UNIVERSITY OF DENVER ANALYTICS CHALLENGE

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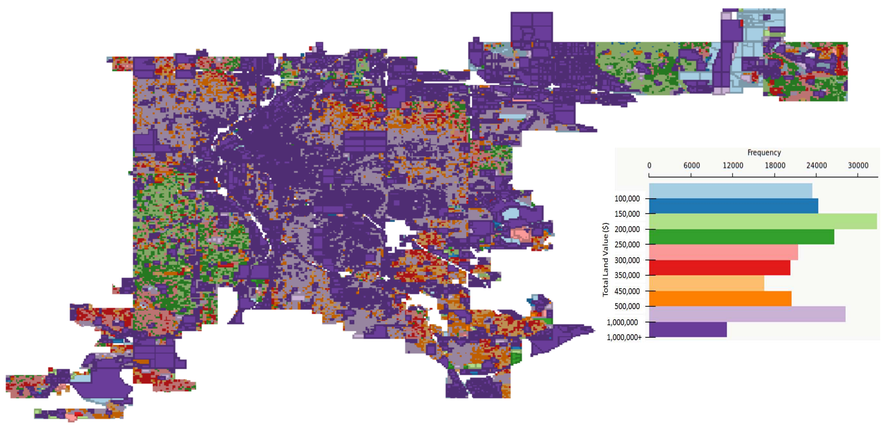
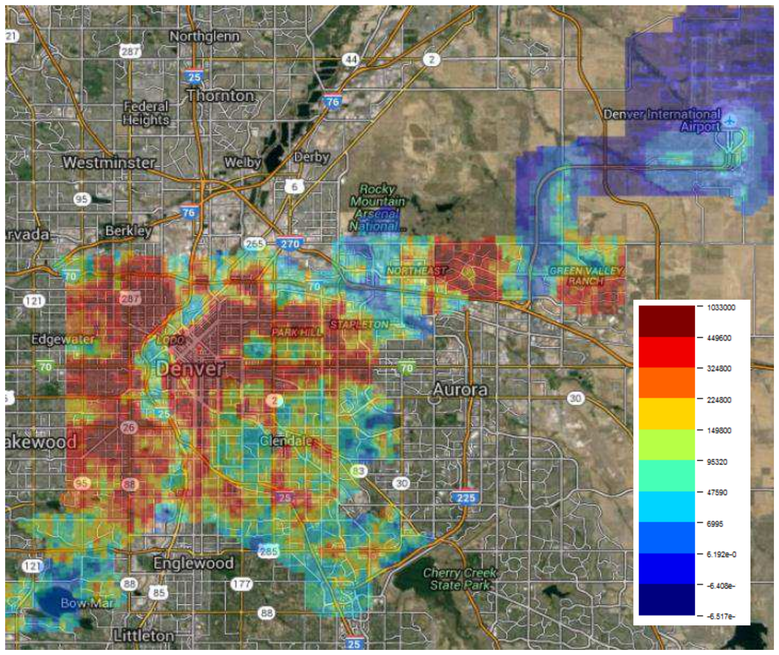
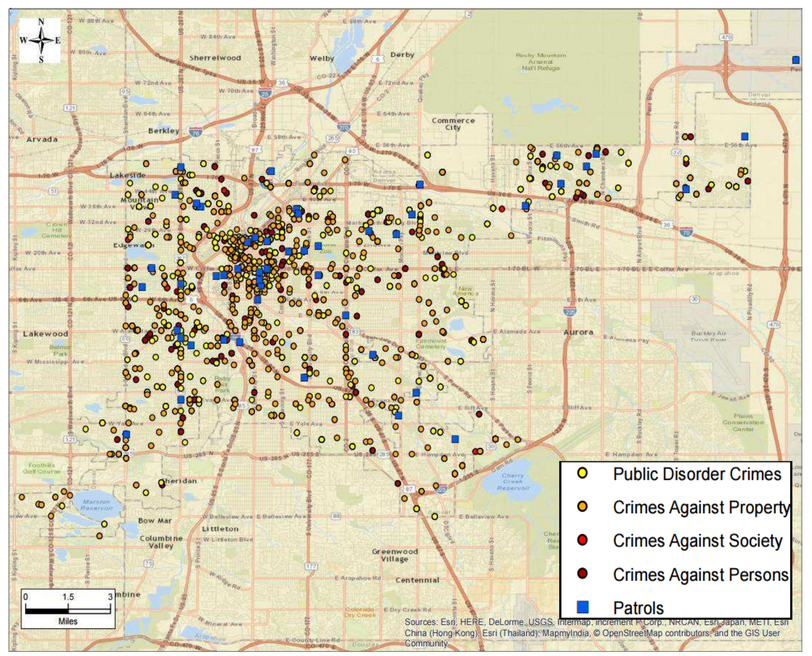
March 4th, 2016

Objectives

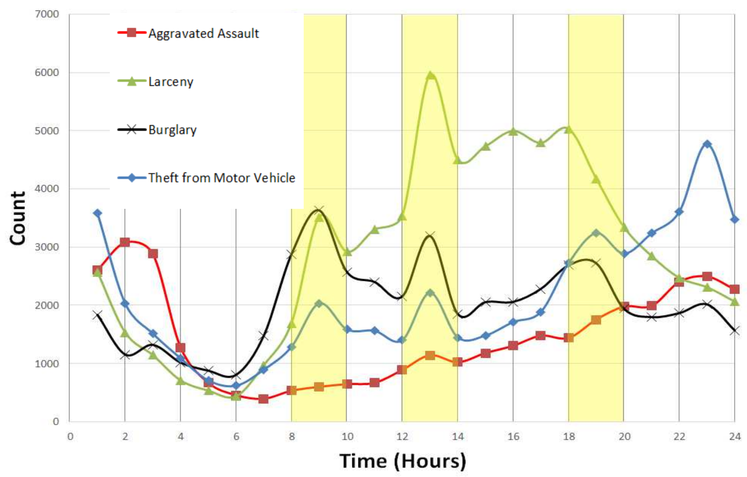
- Explain and predict crimes in hotspot areas using **Social Control Theory** (*Buy-in concept*).
- Measure Spatial dissonance between the two process: where are crimes happening frequently, but street checks are not.







Total Land Values Across Denver Area



Theft and Assault Time Analysis (2010 – 2015)

Crime Category	Total	Weekday	Weekend	Weekend/Total
Burglary	48,178	36,911	11,267	*23.39%*
Larceny	70,126	51,657	18,469	*26.34%*
Theft from Motor Vehicle	51,016	36,593	14,423	*28.27%*
Simple Assault	49,266	32,719	16,547	*33.59%*
Aggravated Assault	35,192	20,590	14,602	*41.49%*

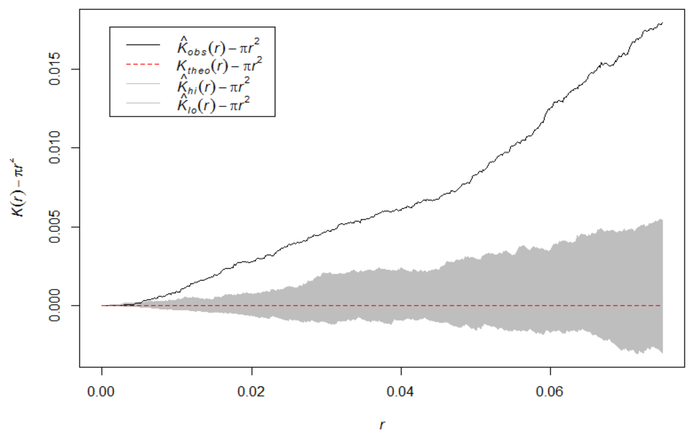
2011 Simple and Aggravated Spatial Crime Distribution

Statistical Methodology

- In order to identify hotspots where the Policing Pill Model can be implemented, we take a probabilistic approach
- Statistically, crimes are an example of events in a spatial point process, generated by a Poisson Distribution

$$\lambda(s) = \lim_{|ds|\to 0} \frac{\mathbb{E}[N(ds)]}{|ds|} \approx \hat{\lambda}(s) = \sum_{x \in N \cap D} \frac{k[(x-s)/h]}{c(s)} \quad \tilde{f}_D = \left| \frac{\hat{\lambda}_{GO}}{\int \hat{\lambda} ds} - \frac{\hat{\lambda}_{SC}}{\int \hat{\lambda} ds} \right|$$

Simulated K-function (n=100)

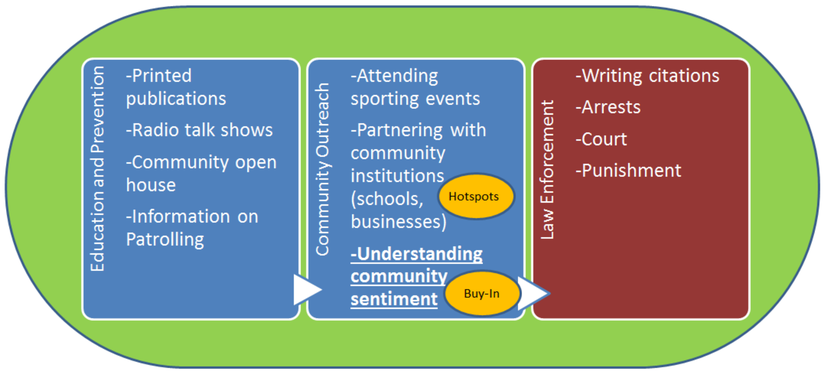


Patrol Route Optimization

Optimization Model

- **Parameters**: Weight of crimes, Location of crimes
- **Variables:** Location of each patrol
- **Objective**: Minimize total distance between patrols and crimes in surrounding areas
- **Constraints**:
  - Crimes evenly distributed between patrols
  - At least one patrol serves each crime

Policing Pill Model



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