



EMORY  
COLLEGE  
OF ARTS AND  
SCIENCES

Department of Quantitative  
Theory and Methods

# Metro Atlanta Rental Housing Submarkets



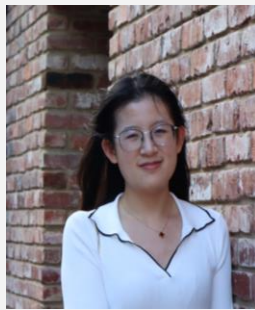
Microsoft



# MEET OUR TEAM



**Billy Ge**  
Quantitative Science &  
Economics



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Economics



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Computer Sciences



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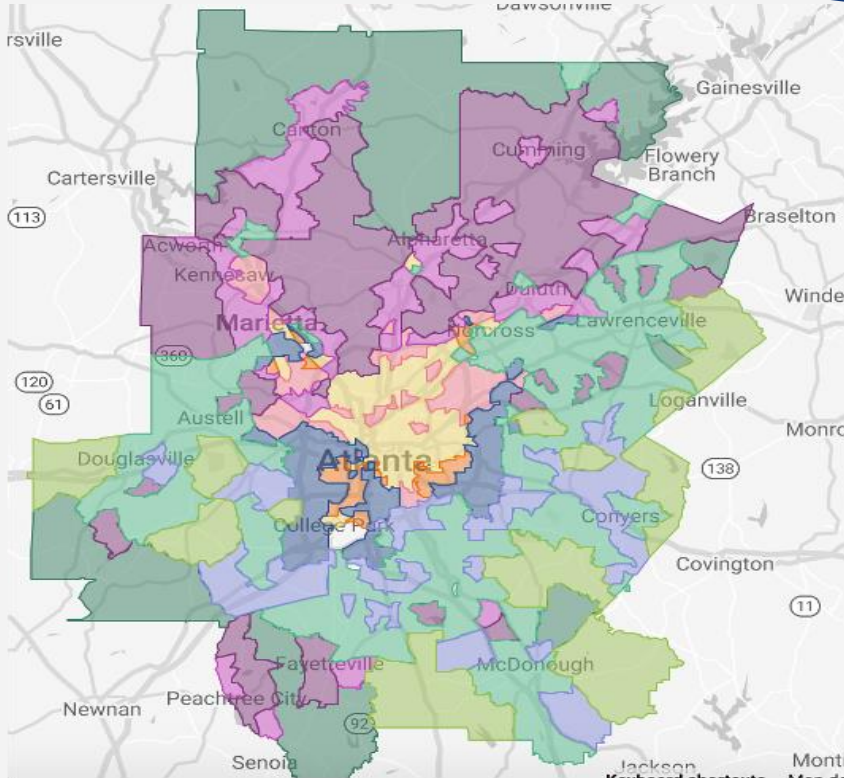
CONCLUSION



# Introduction



## MAIN QUESTION



## Submarkets of Rental Housing in Metro Atlanta

# METHODOLOGY

**Social  
Demographical  
Patterns**

**Similarity**

**Geographical  
Contiguity**

# **Social Demographic Landscape**



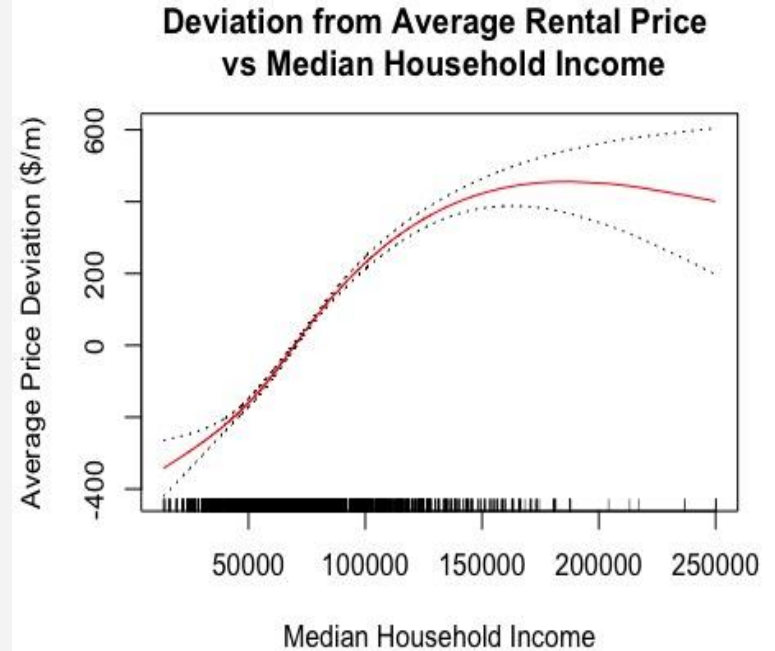
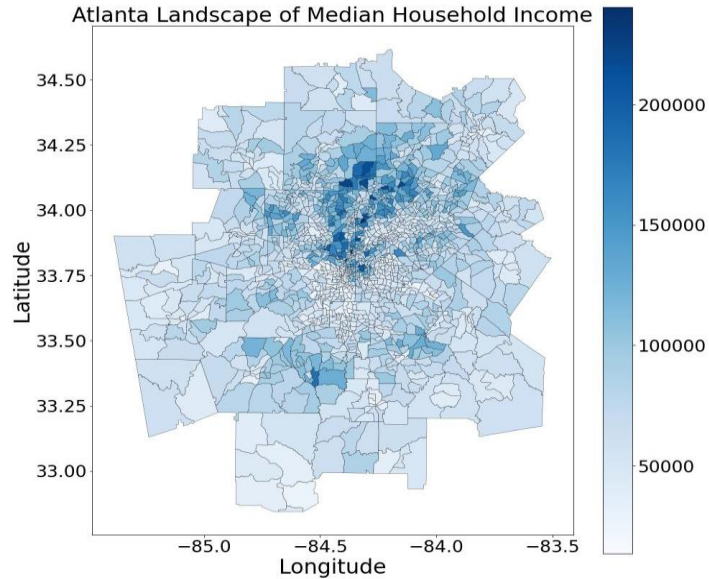


# Household Income

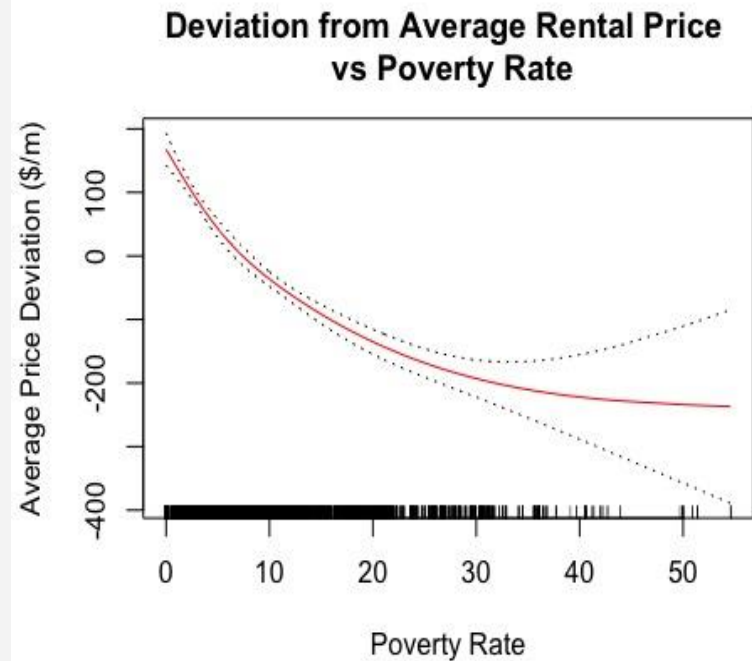
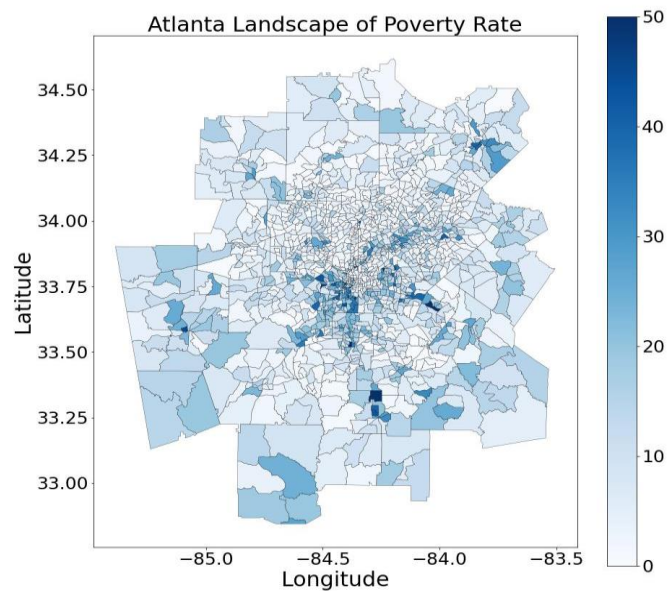
**Landscape  
map**

**Association  
with house  
rental price**

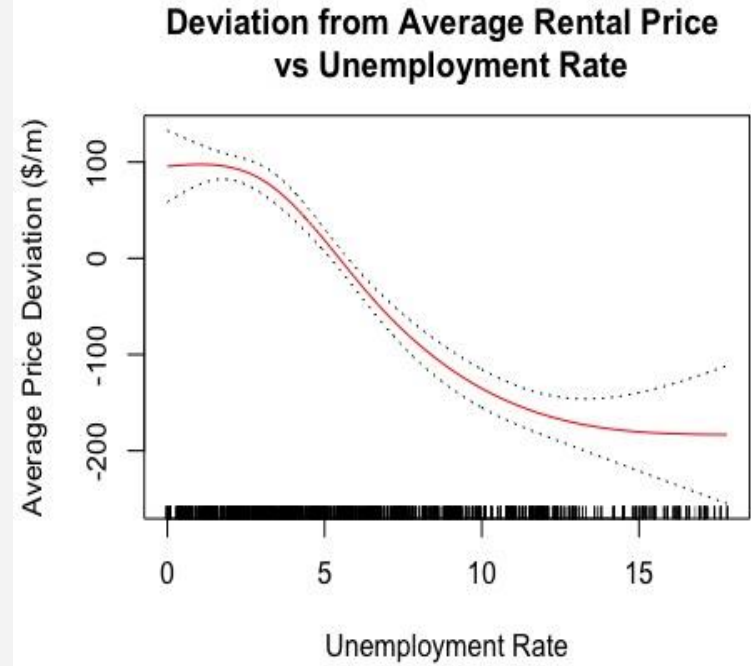
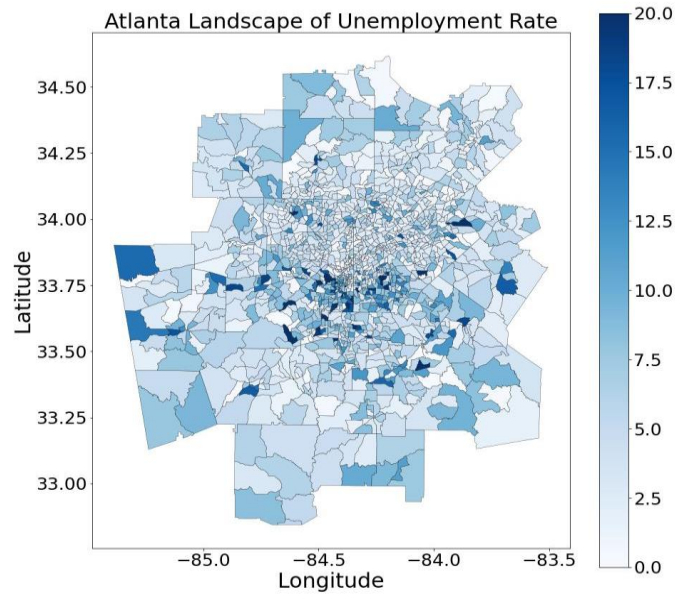
# MEDIAN HOUSEHOLD INCOME



# POVERTY RATE



# UNEMPLOYMENT RATE





# THINK QUESTIONS

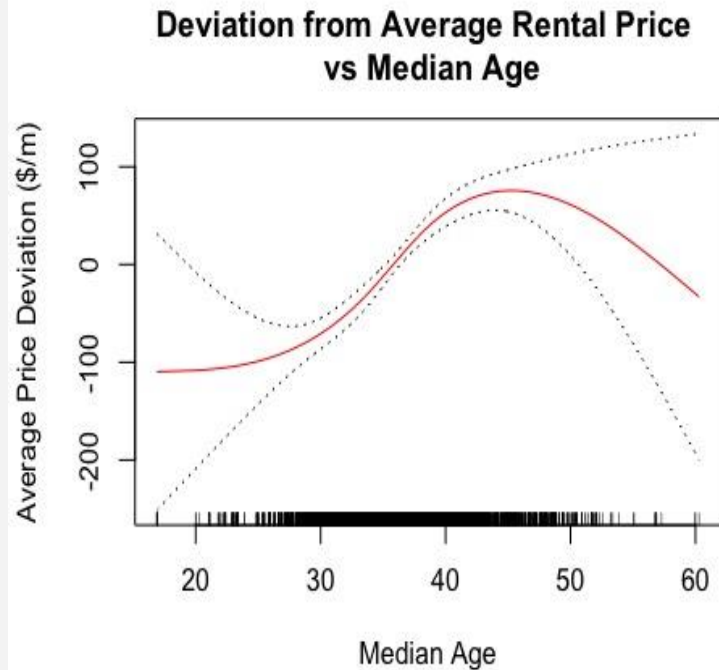
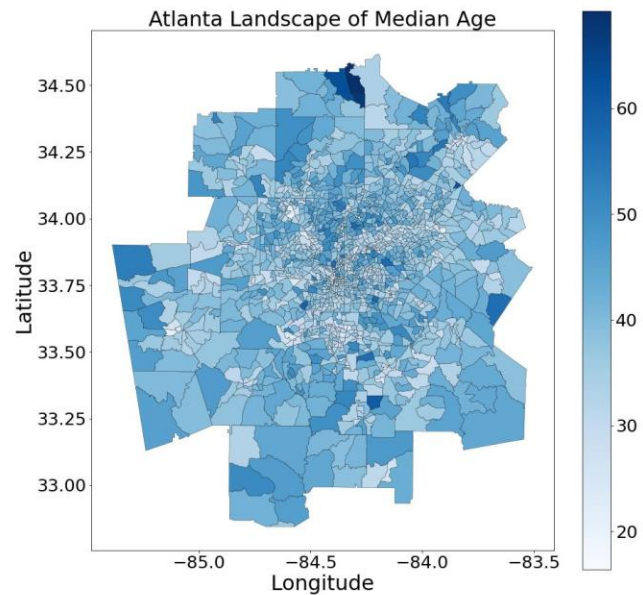


**Age**

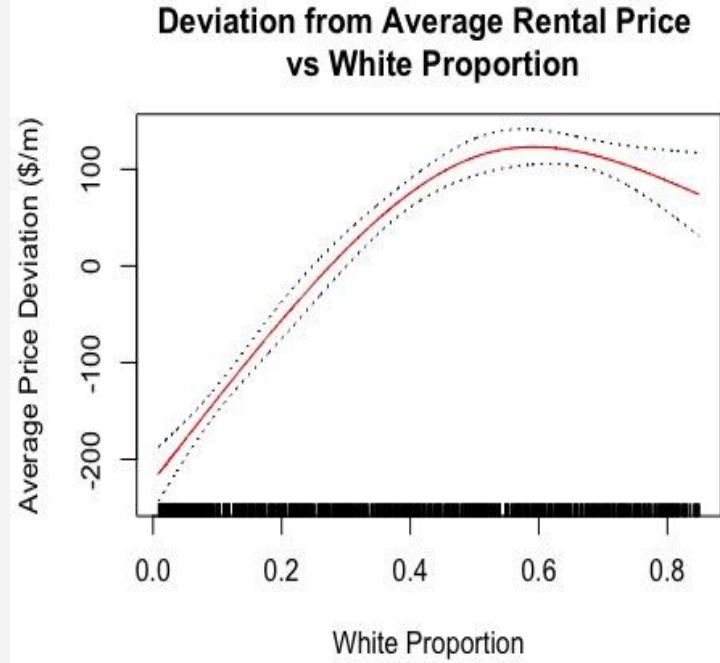
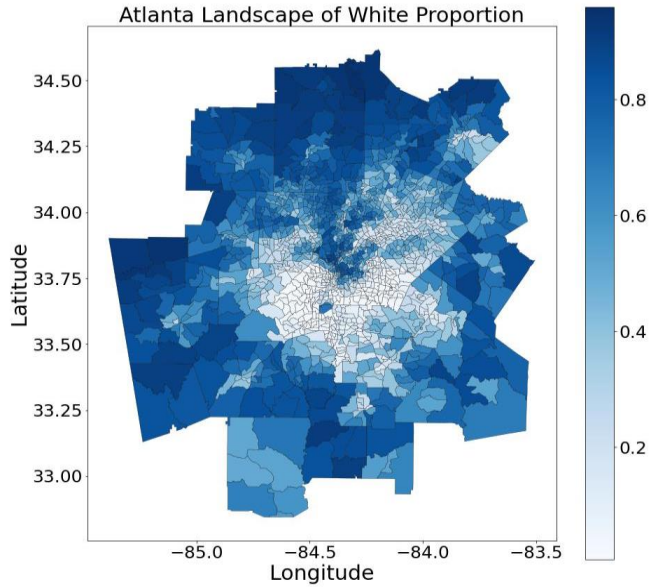


**Race**

# MEDIAN AGE



# WHITE PROPORTION

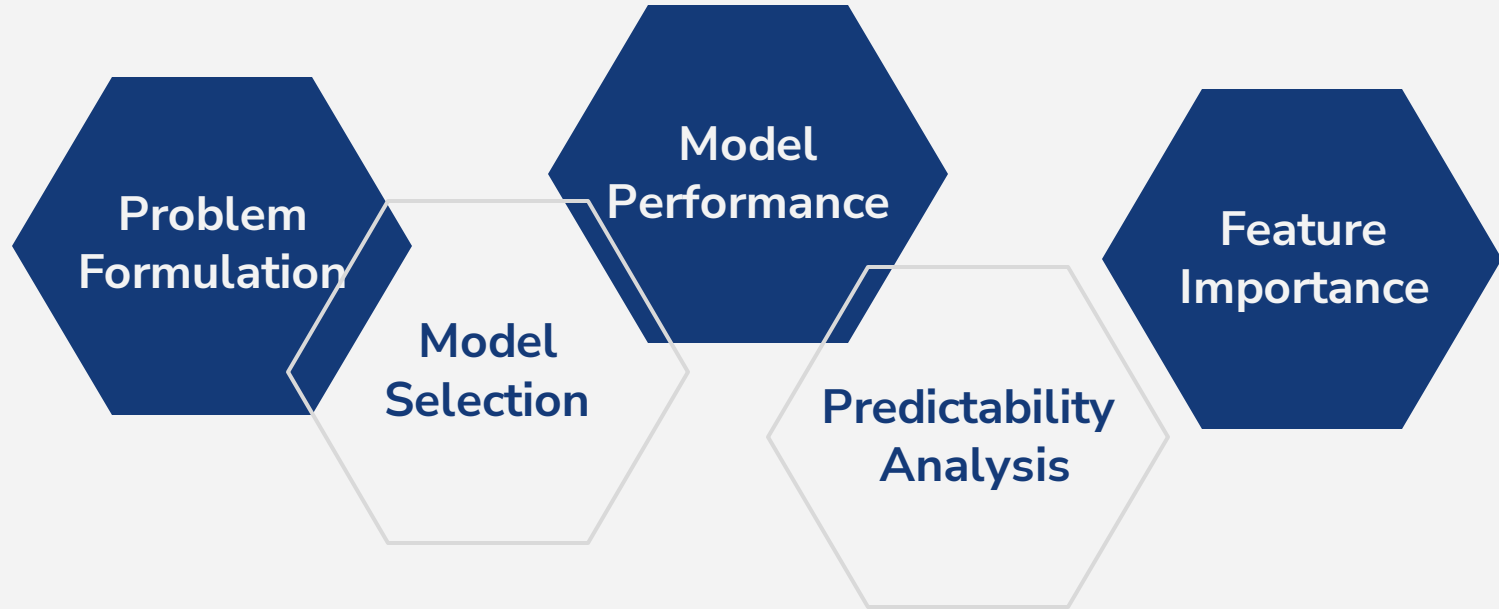


# Spatial Prediction





# SPATIAL PREDICTION FOR RENTAL HOUSING PRICE



# PROBLEM FORMULATION & MODEL SELECTION

Given point-based spatial observations, predict the rental price given location and corresponding demographical covariates

Targeted ML-based Models:

1. Random Forest
2. Neural Networks

Decision Criterion:

1. Accuracy
2. Interpretability & Time

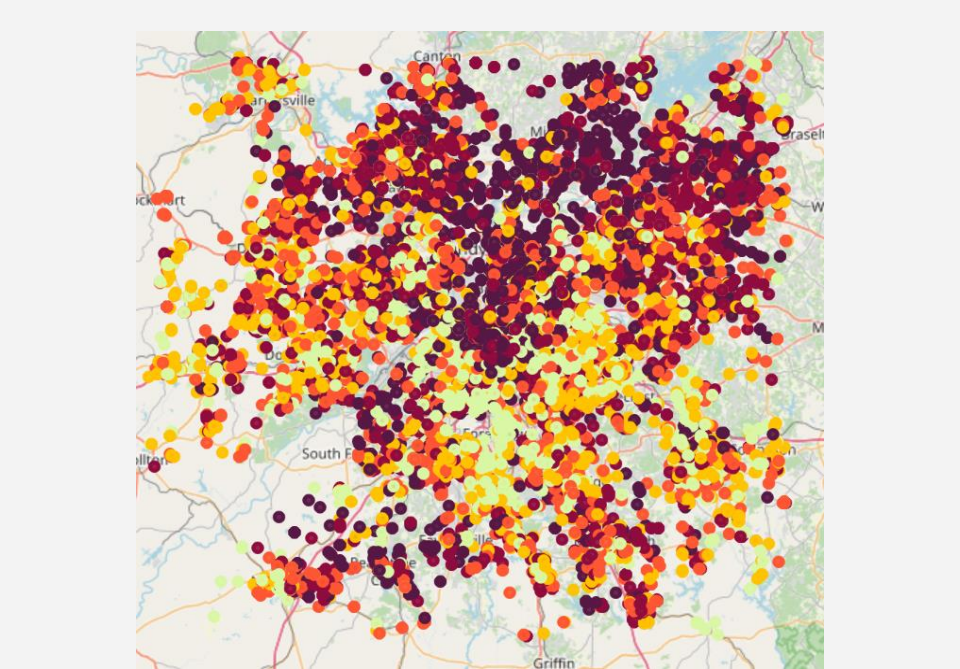
## **RANDOM FOREST MODEL PERFORMANCE**

**Is Rental Price  
Predictable?**

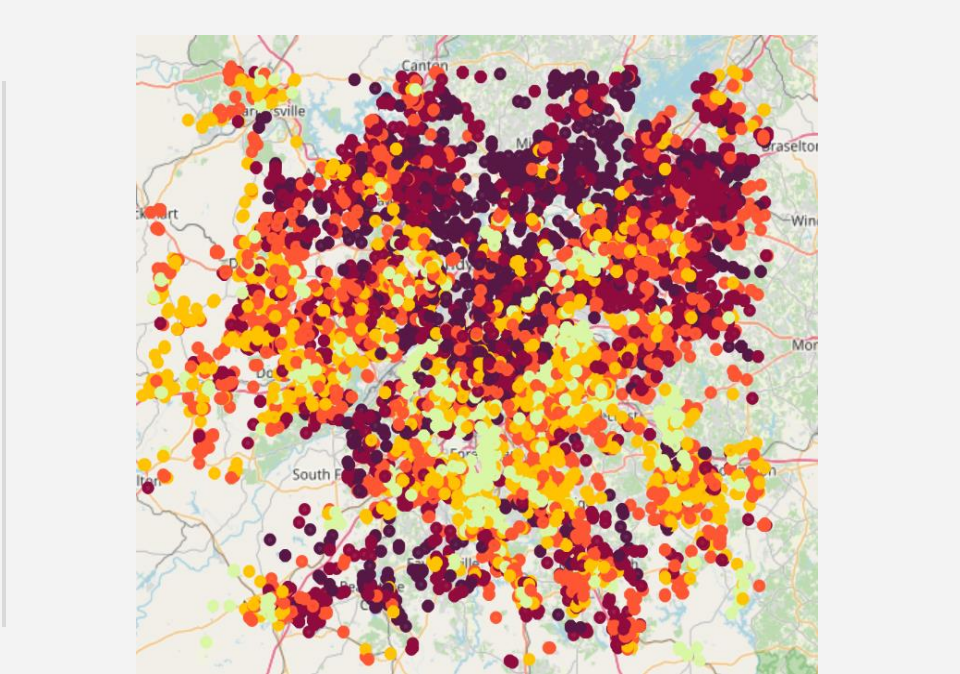
**OOB score: 0.656**

## PREDICTABILITY ANALYSIS

## Real Data

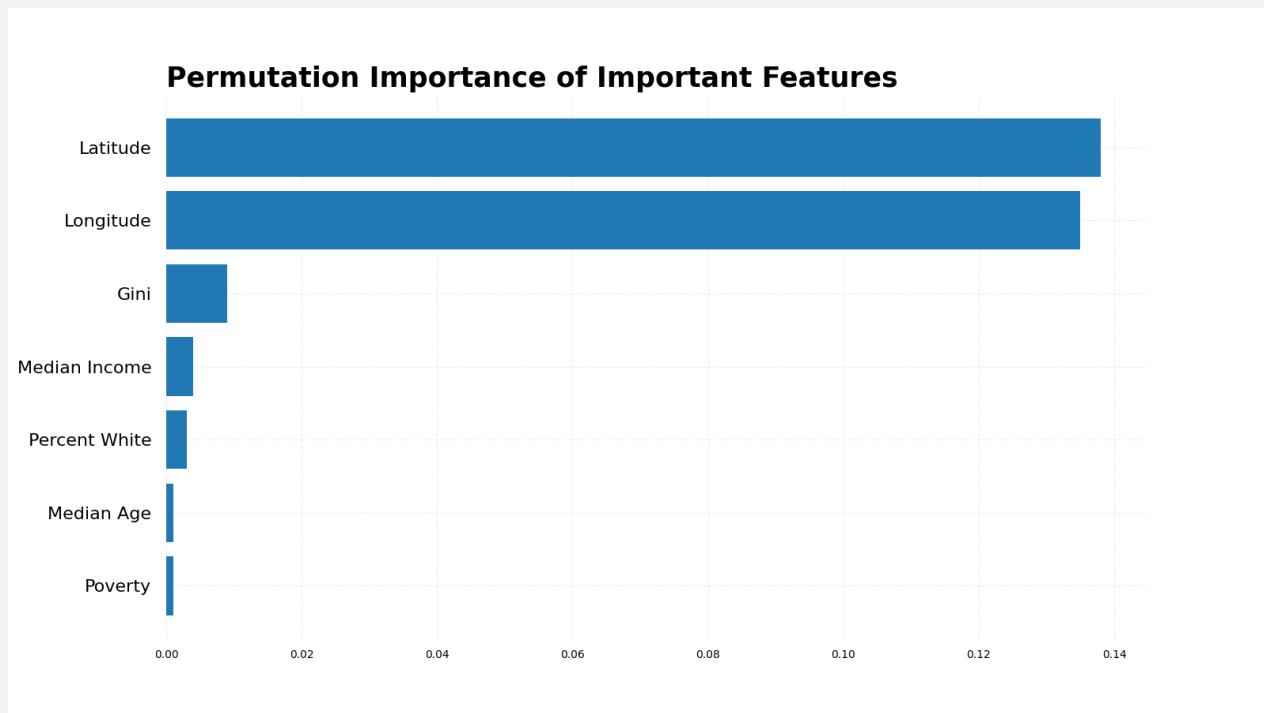


## Predicted Data

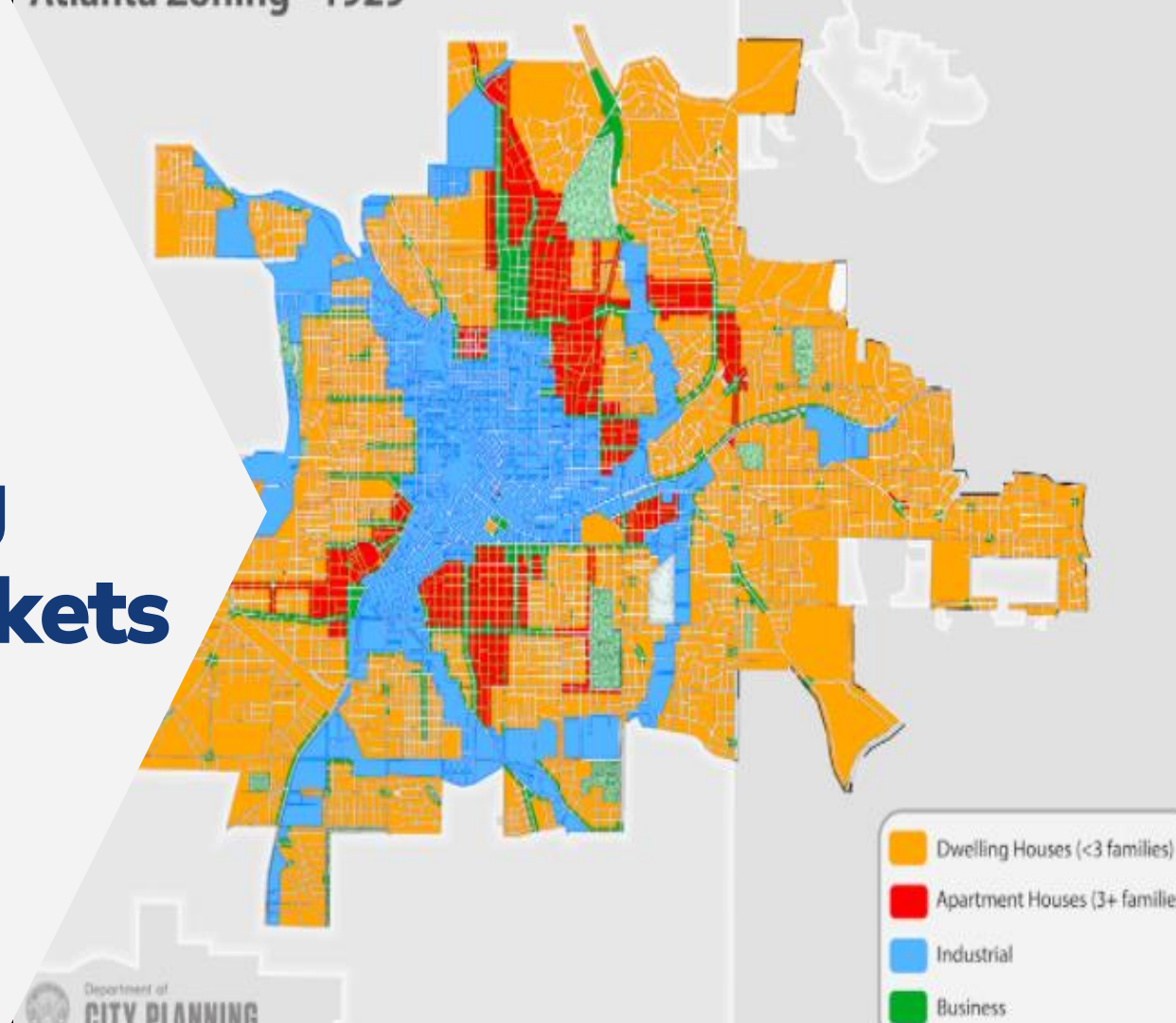




# IMPORTANT FEATURES



# Rental Housing Submarkets



# SPATIAL CLUSTERING



**Algorithm**



**Implementation**



**Analysis**

# SPATIAL CLUSTERING

## SKATER

1. Spatial C(K)luster Analysis by Tree Edge Removal
2. Weight Computation

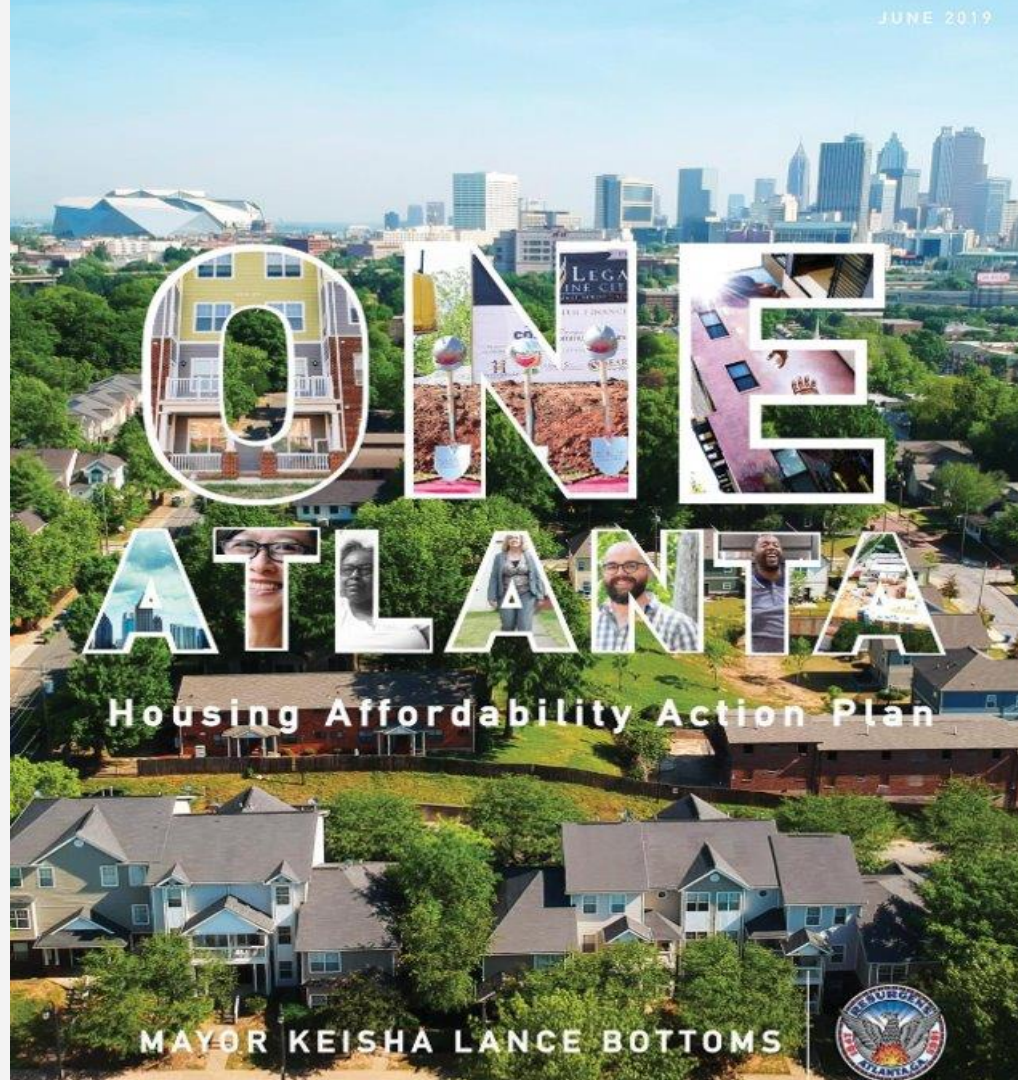
## Clustering Algorithm & Implementation

## Cluster based on polygons

1. Each polygon has its unique Census Tract ID and a group of points
2. Represent each polygon with its centroid



# Conclusion



## **FUTURE WORK**

**SELECTION  
BIAS**

**RENTING +  
HOME  
OWNERSHIP**

**FROM  
DESCRIPTION TO  
POLICY**

**COMMUNITY  
VS.  
RENTING**

**THANK YOU VERY MUCH!**

**Questions?**

<https://emoryqtm.z13.web.core.windows.net/>

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# Outtake

