

ES201/AM231 Final Project Proposal: Predictive Policing for the City of Boston

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MOTIVATION: We will perform predictive policing for Boston, MA. Predictive policing techniques have been employed by many cities in the US and Europe, and have proven to be effective. In Santa Cruz, CA, the implementation of predictive policing resulted in a 19% drop in the number of break-ins.¹ The goal of predictive policing is to reduce crime by helping law enforcement make more educated decisions about their allocation of resources, that is by enabling police departments to dispatch officers precisely to high-risk areas. Predictive policing can also help civilians by providing them with precautionary notifications against possible crimes near them.

DATA: We are taking our database from "Analyze Boston," the City of Boston's open data hub, which features a crime incident report data set ranging from 2015 to today.² The CSV file provided by the City of Boston contains close to 400,000 data points. Their most important features are district, time, and type of crime.

APPROACH: We will begin by examining the data and deciding what to use as features and what to use as labels. Using a cloud-computing platform (we have AWS credit), we will implement a Multinomial Naive Bayes baseline model as a proof of concept: Can we predict what type of crime will occur when and where better than through just guessing randomly? Based on these results, we will then explore more granular crime prediction, for example, by considering the probability distribution over the top five predicted crimes for a given place and time. We will try out a handful of models to find the best suited one, giving us the opportunity to delve deeper into many models from class: NNs, Random Forests (a decision-tree ensemble method), and SVMs. In addition, we will go beyond the scope of the class by self-studying and implementing time-series prediction—which we hold out some hope for since certain crime might be seasonal or the face of crime in Boston might be changing over time.

END PRODUCT: Building on our research, we will build a mobile app that provides a predictive heat map to Boston Police patrols. In addition, civilian users will be alerted with precautionary notifications against possible crimes in their area. Plus, if the user has witnessed or been the victim of a crime, he or she can report it on the app, which will update our database.

Week	Milestones	Assignment
1	(1) Data exploration (2) Implement baseline model (Multinomial Naive Bayes) as proof of concept (3) Set up AWS server for faster training & grid-search hyperparameter tuning	(1) All (2) Jorma (3) Nicolas, Jaemin
2	(1) Implement several other models (NNs, Random Forests, SVMs) (2) Compare results and attempt to improve upon them	(1) All (different model per person) (2) Jorma, Nicolas
3	(1) Research and learn the theory behind different time-series prediction methods	(1) All
4	(1) Implement time-series prediction (2) End-user application development	(1) Jaemin, Jorma (2) Jaemin, Nicolas
5	(1) Compare time-series prediction results and attempt to improve upon them (2) Application development continues + buffer time	(1) Jorma, Nicolas (2) Jaemin
6	(1) Prepare Jupyter notebook and presentation	(1) All

¹ <https://leb.fbi.gov/articles/featured-articles/predictive-policing-using-technology-to-reduce-crime>

² <https://data.boston.gov/dataset/crime-incident-reports-august-2015-to-date-source-new-system>

