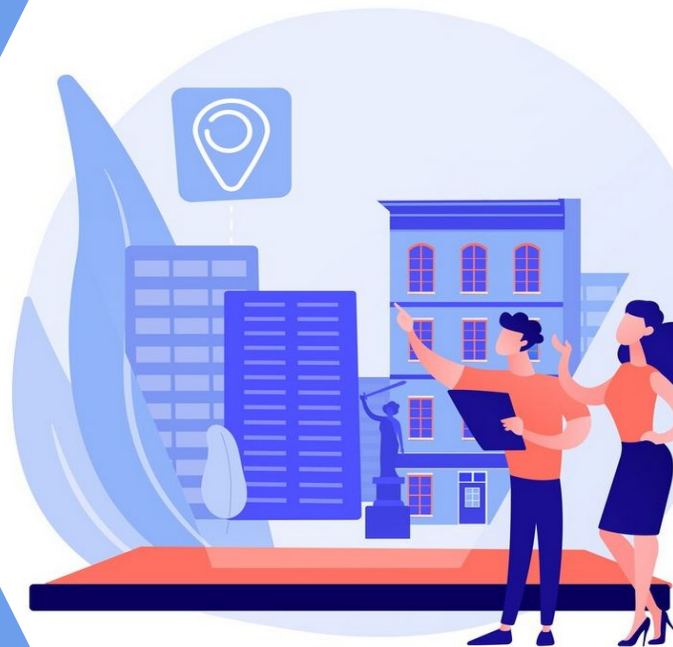


# ***Rotman***

## FutureBuild Insight: Consulting for RCondo Developer



Nov.28, 2023 Prepared by Team14

Lu Gan, Jeyaram Ganeshalingam, Junting(Tim) Liang, Yuwen Sheng, Yue(Erin) Yu



Rotman School of Management  
UNIVERSITY OF TORONTO

- **Background**
- **Business Case**
- **Feature Selection**
- **Clustering**
- **Prediction Models and result**

## **“Ontario removes provincial HST on some new rental builds”**

- Ontario removes provincial HST for new rental developments, effective November 1. [1]
- Applies to purpose-built rental housing like apartments, student housing, and senior residences meeting specific criteria.
- Applies to projects that begin construction between September 14, 2023, and December 31, 2030, and complete construction by December 31, 2035.
- Current New Residential Property Rebate is 75% of provincial HST (up to \$24,000); proposed rebate aims for 100%, with no maximum limit.

## **Business Objective:**

**Advising on optimal rental build locations and types for construction based on geographical income level**

- Incentivized by the subsidy to develop new condominium properties for rental purposes
- Requires demographic information to strategically plan and design properties



**The correlation matrix shows that the median household income has higher correlation with below attributes:**

"households built before 1961": **-0.38**

"households built between 1961 and 1980": **-0.36**

"house type households": **+0.44**

"apartment, building low/high rise type households": **-0.53**

"dwellings by tenure owner": **+0.36**

"dwellings by tenure renter": **-0.58**

**From this part we can roughly see the trends:**

- a CT with older households tends to have lower median income
- a CT with more apartment and building low/high rise type households tends to have lower median income
- a CT with many renters tends to have lower median income
- a CT with more house type households tends to have higher median income
- a CT with more owner dwellings tends to have higher median income

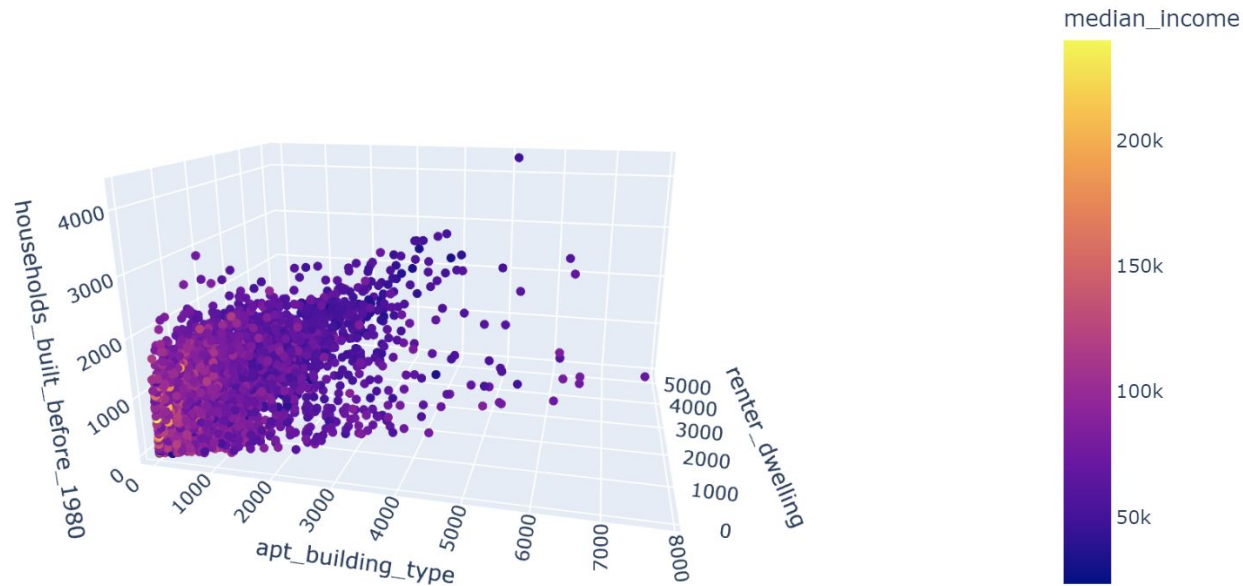
**Since the coefficient for households built before 1961 and between 1961 and 1980 are similar, we combine the two features together to "before 1980".**

**Selected Features:**

- **House Type**
- **Apartment Building Type**
- **Owner Dwelling**
- **Renter Dwelling**
- **Households Build Before 1980**
- **Median Income**

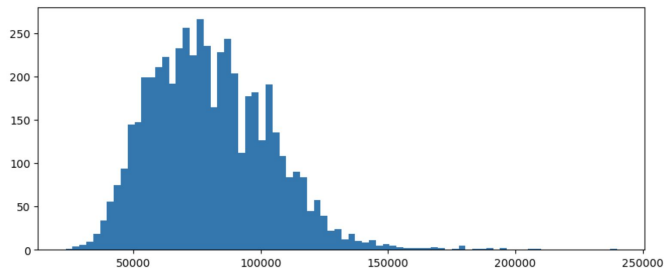
# Dataset plot

**Rotman**

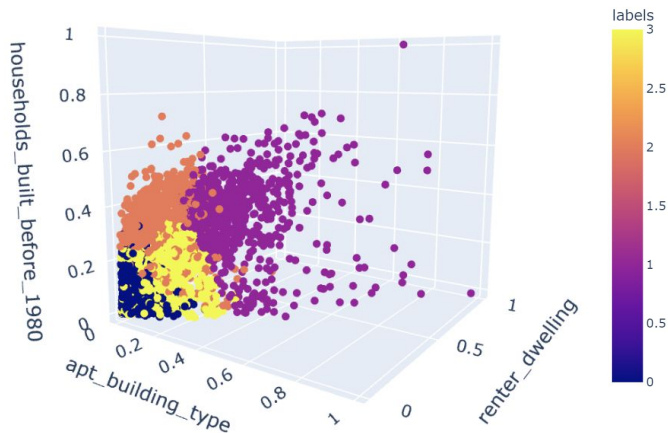
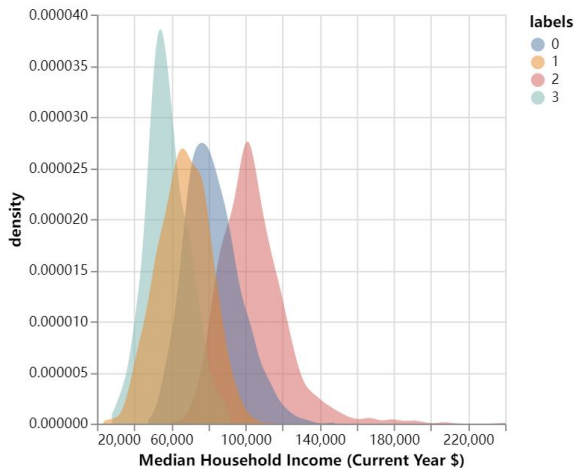


# Clustering Results

**Rotman**



Median Income Distribution



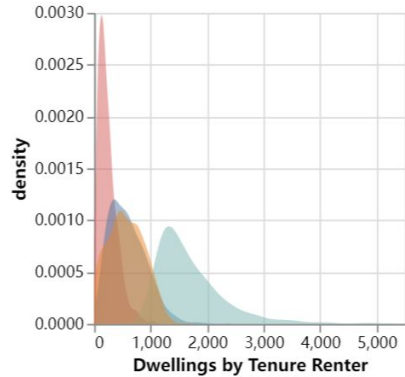
label	avg_median_income_scaled	avg_median_income
0	0.273237	82583.088870
1	0.200335	66792.616168
2	0.374678	104555.233990
3	0.158738	57782.716049

- KMeans Clustering
- K = 4

- **Clustering**  
**Median Income**  
**MSE: \$15,144**

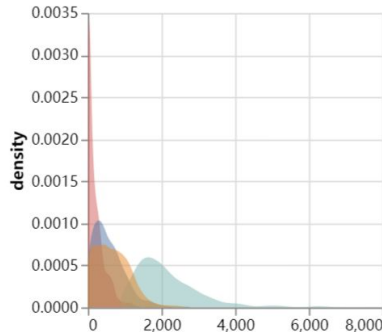
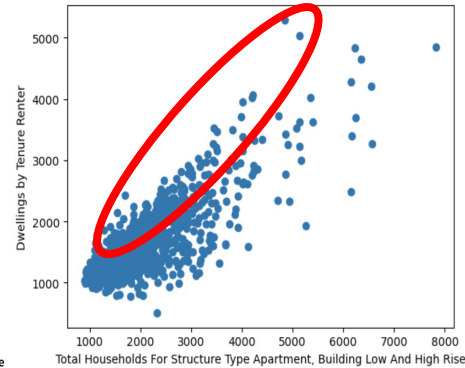
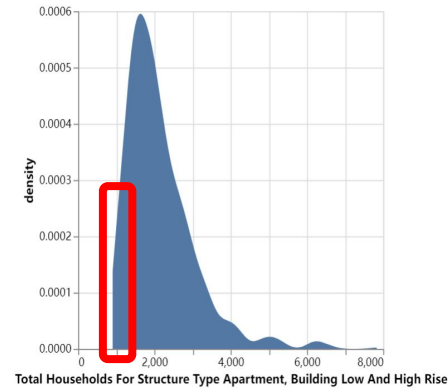
# Site Selection for Cluster 3

**Rotman**



Cluster 3 (green) has the highest number of renters.

- We suggest these CTs for RCondo new apartment site selection, since the demand could be high in these areas.



However the apartment supply in cluster 3 (green) is also high.

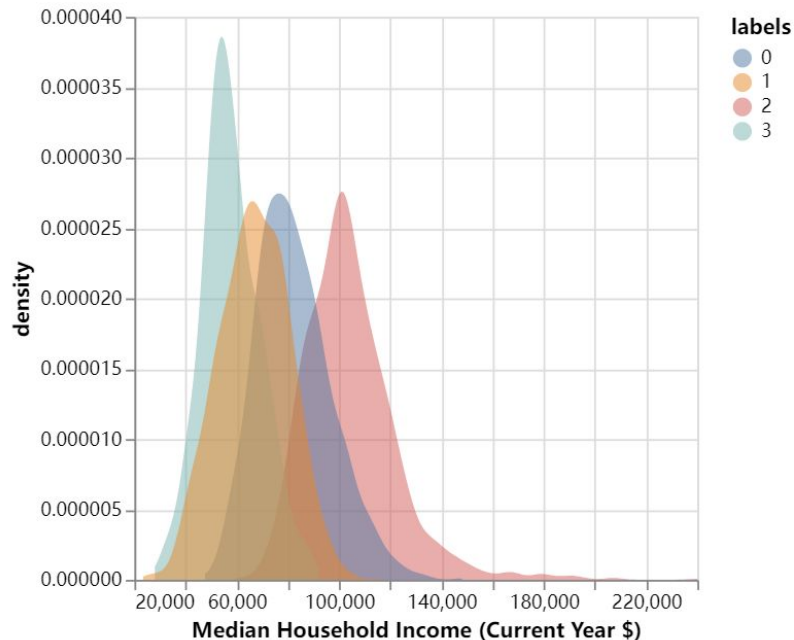
- We suggest to look for CTs that have less apartment building and more renters.

Total Households For Structure Type Apartment, Building Low And High Rise



# Type of Apartment for Cluster 3

**Rotman**



- **Cluster 3 (green) has the lowest median income, average \$57,780.**
- If RCondo choose to construct new apartment building in cluster 3 CTs, we suggest to build affordable units instead of high-end luxury ones.

# Prediction Models and Results

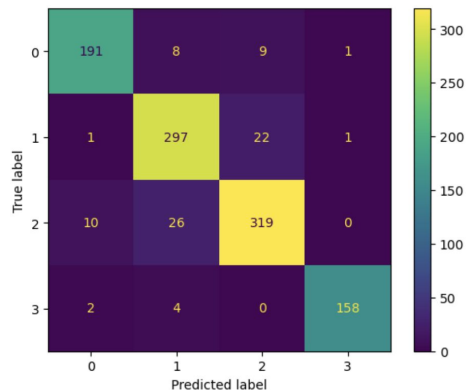
**Rotman**

Random Forest best prediction on testing set  
0.9199237368922784

	precision	recall	f1-score	support
0	0.94	0.91	0.92	209
1	0.89	0.93	0.91	321
2	0.91	0.90	0.90	355
3	0.99	0.96	0.98	164
accuracy			0.92	1049
macro avg	0.93	0.93	0.93	1049
weighted avg	0.92	0.92	0.92	1049

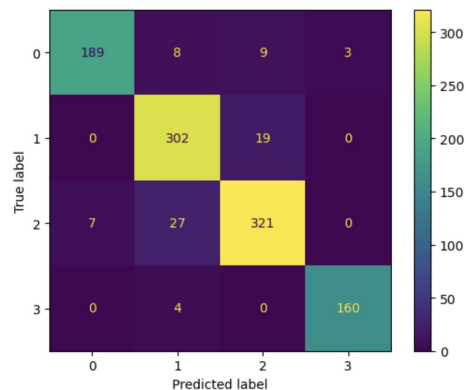
KNN best prediction on testing set  
0.9265967588179218

	precision	recall	f1-score	support
0	0.96	0.90	0.93	209
1	0.89	0.94	0.91	321
2	0.92	0.90	0.91	355
3	0.98	0.98	0.98	164
accuracy			0.93	1049
macro avg	0.94	0.93	0.93	1049
weighted avg	0.93	0.93	0.93	1049



**Prediction result is  
more accurate for  
cluster 0 and 3**

**Less accurate for  
cluster 1 and 2**



- Suggest suitable rental condo types and locations to RCondo Developer
- Selected 6 variables based on correlation level
- Applied K-means algorithm to cluster neighborhood average income ( $K = 4$ )
- Established prediction models (KNN & Random Forest Classifier)

## Suggestion:

- Focus on Cluster 3: largest renter population & average \$57780
- Construct Economically Affordable condos in Cluster 3 regions



*The view of 100 Merton Street building (affordable housing) [2]*

# ***Rotman***

## Thank you!

Team 14 Members:

- Lu Gan
- Jeyaram Ganeshalingam
- Junting(Tim) Liang
- Yuwen Sheng
- Yue(Erin) Yu

Here's  
where it  
changes.

- [1] Robitaille, E. (2023, November 9). *Ontario removes provincial HST on some new rental builds*. CIC News.  
<https://www.cicnews.com/2023/11/ontario-removes-provincial-hst-on-some-new-rental-builds-1141023.html#gs.1gknhd>
- [2] City of Toronto. (2023, March 23). *Subsidized housing listings*.  
<https://www.toronto.ca/community-people/employment-social-support/housing-support/rent-geared-to-income-subsidy/subsidized-housing-listings/#location=&lat=43.691708&lng=-79.372787>



# Q&A



