CIS545: Term Project Proposal

Vijay Yevatkar, Saumya Suvarna

1 Data Source

Murder Accountability Project
"More than 256,000 Americans have perished in unsolved homicides committed since 1980 - more than the combined death toll of all U.S. military actions since World War II."

- With no law enforcement agency in America assigned to monitor failed homicide investigations, this project was set up to track unsolved homicides nationwide.
- It is dedicated to educating Americans on the importance of accurately accounting for unsolved homicides within the United States.
- The project provides CSV files summarizing all homicides and homicide clearances reported from year 1965 to 2020.
- The size of the data is a little shy of a million records - 827220

2 Project Plan

Our project will be roughly divided into the following sections:

1. Data Wrangling
   This section will involve:
   - Cleaning the data.
   - Data preprocessing.
   - Scaling, normalization, encoding values.
   - **(Stretch Goal)** Merging data from various sources for additional insights.
2. Exploratory Data Analytics
   This section will involve:
   - Visual representations of interesting aspects of the data.
   - General statistics to get a better understanding of the overall data.
3. Modelling and fine tuning
   This section will involve:
   - Selection of a model.
   - Evaluating the performance.
   - **(Stretch Goal)** Comparison between models that might give equivalent or better performance based on the data.
4. Bias Detection and Mitigation
   This section will involve:
   - Evaluating if the model is making biased decisions (for the purpose of this project we will only consider based on race/gender).
   - Mitigating these biases.
   - **(Stretch Goal)** Debiasing the dataset.

5. Analysis
   This section will involve:
   - Performance analysis of the model based on hyperparameter tuning.
   - Performance comparison between the unbiased and biased models and the bias performance tradeoff.
6. **(Stretch Goal)** Interpretability
   This section will involve evaluating the interpretability of the model and a detailed analysis of performance vs interpretability tradeoff.

3 Objectives

- Our main objective of this project is to study the propagation of bias through a machine learning pipeline and the different ways we can mitigate it at various levels.
- At the end of this project we want to have made a prediction on a dataset that contains sensitive information, ensure that it is not biased and perform an analysis on the tradeoff of accuracy vs bias in the model.
- Based on the structure of our dataset, ensemble models will be our first choice of models to work with.

4 Group Member Responsibilities

- Saumya Suvarna
  - Exploratory Data Analytics.
  - Bias detection and mitigation.
  - **(Stretch Goal)**Interpretability
- Vijay Yevatkar
  - Data Preprocessing.
  - Modelling and fine tuning.
  - Analysis.

5 Problem Interest

The problem is interesting for the following reasons:

- We are working on real data collected.
- Many AI applications make biased predictions based on sex, race etc and we want to explore the complexity of ensuring that there is a reasonable bias vs accuracy tradeoff.
- Mitigate choices that are motivated by bias and ensure a degree of explainability for our model.
- Ensure these steps can be easily replicated for a wider variety of applications to ensure no significantly biased predictions in any space.

6 Potential Challenges

- One of the major challenges we anticipate with this project is a significant drop in performance with the debiased data/model.
- We might also face the lack of resources in this particular domain if we run into issues.
- Would we be inducing an unknown bias by removing a known bias?

7 TA

We would like to be assigned to Sally Hu as our TA for this project.