peninsula	Downtown	$150.83
	NorthEnd	$140.63
	SouthEnd	$133.00
	WestEnd	$79.17
Mainland Halifax	Spryfield	$100.00
	Clayton Park	$99.00

Parking Type

- [x] (All)
- [x] Free Parking
- [x] Paid Parking - With Cost
- [x] Paid Parking - Without Cost

Overview Dashboard

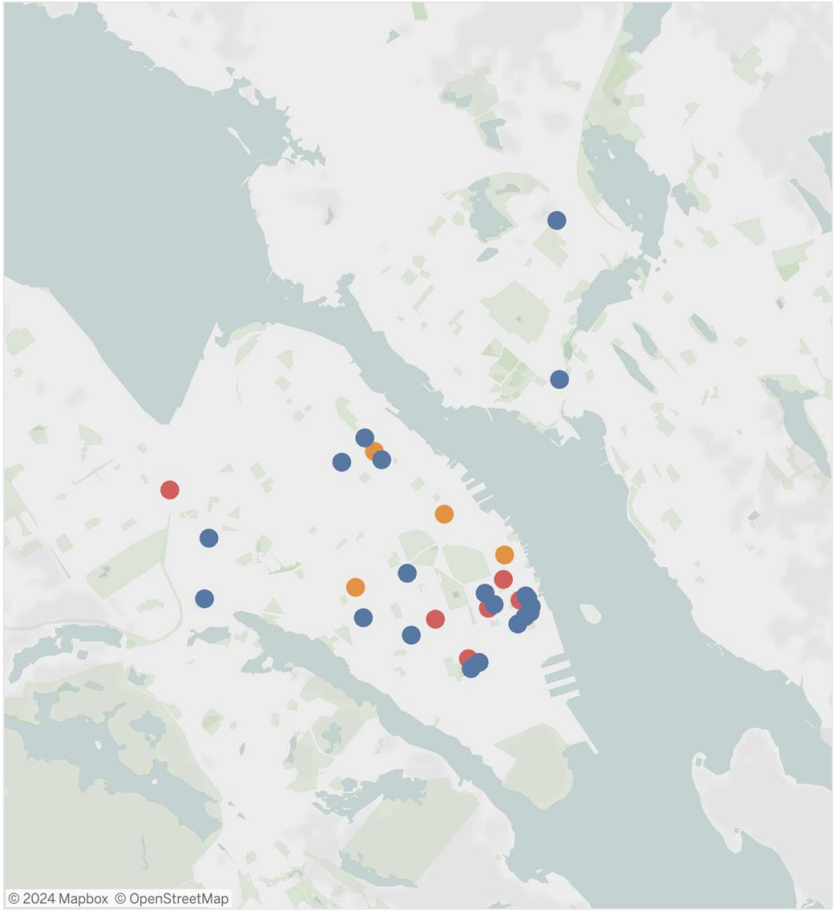
Listings Dashboard

Competitor Analysis Dashboard

Parking Dashboard

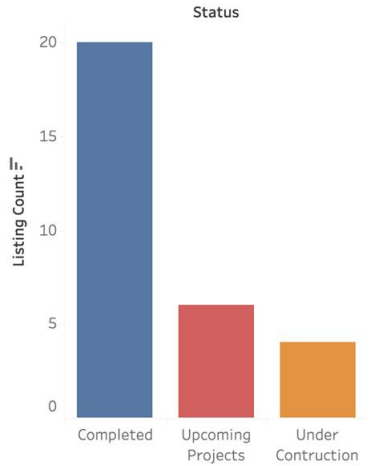
Upcoming Projects Dashboard

Builder Dashboard



Total Properties
30

Total Builders
5



Builder
- [x] (All)
- [x] Banc Group
- [x] Dexel
- [x] Principal Developments
- [x] Urban Capital
- [x] Werkliv

Rent Forecasting

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2064

Amount of Listing Data Analyzed and used for this project.

MODEL FEATURES

LOCATION	listingMajorRegion, listingMinorRegion, listingLatitude, listingLongitude
PROPERTIES	listingType, listingPropertyType, listingSizeSquareFeet, bedroomCount, bathroomCount
UTILITIES	heatUtility, waterUtility, hydroUtility, furnishedUtility
AMENITIES	gymAmenity, parkingAmenity, acAmenity, applianceAmenity, storageAmenity
POLICIES	petPolicy, smokingPolicy
ACCESSIBILITY SCORES	transitScore, walkScore, bikeScore, crimeScore,retailGroceryScore,retailRecreationScore, educationCenterScore, emergencyCenterScore
TARGET VARIABLE	listingRent

Various Algorithms Trained

```
Ridge Regression Performance:
  MAE: 261.68
  MSE: 131643.69
  RMSE: 362.83
  R2: 0.62
  Median AE: 189.76
  MSLE: 0.03
  Explained Variance: 0.62


Random Forest Regressor Performance:
  MAE: 207.90
  MSE: 100134.80
  RMSE: 316.44
  R2: 0.71
  Median AE: 124.48
  MSLE: 0.02
  Explained Variance: 0.71
```

```
LightGBM Regressor Performance:
  MAE: 223.60
  MSE: 99608.47
  RMSE: 315.61
  R2: 0.71
  Median AE: 154.93
  MSLE: 0.02
  Explained Variance: 0.71


ElasticNet Performance:
  MAE: 273.31
  MSE: 149343.56
  RMSE: 386.45
  R2: 0.57
  Median AE: 199.00
  MSLE: 0.03
  Explained Variance: 0.57
```

```
K-Nearest Neighbors Regressor Performance:
  MAE: 279.23
  MSE: 163927.00
  RMSE: 404.88
  R2: 0.52
  Median AE: 204.20
  MSLE: 0.03
  Explained Variance: 0.54


Decision Tree Regressor Performance:
  MAE: 317.24
  MSE: 234026.44
  RMSE: 483.76
  R2: 0.32
  Median AE: 200.00
  MSLE: 0.05
  Explained Variance: 0.32
```

```
SVR Performance:
  MAE: 438.58
  MSE: 357113.76
  RMSE: 597.59
  R2: -0.04
  Median AE: 333.71
  MSLE: 0.07
  Explained Variance: 0.03
```

```
XGBoost Regressor Performance:
  MAE: 217.07
  MSE: 92612.40
  RMSE: 304.32
  R2: 0.73
  Median AE: 147.25
  MSLE: 0.02
  Explained Variance: 0.73
```

Based on XGBoost's MAE and R-Squared, XGBoost was used for further fine-tuning.

Fine-Tuned XGBoost Model

```python
# XGBoost Hyperparameters
xgb_params = {
    'n_estimators': [100, 200],
    'max_depth': [3, 5],
    'learning_rate': [0.01, 0.1],
    'subsample': [0.7, 0.9],
    'colsample_bytree': [0.7, 0.9],
    'min_child_weight': [2, 5],
    'gamma': [0.1, 0.2],
    'reg_alpha': [0.1, 1],
    'reg_lambda': [0.1, 0.01]
}
```

```
XGBoost Regressor Performance:
  MAE: 210.92
  MSE: 90085.77
  RMSE: 300.14
  R2: 0.74
  Median AE: 148.80
  MSLE: 0.02
  Explained Variance: 0.74
```

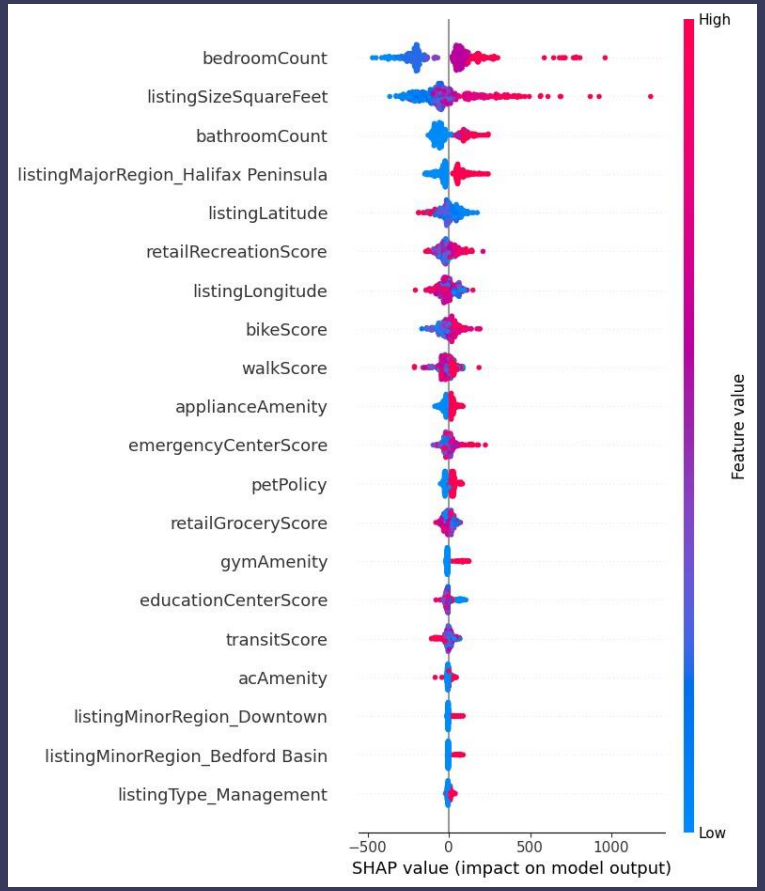
Fine-Tuned Model Trained on Augmented Data

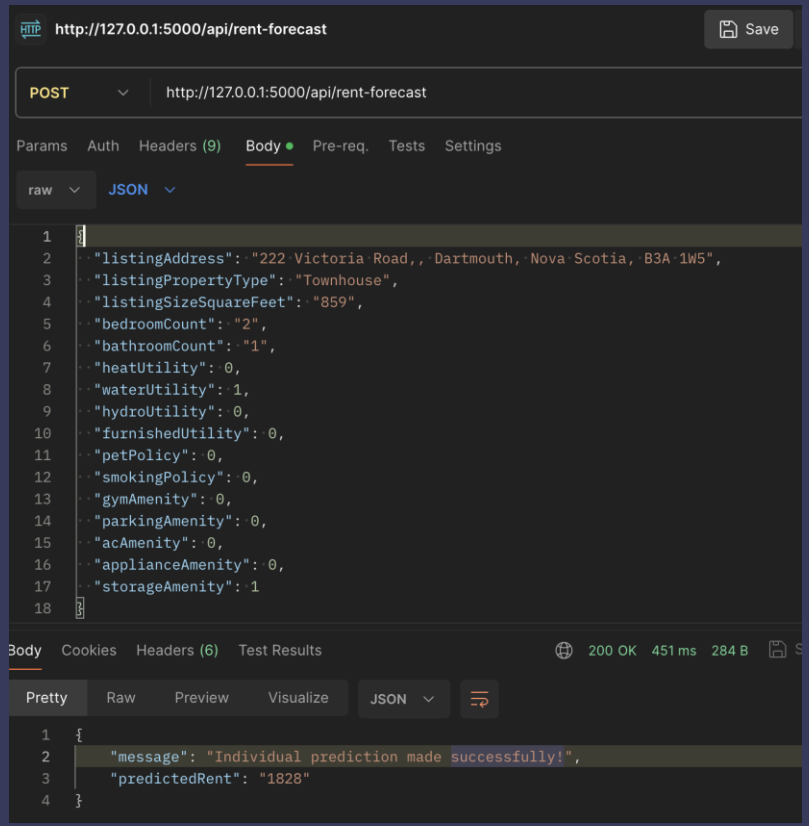
```
XGBoost Regressor Performance:
  MAE: 132.62
  MSE: 38380.04
  RMSE: 195.91
  R2: 0.88
  Median AE: 95.53
  MSLE: 0.01
  Explained Variance: 0.88
```

5-Fold Cross Validation

```
XGBoost Regressor:
Mean Absolute Error scores for each fold: [139.34423349 138.41209347 136.89206432 150.64019239 138.96458481]
Average Mean Absolute Error: 140.85 ± 4.97
Mean Squared Error scores for each fold: [41285.508286   42954.59923547 47330.90483814 68212.0966805
 50073.3868984 ]
Average Mean Squared Error: 49971.30 ± 9637.28
R2 scores for each fold: [0.86780404 0.84721008 0.8507167  0.81432251 0.78850096]
Average R2: 0.83 ± 0.03
Root Mean Squared Error scores for each fold: [203.18835667 207.25491366 217.55667041 261.17445641 223.77083567]
Average Root Mean Squared Error: 222.59 ± 20.63
Median Absolute Error scores for each fold: [92.71362305 96.76721191 83.60803223 95.60546875 88.05688477]
Average Median Absolute Error: 91.35 ± 4.90
Mean Squared Log Error scores for each fold: [0.00969361 0.00921798 0.01002169 0.01363632 0.01389408]
Average Mean Squared Log Error: 0.01 ± 0.00
Explained Variance scores for each fold: [0.86862951 0.8490277  0.85129718 0.81434309 0.79369453]
Average Explained Variance: 0.84 ± 0.03
```

Model SHAPELY Interpretations





Rental Forecasting Prediction Results

UPCOMING PROJECTS ALERT

UPCOMING PROJECTS ALERT

Each day, the business receives an alert containing detailed information about the upcoming projects from various builders.

MAIL ALERTS

Builder Alert - New Property Available

sameer.patel201999@gmail.com
to me

Mon, Mar 25, 9:18 AM

Dexel

Spring Garden West	Spring Garden Rd.	Halifax, Nova Scotia
Barrington St. Project	1333,1343,1351 Barrington St.	Halifax, Nova Scotia
1585 Grafton St	Halifax, Nova Scotia	
MITCHELL	Halifax, Nova Scotia	

Urban Capital

North Central, Halifax. | 169 unit residential building with ground floor retail. | architectsAlliance, Toronto, and MNA Architects, Halifax. | Marco Group Limited.
North End, Halifax. | 72 unit boutique residential building with ground floor retail. | Breakhouse and MNA Architects, Halifax. | Marco Group Limited.

Banc Group

Margaretta Suits | Spring Garden Road
The Interchange | 3514 Joseph Howe Drive
Lock Suites | Wellington Street, SouthEnd, Halifax

Werkliv

Le Mildore | 2025 Peel St, Montreal, QC
Lambe's Lane | 6 Lambe's Lane, St-Johns, NL
Terrasse des Récollets | 1140, Boulevard des Récollets Trois-Rivières, QC

In-House APIs

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In-House APIs

Walk Score

Scores based on the number of necessities within walking distance

Bike Score

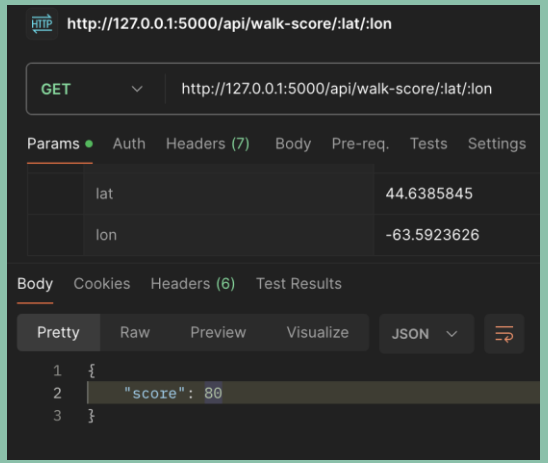
Scores based on the number of necessities within biking distance

Transit Score

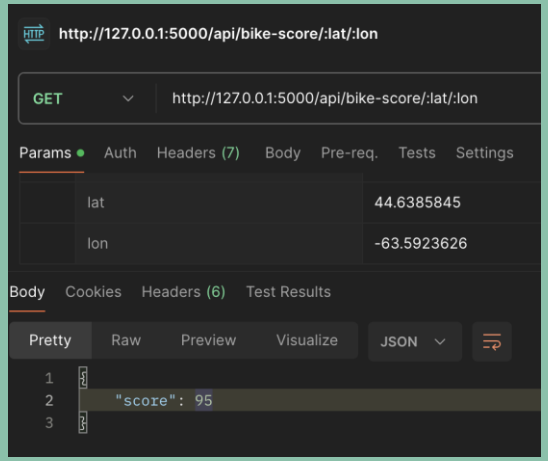
Scores based on the number of bus stops within walking distance

In-House APIs

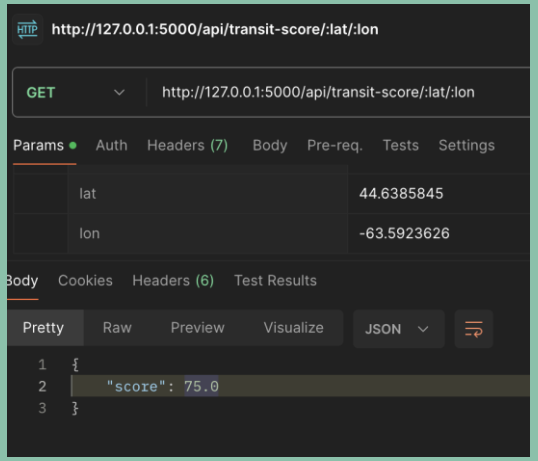
Walk Score



Bike Score



Transit Score



DEMO TIME!

Let’s talk Tech!

TECH STACK

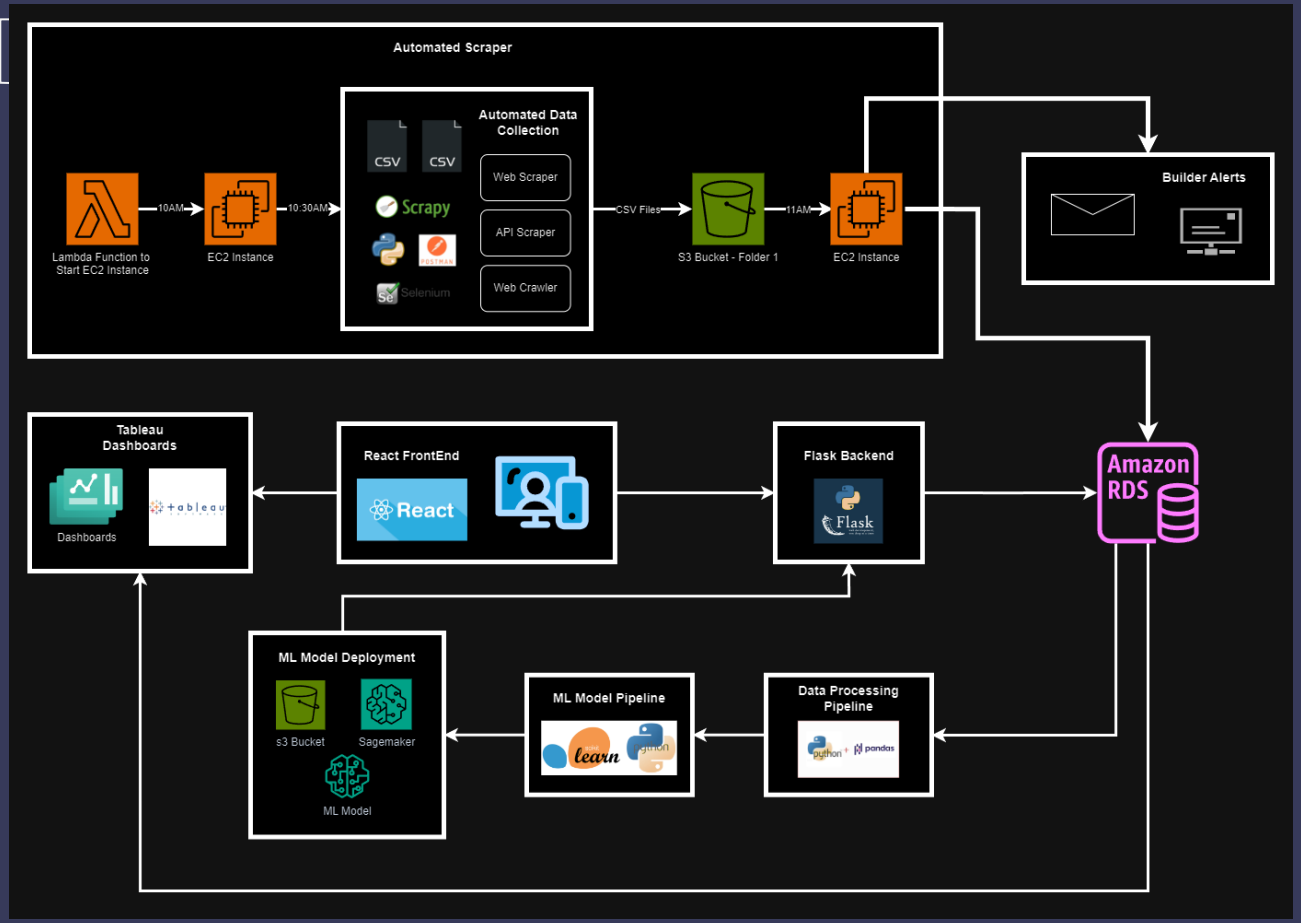
FrontEnd:
- ReactJS

BackEnd:
- Python
- Flask

ML/AI Infra:
- Pandas
- SkLearn

Cloud Infra:
- AWS Cloud

Dashboard:
- Tableau



FIN.