The Street Score project: Scope for Improvement?

Knowledge Lab Team Presentation

Nandana Sengupta

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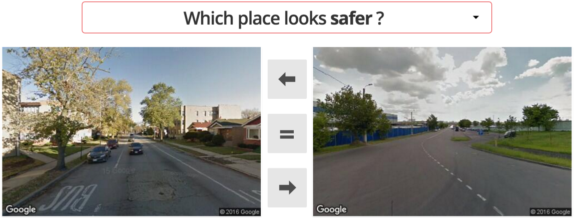
The Street Score Project

- MIT Media Lab Project
- Generating database of visual perceptions of safety/uniqueness etc
- 

- Participants shown **random** pairs of images
- Main application: ranking of neighborhoods/ cities.
- Ranking methodologies – Borda Score (win ratios), Microsoft True Skill Algorithm (Online gaming)
- Cities in dataset: Boston, NYC, Linz, Salzburg
- Number of images: 4109 , Number of participants: 7872 , Number of comparisons: 208738.

Limitations and Scope for Improvements

- Limitations
  - Images taken from Google Street View – represents the way cities look from a car
  - Images are typically from early mornings – less traffic, people, shops closed
  - Data collection methodology random – not taking advantage of similarity in images or participants
  - Data issues: sparsity of win-loss matrix, multiple images at the same location
  - Prediction accuracy
- Scope for Improvements
  - Compare prediction accuracy of different ranking methods: Borda, TrueSkill, SVM, SVM with features.
    - Might require clustering data due to sparsity of observations.
    - Extraction of features: visual and demographic.
  - Use Active Learning techniques for collecting data.
    - Might require setting up a new survey

Feature Extraction

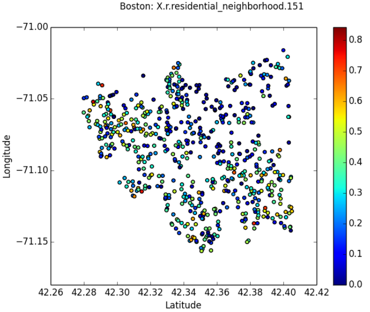
- Visual Feature Extraction
  - MIT's Places CNN (Convolution Neural Networks)
  - Deep Learning Software, open source
  - Scene Recognition: 205 scene categories eg, residential, highway, apartments etc.
  - User Input: Raw Image
- Demographic Feature Extraction
  - US Census Data and American Community Survey Database
  - Demographic characteristics by region, eg, average income, educational levels, racial distribution etc
  - User Input: Latitude and Longitude

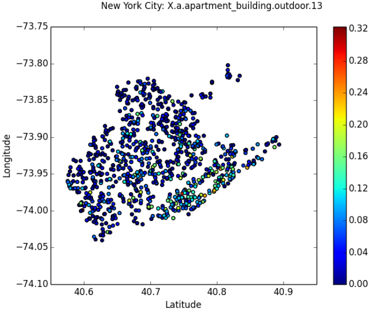
Feature Extraction using Deep Learning Software

Top 3 Predictors: (office building, apartment building, hospital)

Top 3 Predictors:(yard, residential neighborhood, driveway)

Feature Extraction: distribution across physical area

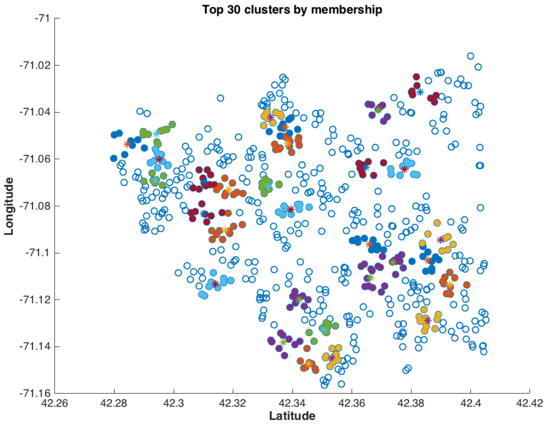




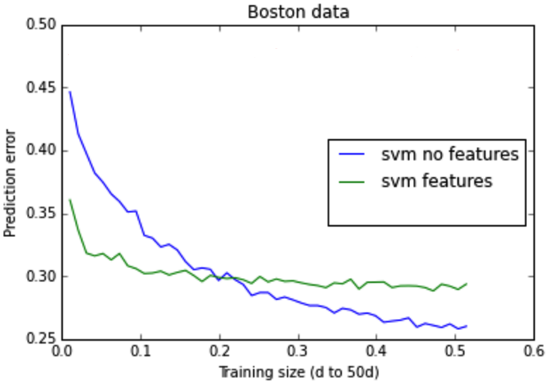
Digging Deeper into the Data

- Current number of comparisons makes svm training difficult ($K \times n \log n$ comparisons required)
- Multiple images at the exact location
- Image comparisons across cities
- We focused on a single city Boston
  - 1237 images from 635 unique locations
  - Less sparse than overall matrix but still not enough observations for consistent ranking
  - Divided images into 100 clusters using k-means clustering
  - Features for each cluster: weighted average of member images
- Now ready to run different ranking techniques

Clustered Data for Boston: Top 30 clusters



SVM prediction results on the Boston Data – NO clustering



Thanks!