Introduction to Data Mining
Predicting Crime Type in NY

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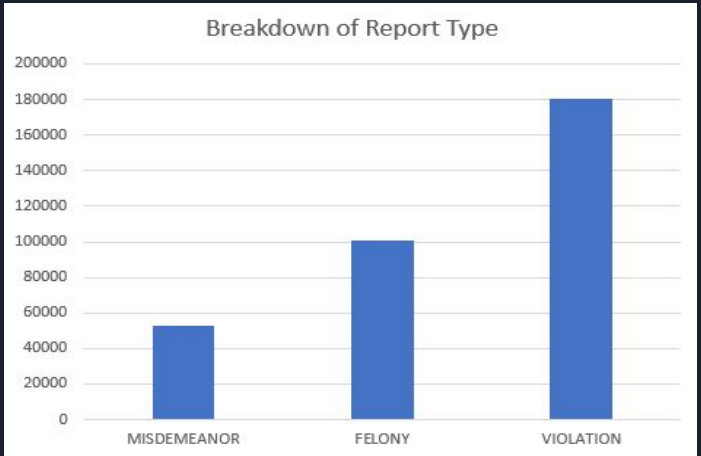
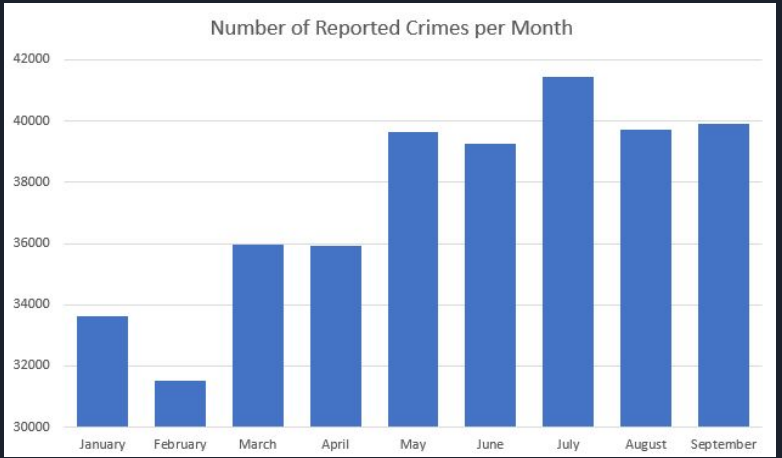
Our Dataset

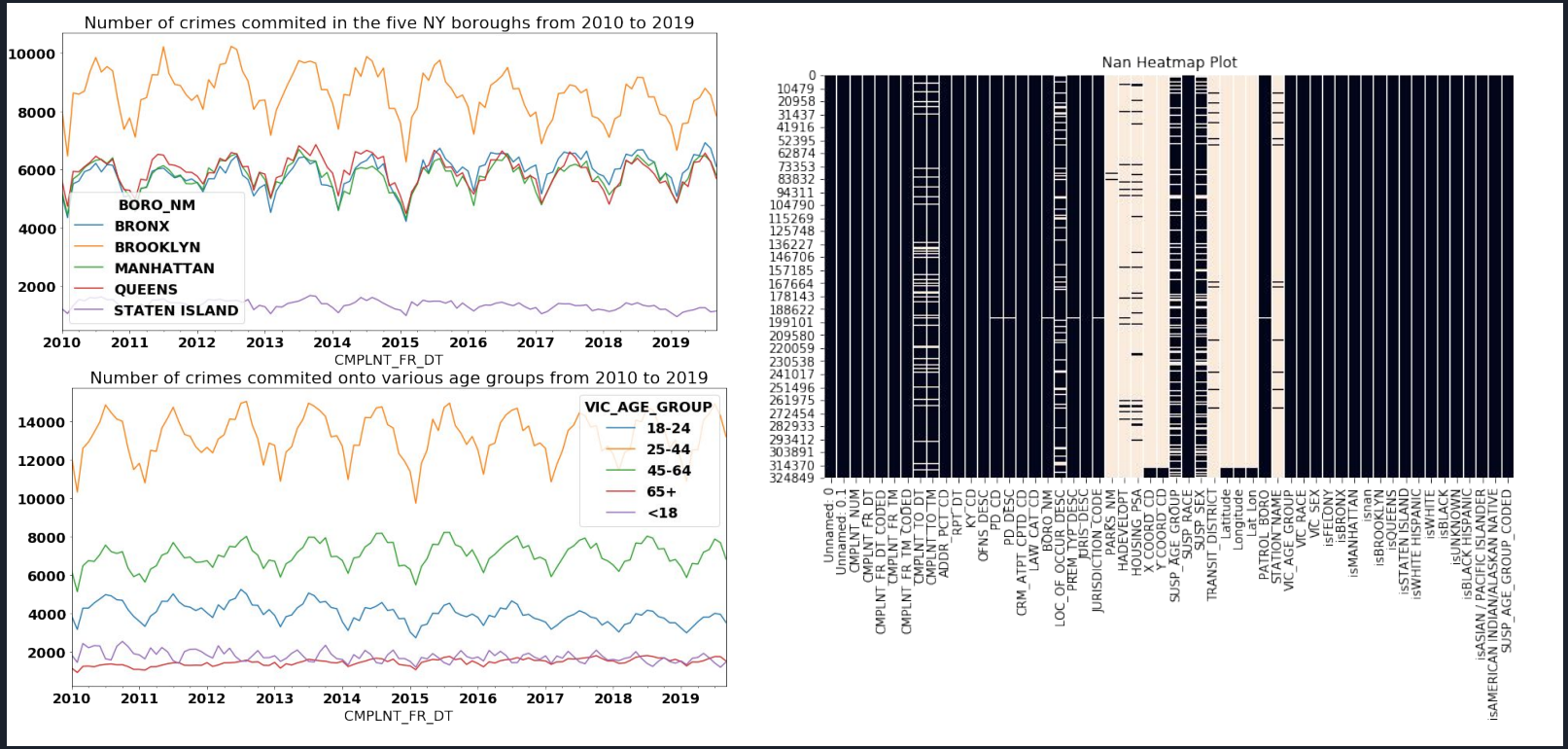
- NYPD Complaint Data Historic
- Data provided by NYC Open Data and the New York Police Department
- Contains every felony, misdemeanor, and violation crime that the New York City Police Department received a report for from 2006 to 2019
- Contains information such as race / age / sex of victims and suspects, the time of day the crime was committed, and information about the location
- Over 6 million observations
- 35 columns
- Updated Annually

Overview of the Dataset





Continued EDA



Cleaning

- Limited our data to 2019, giving us about 350,000 reports
- Encoded numerical variables (date/time) to a continuous number
  - Nulls -> average
- Encoded ordinal categorical variables (age) to continuous number
  - Nulls -> average
- One-hot encoded categorical (not ordinal) variables (borough, sex, etc) to separate features for each possible
  - Nulls -> randomly assigned matching the given distribution of possibilities

Available Features

- Date of reported event (start and end)
- Time of reported event (start and end)
- Precinct in which the event occured
- Date of report
- Offense classification code / description
- Internal classification code / description
- Indicator of whether or not the crime was successfully completed
- Level of offense
- Borough in which the offense occurred
- Specific Location around the premises
- Description of the premises
- Jurisdiction code / description
- Victim Race / Sex / Age
- Suspect Race / Sex / Age
- Specific location as X and Y coordinate on the NY State Plane Coordinate System
- Latitude and Longitude
- Patrol borough

Decision Tree Models: Targets and Features

- For simplicity, separate models targeting each crime type
- Targets: felony, misdemeanor, violation
- Features:
  - Time of reported event
  - Date of reported event
  - Victim Age / Sex / Race
  - Borough in which the event took place
  - Description of the premises
  - Specific location on the premises
  - Jurisdiction code description
- Max leaf nodes = 50

Decision Tree Models: Results

- Tweaking the test_size and the max_leaf_nodes, our best results were:
- Violation:
  - Accuracy: 84%
  - F1: 11%
  - Confusion Matrix:

28134	14
5243	7

- Felony:
  - Accuracy: 70%
  - F1: 3%
  - Confusion Matrix:

22903	561
9343	591

- Misdemeanor:
  - Accuracy: 58%
  - F1: 61%
  - Confusion Matrix:

8497	6832
7034	11035

Other Modeling Attempts

- Random Forest
- Multinomial Logistic Regression
- Support Vector Machine
- Random Forest
- These methods did not see as much success as decision tree