Predicting Crime in Boston

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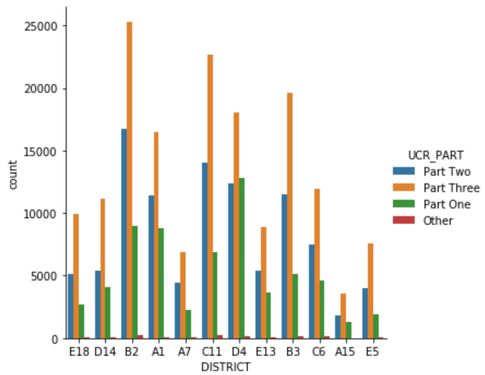
Abstract

Boston is the largest city in New England. Being a major metropolitan area means that crimes occur around the city every day. Our project takes a look into the "Crimes in Boston" dataset. This is a dataset of police reports from 2015-2018. From the information in these data, we used machine learning techniques to see if, given a specific crime and the day which that crime occurred, we could predict where that crime is most likely to happen within the various neighborhoods in Boston.

1 Introduction

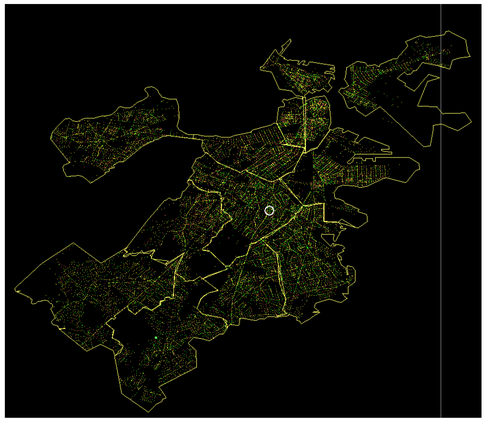
- Purpose: Try to predict where various crimes are likely to happen within the city of Boston
- Use Multi-class logistic regression to predict where a specific crime was likely to happen
- Use Decision Tree algorithm to predict where a crime was likely to happen
- Create a map of Boston which visualizes our results



A graph showing the police districts along with the amount of crime organized by UCR part number.

2 Setup to our model

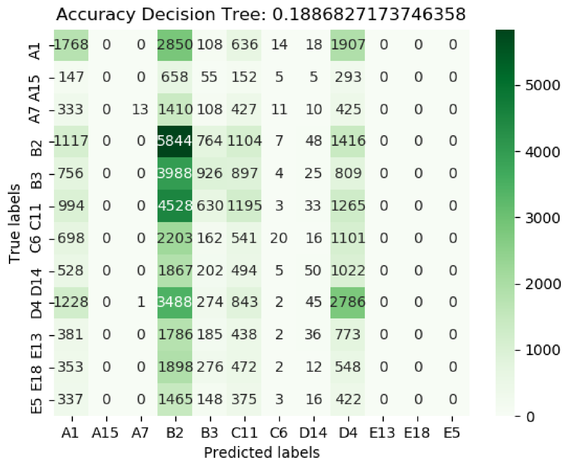
- Each location of city is organized by BPD districts
- 12 districts in total
- Individual crimes are given an offense code number. These are then put into offense groups
- For our analysis, we used the offense group, not the individual offense code number
- 67 offense groups in total
- Combined the month and year columns to be one column
- One Hot encoded all of our variables as they were categorical
- Data was spilt into 80/20 training, testing datasets



This map is a visual representation of our dataset. It shows the city of Boston, divided into each police district. Each dot is a row in the dataset. For example, the dot circled represents a police report where the officer was called for medical assistance within district B2 on a Friday in August, 2018 at 10pm.

3 Decision Tree

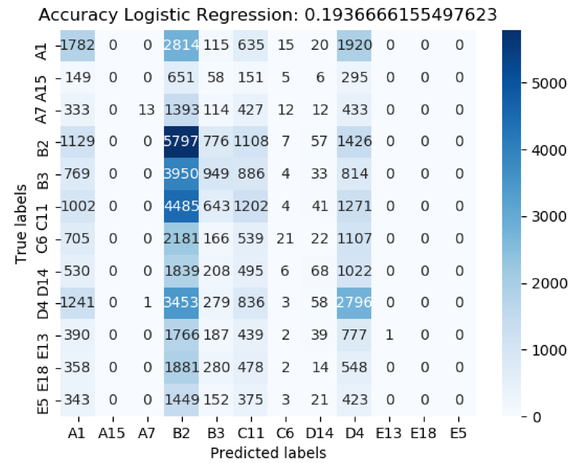
To set up a baseline for our data predictions, we first created a decision tree. To create this tree we used the DecisionTreeClassifier from sklearn. In order to get the maximum depth we ran the algorithm, testing depths from 1 to 119. A depth of 26 gave the highest accuracy. The accuracy for this model was low at only 0.18. This model misclassified a lot of the districts, for example it did not classify any of the A15 crimes correctly and classified a high amount of crimes as B2 when they should not have been.



A confusion matrix representing our decision tree model

4 Multi-class logistic regression

Next we created a multi-class logistic regression algorithm to try to compute where a crime was most likely to happen. To calculate the model, we used sklearn's built in LogisticRegression method. This model had very low accuracy of about 20%



A Confusion Matrix representing our mutli-class logistic model

5 Future Work

- Increase prediction accuracy of our models
- Bring other data into consideration for classification such as time crime occurred
- Analyze other datasets for information on why certain districts have more crimes or are more likely to have specific crimes than other districts
- Create a visualization of our data using the map of Boston. Each dot on the map would be a prediction where the color of the dot would represent whether or not the prediction was correct.

Citations

Jain, A. (2018, February). Crimes in Boston, Version 3. Retrieved November, 2019 from https://www.kaggle.com/ankkur13/boston-crime-data.

Boston Police. "The Boston Police Department's Virtual Community." Bpdnews.com, 7 Dec. 2019, https://bpdnews.com/.