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Panel #139

Calgary, April 30<sup>rd</sup>, 2024

# Studies and Datasets

Final Project in a Class (Data 604 in Winter 2021) of Data Science and Analytics of UofC:


“Calgary Property assessment truths and myths based on Analysis of Residential Property Assessment in 2019” – Ref. 6

Main Goal: Does the property assessment per Sqf differ among Calgary communities and Calgary zones?

If so, Can this be explained by the differences of some factors (e.g. communities with more schools, and/or commercial services nearby)? How does this differ (normalized by some of the factors)?

## Datasets Used:

- Calgary Assessed Property Value (2019, 2023) - Ref. 1
- Census by Community Dataset (2019 , ..... ) – Ref. 5
- Community Services (2019, 2023) – Ref. 2



calgary.ca/info-requests/civic-census.html

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## Civic Census

The Civic Census is an official count of dwelling units and the population who are living in these units, by the door to door physical collection and recording of data.

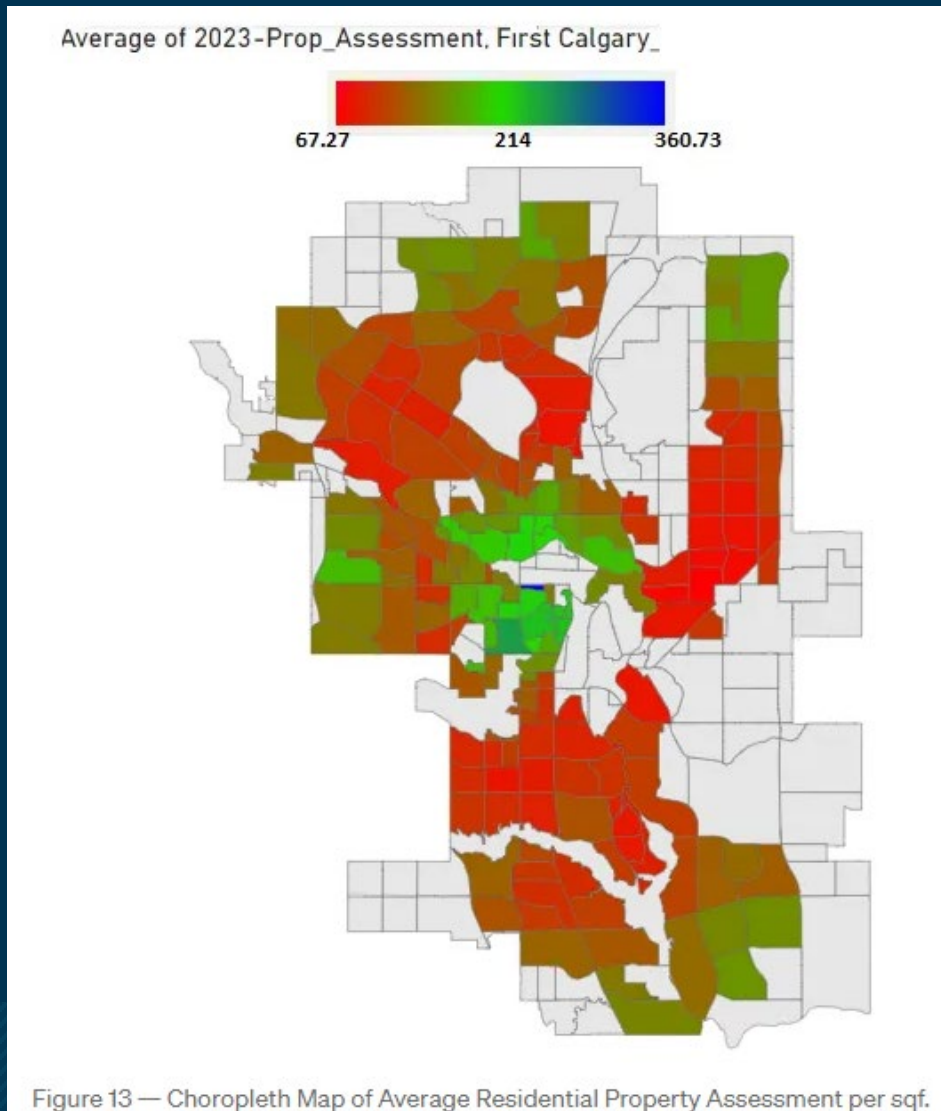
The City of Calgary previously conducted a census. The census gathered:

- a count of dwelling units,
- population, and
- other demographic information.

**Information | Civic Census discontinued**

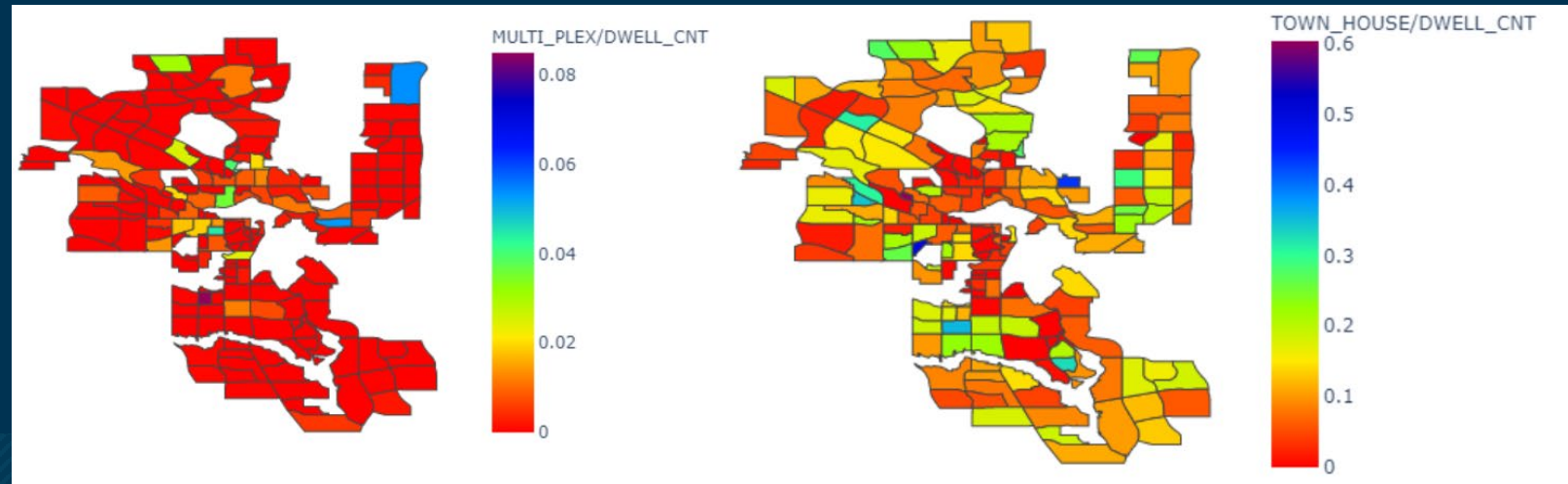
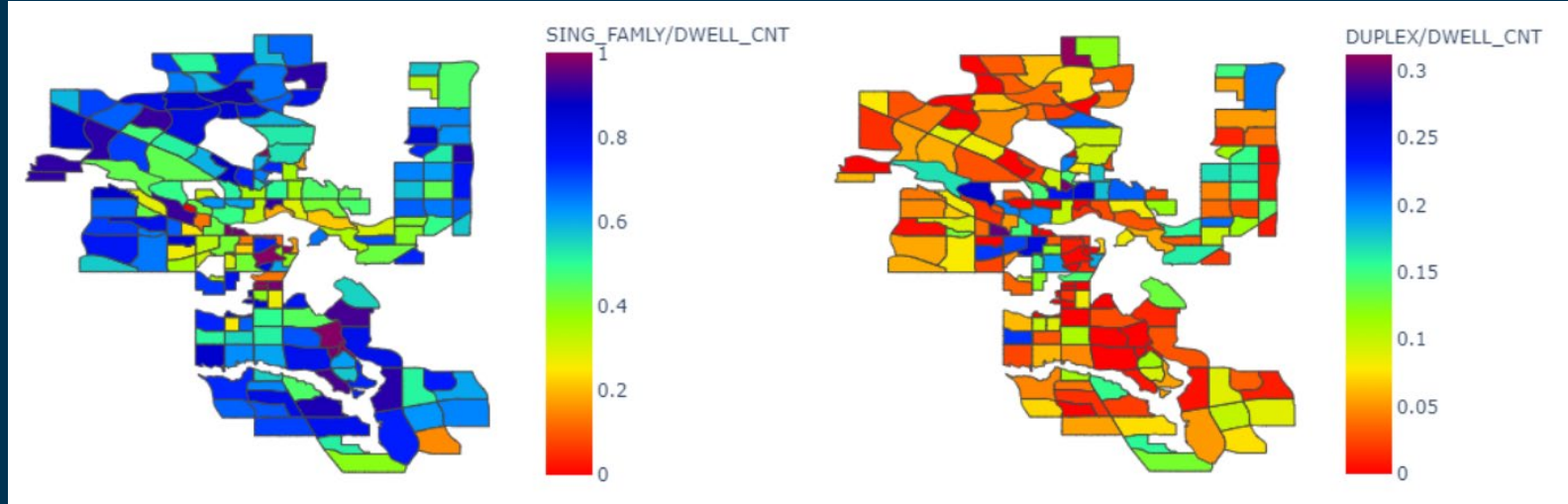
The Civic Census program has been discontinued. This was due to 2020 budget and the Solutions for Achieving Value and Excellence (SAVE) program.

# Analysis

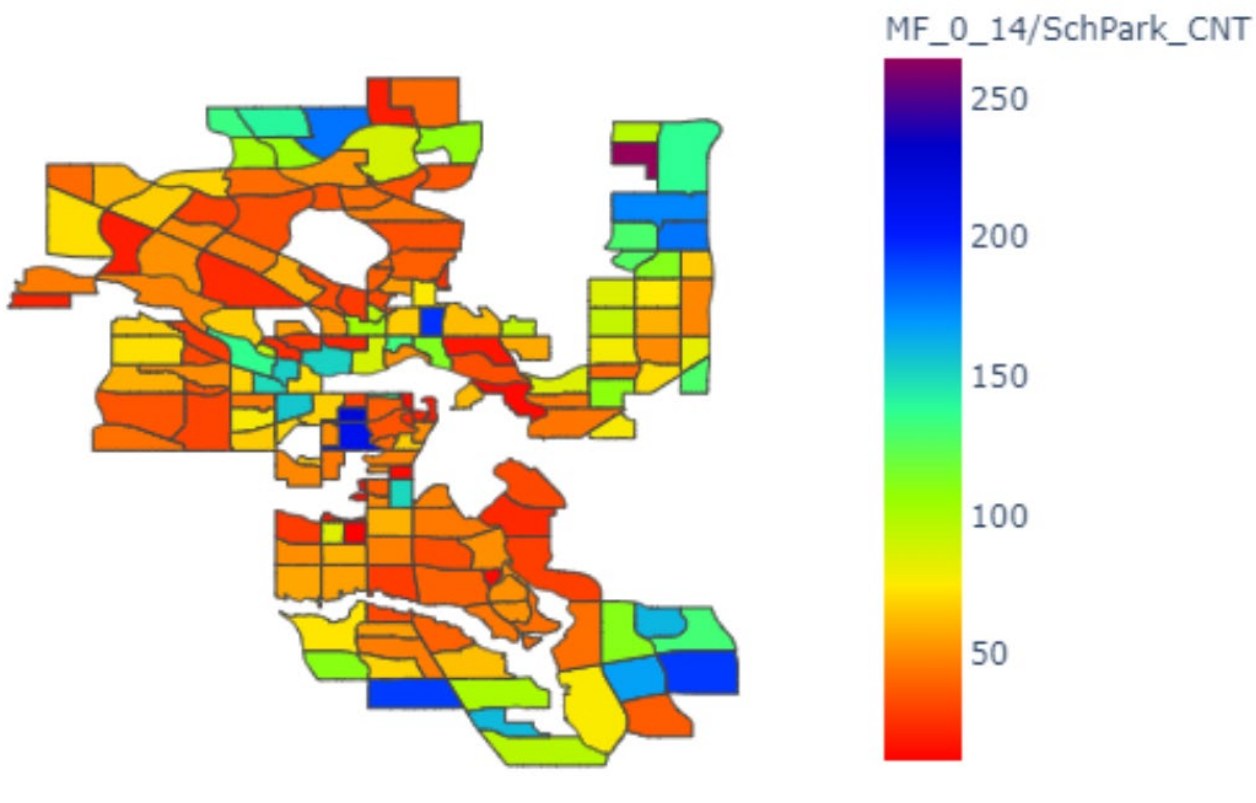


Calgary_Zones	Average of 2019-Prop_Assessment	Average of 2023-Prop_Assessment
SW-SE	104.10	120.62
SW	120.07	134.33
SE	98.17	118.54
NW-NE	96.59	105.59
NW	112.76	133.40
NE-SE	97.07	111.93
NE	92.83	114.07
<b>Total</b>	<b>106.37</b>	<b>124.91</b>

# Analysis



# Analysis



**Table 13 – Top 20 communities with the highest number of schools/recreation area.**

	Calgary_Zones	COMM_NAME	MF_0_14	SchPark_CNT	avg(RES_ASSESSED_VALUE_per_LAND_SIZE_SF)	MF_0_14/SchPark_CNT
0	NW	PANORAMA HILLS	5885	67	118.043944	87.8358
1	NE	SADDLE RIDGE	5385	31	116.615947	173.7097
2	SE	AUBURN BAY	5170	31	132.107110	166.7742
3	NW	TUSCANY	5112	71	118.853515	72.0000
4	SE	CRANSTON	5026	66	116.379874	76.1515
5	NW	EVANSTON	5001	28	118.918950	178.6071
6	SW	EVERGREEN	4718	64	115.084181	73.7188
7	NE	TARADALE	4627	26	110.437886	177.9615
8	NE	COVENTRY HILLS	4319	40	98.276114	107.9750
9	SE	MCKENZIE TOWNE	4108	37	111.301378	111.0270
10	SE	NEW BRIGHTON	3695	23	117.948335	160.6522
11	SE	COPPERFIELD	3674	28	110.108323	131.2143
12	SE	MAHOGANY	3479	18	123.599494	193.2778
13	SW	WEST SPRINGS	3110	43	141.795180	72.3256
14	SW	BRIDLEWOOD	2972	27	106.316567	110.0741
15	NE	MARTINDALE	2970	23	101.054772	129.1304
16	SE	CHAPARRAL	2908	29	109.112882	100.2759
17	NE	SKYVIEW RANCH	2641	10	124.215145	264.1000
18	NW	ROYAL OAK	2631	43	113.878125	61.1860
19	NE	FALCONRIDGE	2566	23	77.904144	111.5652



# The Most Important Parameters that Influences in P.A.

- Mult. Linear Regression

- Simple Correlation

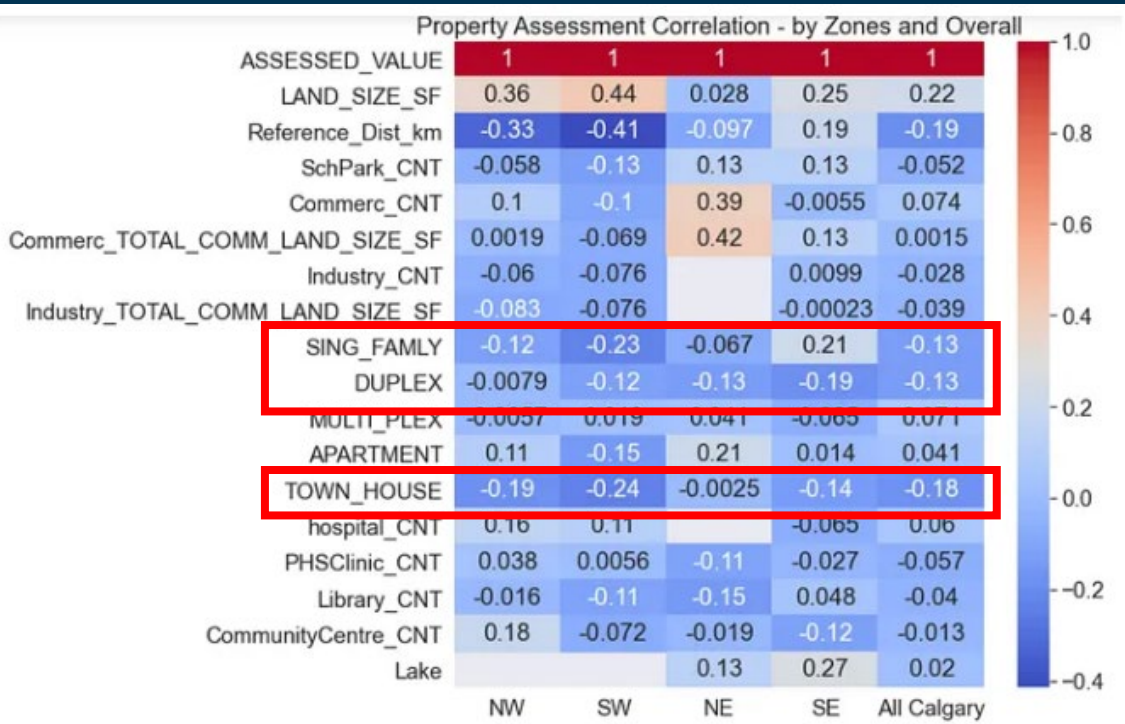


Figure 14 — Heat Map of Correlation of the selected independent variables with Property Assessment — overall and for each major Calgary zone.

## 6.2. SW

OLS Regression Results

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Dep. Variable:   ASSESSED_VALUE   R-squared:       0.425
Model:          OLS               Adj. R-squared:  0.425
Method:         Least Squares     F-statistic:     4003.
Date:           Wed, 28 Jun 2023   Prob (F-statistic): 0.00
Time:           17:37:44          Log-Likelihood:  -9.8283e+05
No. Observations: 70308          AIC:             1.966e+06
Df Residuals:   70294           BIC:             1.966e+06
Df Model:       13
Covariance Type: nonrobust
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	coef	std err	t	P> t	[0.025	0.975]
const	9.746e+05	5526.170	176.360	0.000	9.64e+05	9.85e+05
LAND_SIZE_SF	49.2687	0.424	116.186	0.000	48.438	50.100
Reference_Dist_km	-4.631e+04	356.602	-129.868	0.000	-4.7e+04	-4.56e+04
SchPark_CNT	1874.5754	83.976	22.323	0.000	1709.983	2039.168
Commerc_CNT	4479.4782	127.773	35.058	0.000	4229.044	4729.912
Commerc_TOTAL_COMM_LAND_SIZE_SF	-0.0105	0.001	-13.408	0.000	-0.012	-0.009
Industry_CNT	-4.157e-06	1.59e-07	-26.139	0.000	-4.47e-06	-3.85e-06
Industry_TOTAL_COMM_LAND_SIZE_SF	-0.2269	0.009	-26.275	0.000	-0.244	-0.210
DUPLEX	-236.4815	7.330	-32.263	0.000	-250.848	-222.115
APARTMENT	-88.5615	3.408	-25.983	0.000	-95.242	-81.881
TOWN_HOUSE	-187.9439	5.645	-33.294	0.000	-199.008	-176.880
hospital_CNT	3.757e+05	2.96e+04	12.690	0.000	3.18e+05	4.34e+05
PHSClinic_CNT	-4.961e+04	1.49e+04	-3.334	0.001	-7.88e+04	-2.04e+04
Library_CNT	-8.832e+04	4727.807	-18.681	0.000	-9.76e+04	-7.91e+04
CommunityCentre_CNT	-1.569e+05	2757.666	-56.912	0.000	-1.62e+05	-1.52e+05
Lake	0	0	nan	nan	0	0

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Omnibus:          57500.675   Durbin-Watson:    0.783
Prob(Omnibus):    0.000   Jarque-Bera (JB): 4642646.555
Skew:             3.426   Prob(JB):         0.00
Kurtosis:         42.215   Cond. No.         inf
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Figure 17— Multiple Linear Regression model obtained with SW data points only.

# The Most Important Parameters that Influences in P.A.

- Machine Learning Model

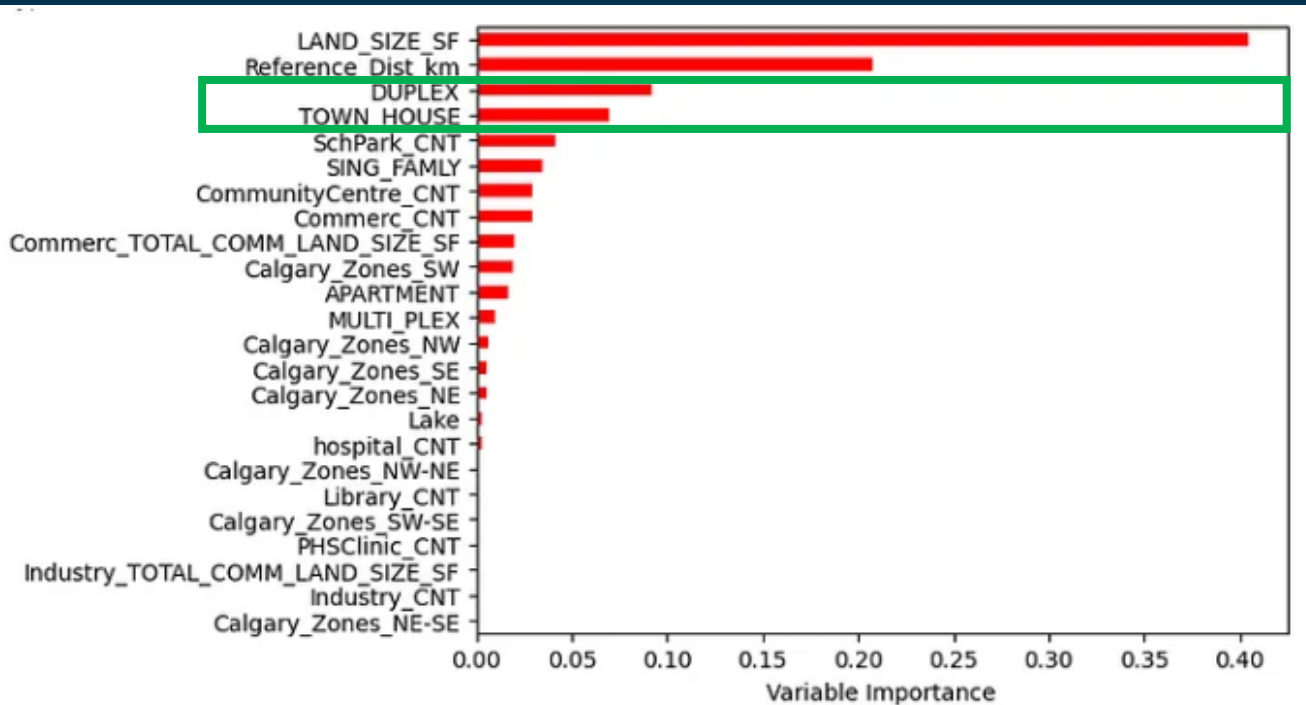


Figure 8. Importance of each Explanatory Variable in Residential Property Assessment in the fitted Gradient Boosting Regressor model with 260 estimators.

	ML_Model	MSE_tr	MSE_te	R2squared_tr	R2squared_te
0	LINEAR REGRESSION	6.237740e+10	6.464046e+10	0.198194	0.195555
1	REGRESSION TREE (Depth = 12)	2.100164e+10	3.124696e+10	0.730043	0.611134
2	GRADIENT BOOSTING REGRESSOR (n = 260)	1.566787e+10	2.493109e+10	0.798604	0.689735
3	RANDOM FOREST REGRESSOR (n = 70)	2.948478e+10	3.197641e+10	0.620999	0.602056
4	BAGGING REGRESSOR (n = 150)	3.413390e+09	2.502695e+10	0.956124	0.688542
5	KNN: k = 39, kd_tree, distance	3.413390e+09	2.696255e+10	0.956124	0.664453
6	XgBoost	1.999481e+10	2.558813e+10	0.742984	0.681558

Table 6. Summary of all ML models to predict 2023 Calgary residential Property Assessment.

# Summary

➤ I do not support this rezoning plan, while you show me:

- The current infrastructure (schools, public transportation, water supply) can support this and the city guarantee the maintenance of them. It is necessary to have updated data to evaluate this.
- The developers and planners provide the probabilities that the increment of houses will really be creating affordable houses.
- If there is a real mechanism that the affordable houses would really buy by the families who need them, instead of people/corporation that have already house and it would taken them to rent for prices like we have today.



# REFERENCES



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8. Nascimento, Carlos Evaluating the Performance of different ML Methods for Predicting 2023 Calgary Residential Property Assessment. Published on Medium on July 10, 2023. <https://medium.com/@carlosnascimentocalgary/evaluating-the-performance-of-different-ml-methods-for-predicting-2023-calgary-residential-property-33bdafd49375>