

Spatial Modeling of Property Values:

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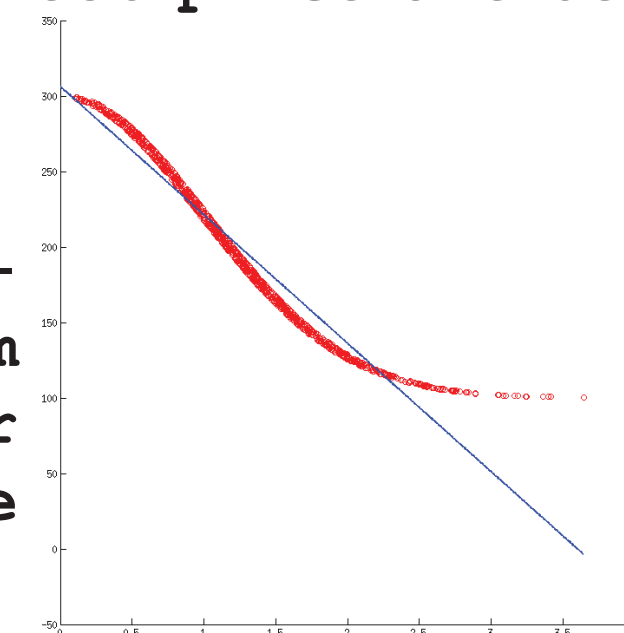
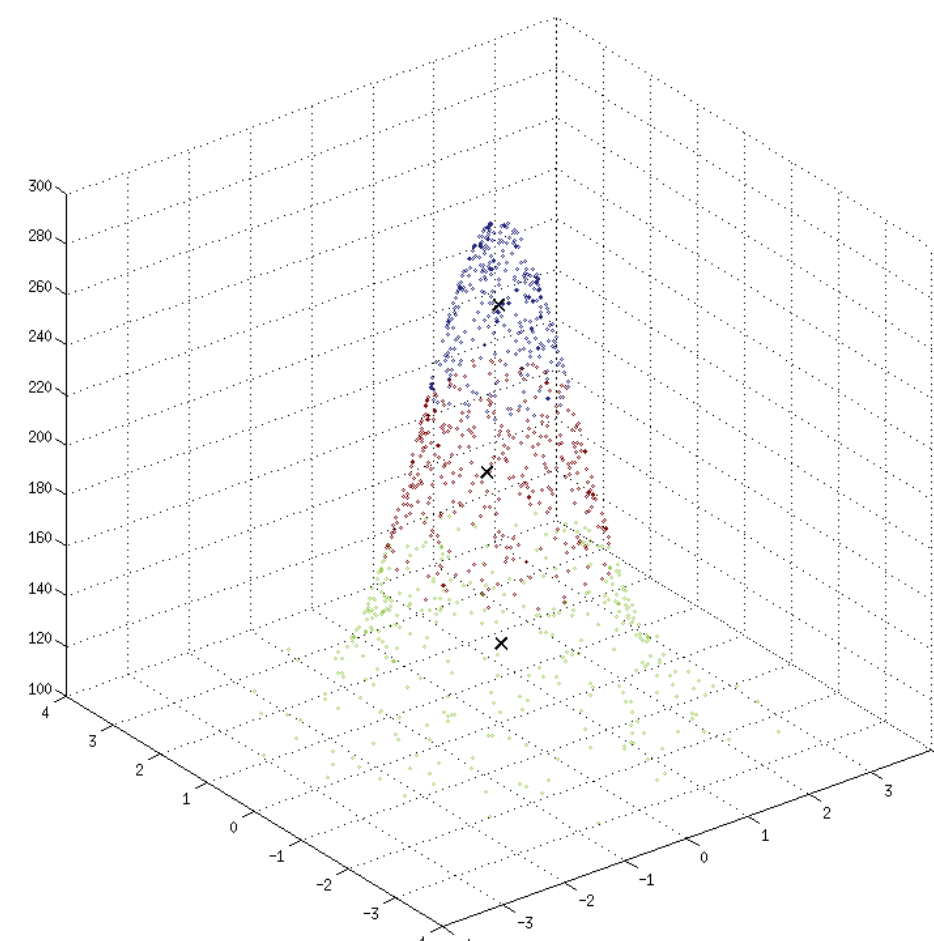
ABSTRACT

The real estate market is a major component of every modern economy. The vitality of the market depends greatly on accurate appraisal of value which often requires highly dimensional observations of individual properties. In this work, we propose two reduced models that seek to characterize property values as a function of geographic location. Clustering and regression analysis are used to implement and test these models.

Urban Center Hypothesis

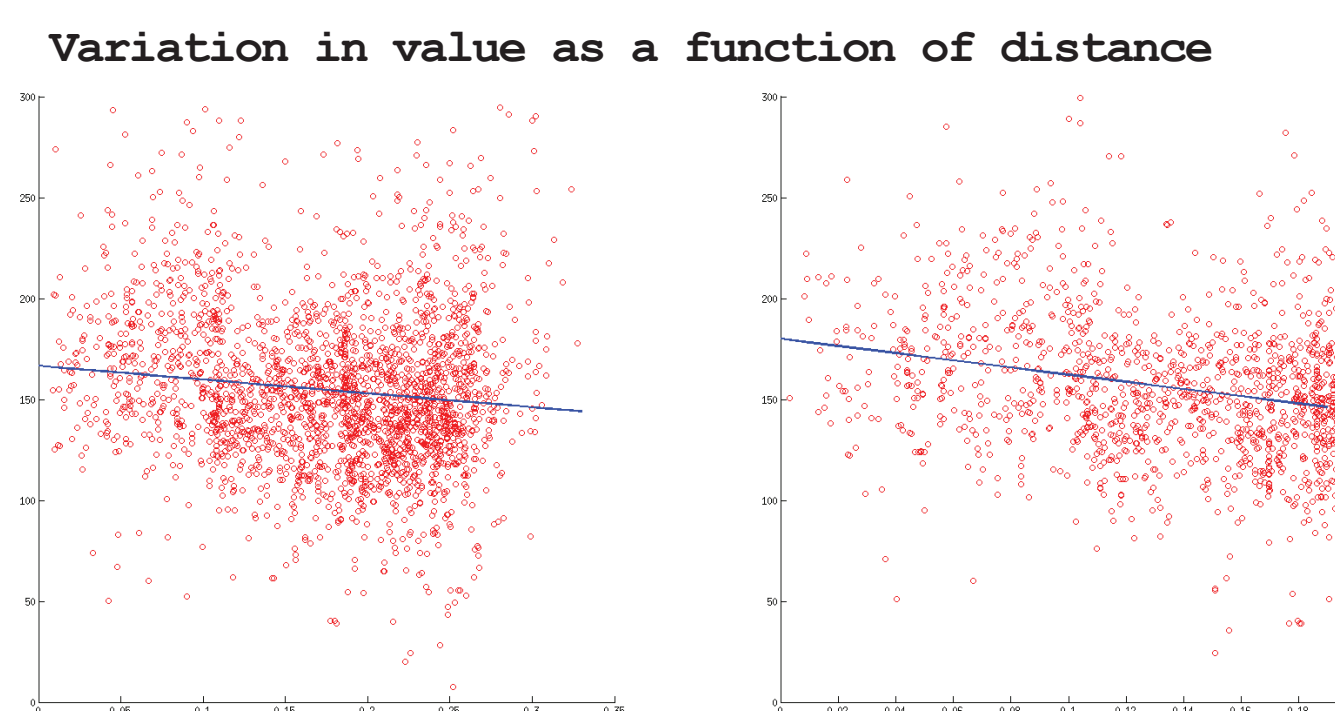
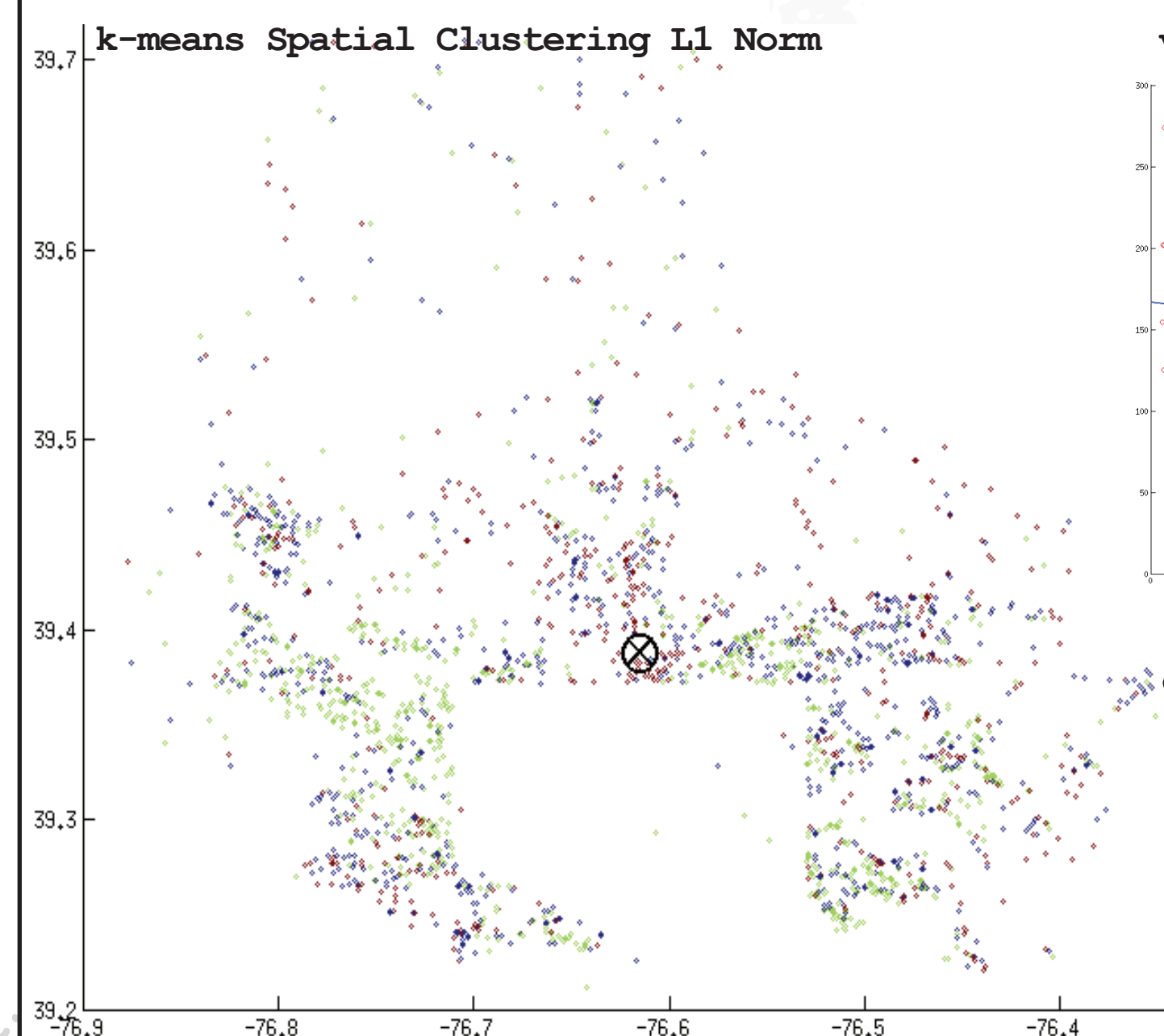
Model Simulation

- Simulated coordinate data was drawn from a 2-dimensional Gaussian distribution, where the price is a scaled and shifted Gaussian function of the coordinates. The coordinates of the cluster with the highest price are determined to be the city center.
- Linear regression is performed with the radius from the origin as the predictor and the price as the output.



Results

- The data for Baltimore County did not include the city of Baltimore, undermining the model assumptions. Using prior knowledge of the city structure, the center coordinates were manually shifted to correct for the missing data.



- Using all data points, the results did not reveal a strong correlation as we would have expected. Results were improved by setting a limit on the radius, reducing the effects of neighboring towns.

DATA

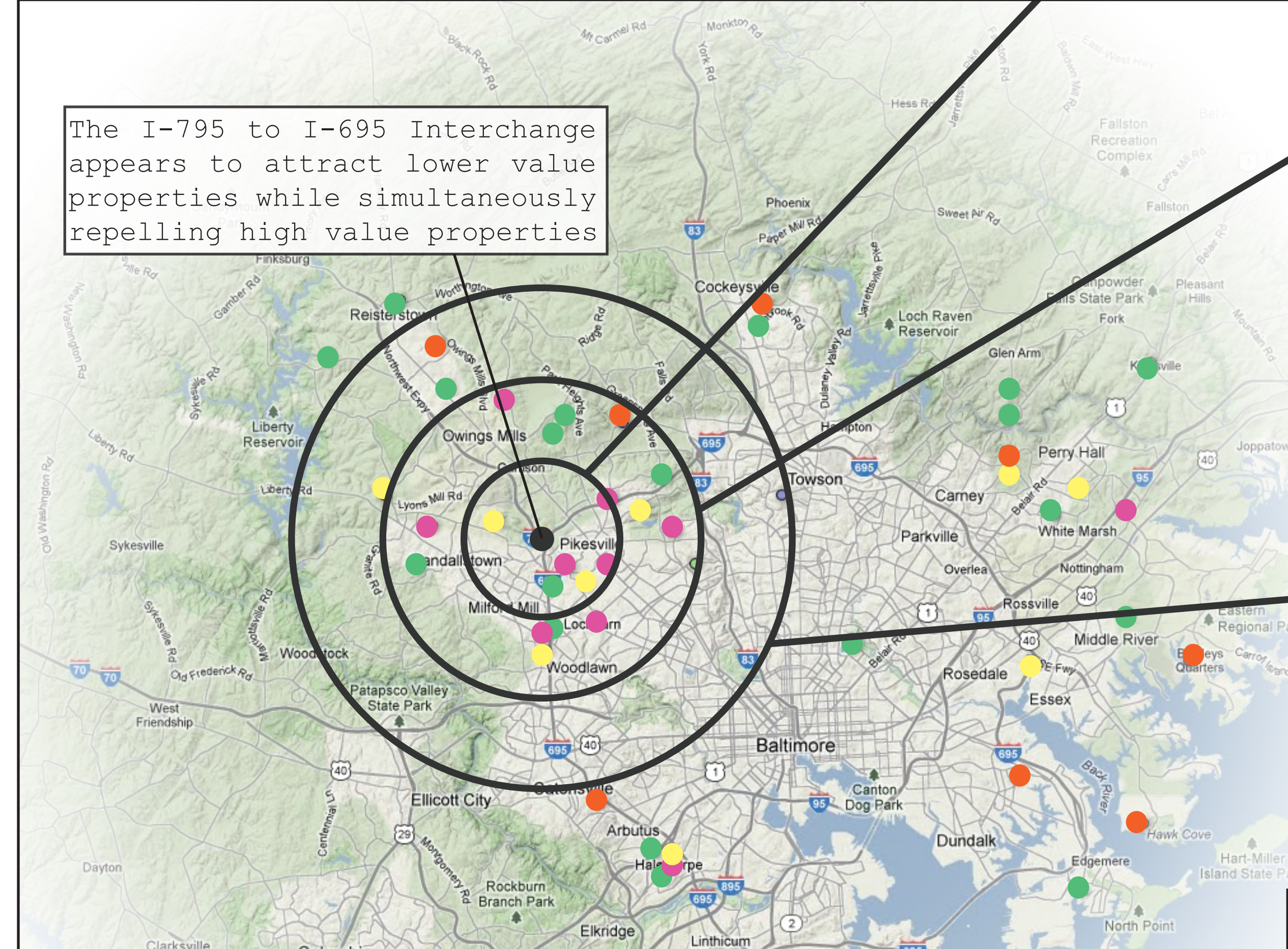
Several large data sets were provided by DataQuick, a real estate analytics firm, who compiled it using public records obtained from the Baltimore Co. Assessors Office. The data consisted of nearly 300,000 observations of 300 dimensions each. Our models were developed and validated using a range of fields which described the price, size and location of assessed properties.

Center Diffusion Hypothesis

Method

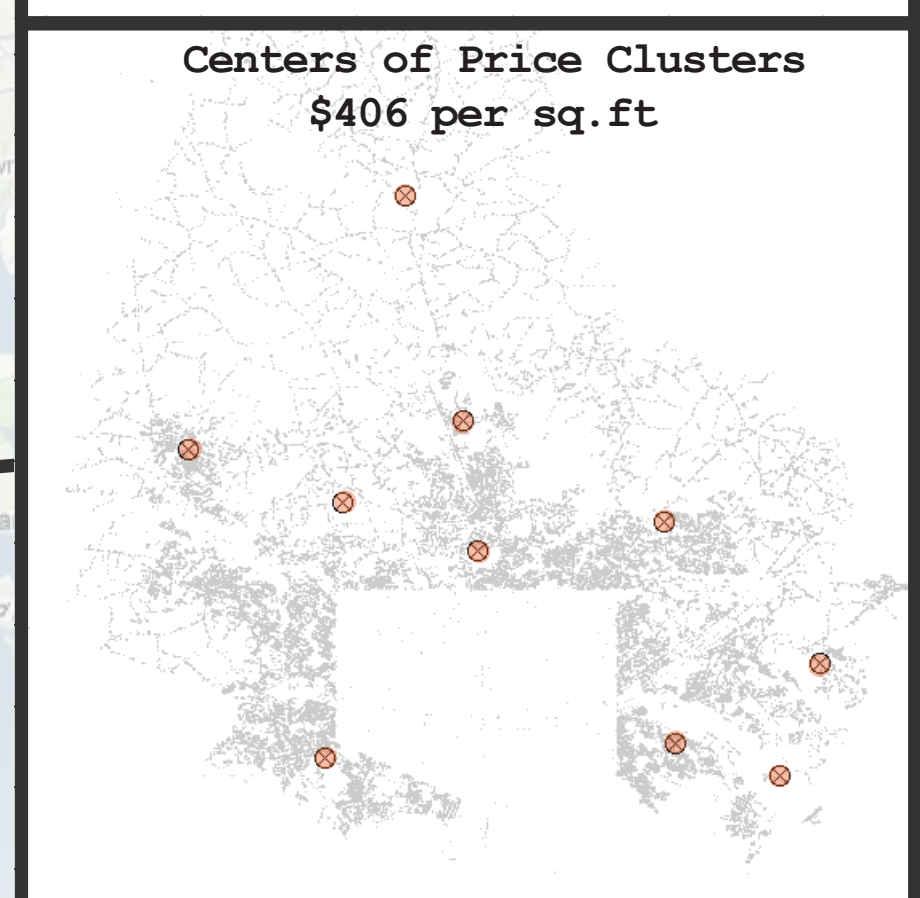
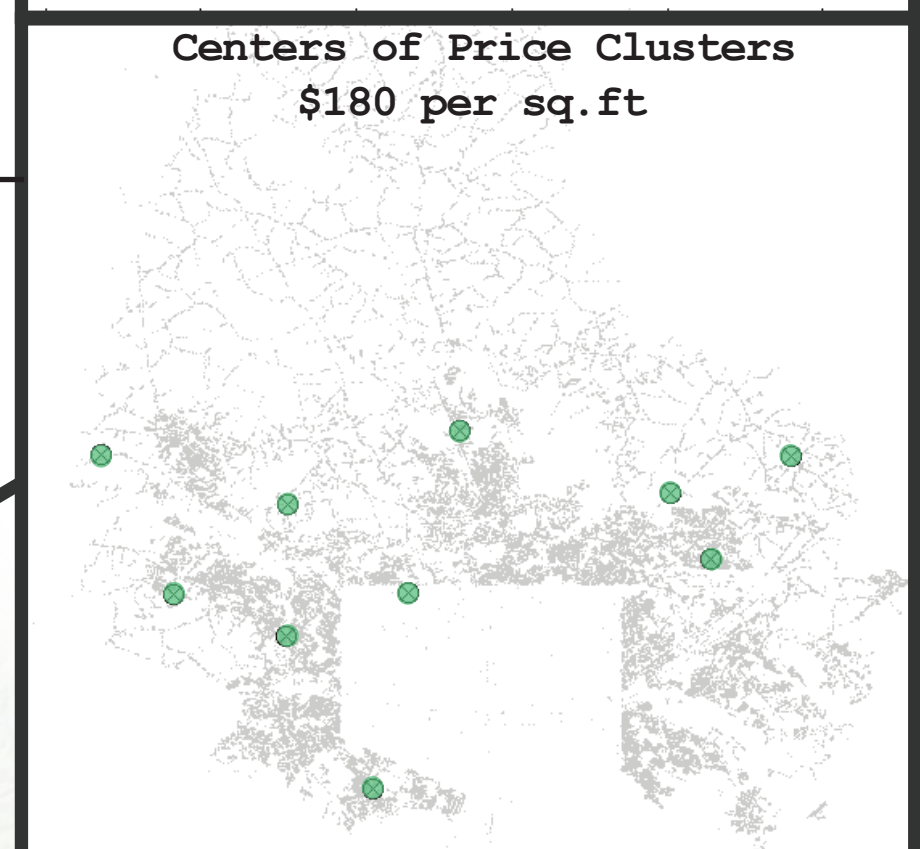
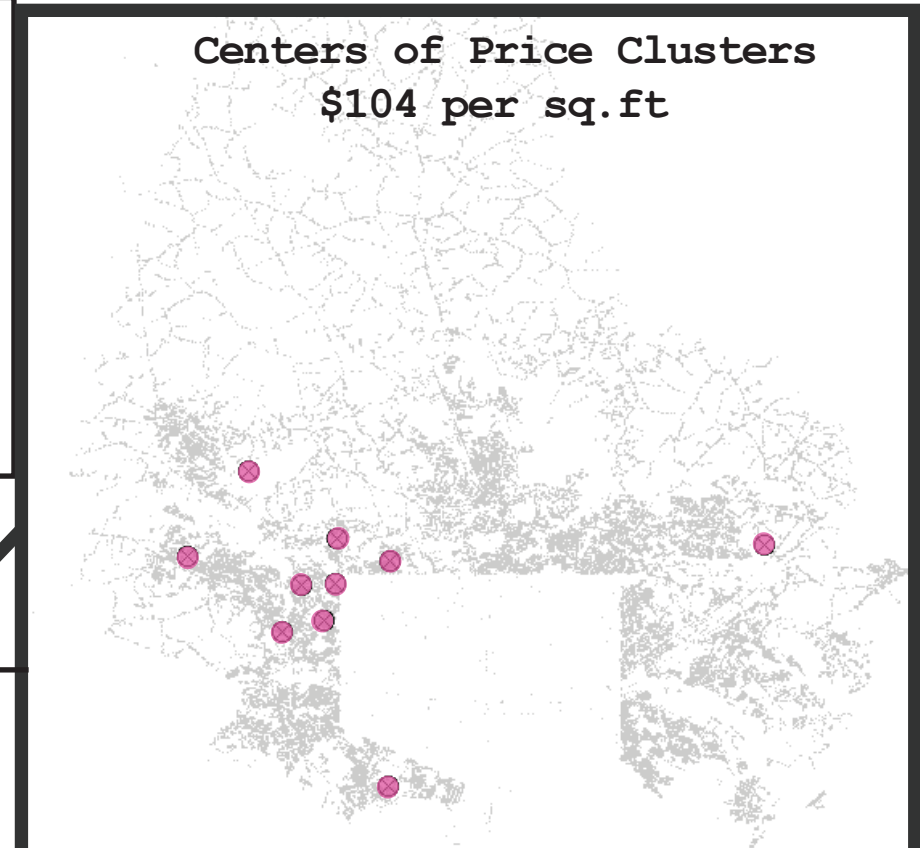
Properties are clustered in two stages: first, by property value (price per sq.ft), then by location. This allows us to spatially classify price "groups"

The I-795 to I-695 Interchange appears to attract lower value properties while simultaneously repelling high value properties



Results

- There exists a characteristic spatial distribution for price groups.
- This characteristic spatial distribution can be described as diffusion from some central point. In this case we explore the a major freeway intersection. (above)
- It can also be described an average distance from all other centers. (right)



Diffusion Between Spatial Centers

