MMGiles

Bond Factors for CT Pretrial Detainees

Overview

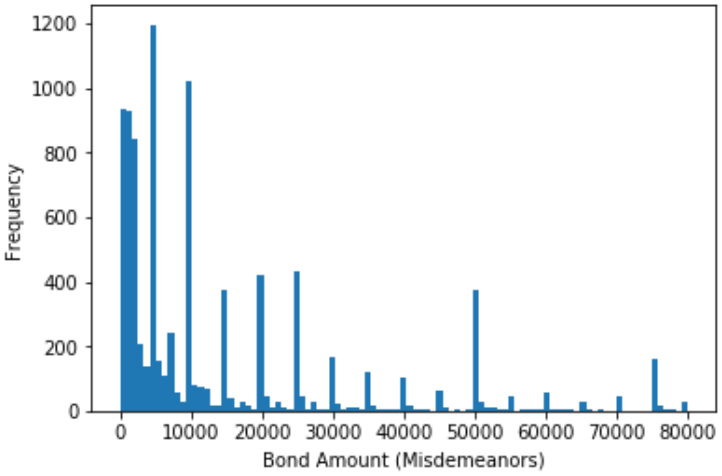
Full code is available at CT_Classification.ipynb.

Connecticut Bail Fund has raised concerns about the state legislature's attempt to reform cash bond conditions. I've previously plotted basic data and analyzed publicly available data for the year before and the year after the change in laws. The statistics offer mixed insights but indicate that gender bias may be more prevalent than racial bias, which became an important factor in the modeling process.

Initial Modeling

The original plan for this project was to predict bond amounts from a mixture of criminal and immutable characteristics. Criminal characteristics include the offense classification, bond, and days detained, and immutable characteristics are those of the individual that cannot be changed: age, race, gender (author acknowledges that age itself changes and gender can *be changed* but must place limitations on playing devil's advocate).

Linear regression proved difficult to perform on this dataset because of the distribution of the bonds as pictured to the right. Attempts to do so are available at CT_Analysis_Linear.ipynb but won't be further addressed here.



Progression and Final Modeling

While the mean bond amounts by race were statistically significant enough to fail to reject the hypothesis that they differed, they weren't practically significant. White/non-white populations also didn't shift much during the two periods. I needed to look for a more significant variable and a different way of looking at the data. I chose to predict gender from a combination of other features: bond amount, days detained, age, offense class, and race.

Female detainees make up about 17% of the population and have a mean bond amount of 60% of the male detainees'. They also stay behind bars while awaiting trial half the mean days of their male counterparts. These differences could matter in modeling.

I began the classification with logistic regression and quickly discovered the imbalance of the data would be problematic. After rebalancing the data by upsampling the female rows, the basic model could predict the correct gender about 82% of the time. The area under the ROC curve (AUROC) also increased. (This upsampled data will be used in all the other models in this section.) Unfortunately, after tuning the hyperparameters with a randomized search, the model could still only correctly predict gender about 82% of the time with no additional increases in recall, precision, or AUROC.

The final attempt at a working classifier utilized a random forest. Out-of-the-box accuracy was well over 75%, a hopeful sign. Precision and recall were both much stronger for this model, both in the mid-80 percents. The classifier was then tuned using a random search Cross tabulation of the predictions on the test set also showed good accuracy, with 82% of females and 89% of males correctly identified.

At this point, I believe that a tuned random forest classifier can accurately predict from the available data whether a detainee is male 90% of the time.

Questions and Future Opportunities

I don't know why there's such a huge disparity in the mean bond amounts and days detained between the genders in this data. I have an interest in criminal justice reform, so I want to know what's fueling it and have two ideas.

First, do judges have an implicit bias toward female detainees? Do they see a woman as a caretaker or mother or weak or [insert adjective here] and lean toward reduced bail (or no-bail) options to get her home faster? I don't see how this dataset could prove whether that implicit bias exists, but could this bias exacerbate/perpetuate the situation if a judge views a mother as necessary and a father as optional when determining conditions?

The second idea involves the social theory that males commit more violent acts -- they're certainly arrested for them more often. This project didn't parse the offenses column further than pulling out the offense class, but a further project could involve parsing that column to determine violent versus nonviolent offenses and how the percentages play out.

One significant limitation to this entire project has been that CT only supplies one offense per arrest, the "[c]ontrolling offense for which the bond amount has been set," and no indicator if how many total charges an individual has. Presumably the bond would be set on a violent offense if a violent offense is available to charge, but charging also relies on what the prosecutor has enough evidence to support at a particular point in time. If the prosecutor adds a violent offense charge at some point after the arrest that affected bond conditions, would the CT database be updated to reflect the change?

The modeling itself also raises some possibilities that I haven't been able to work on yet. The current model includes several features. Dropping any of them led to a decrease in accuracy, but it's possible that fewer features can be used to gain more insight when different techniques are used.

Another possibility is binning the bond amounts to see if detainees can be classed into buckets or coerced into a different type of regression. Utilizing other, non-linear curves, like some form of $f(x) = \frac{1}{x}$, could also help with the bond analysis.