The Analysis: The Production of a Death Penalty Execution Method Prediction Model with MATLAB and its Sociotechnical Applications

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Theme, Method, Analysis, and Applications

The algorithm developed explores the administration of the death penalty in murder trials for American defendants since the Gregg v. Georgia Decision of 1976. The first question asked was, based on age, race, and gender, what is the probability of the defendant getting executed with each of five execution methods (lethal injection, electrocution, fire squad, hanging, or gas chamber)? The second question asked was how does the prevalence of execution for murder trials varies by state? Three external sources were used for this project: MathWorks to learn more about and apply specific MATLAB functions, the Wolfram Data Repository to get a data table detailing all death penalties since 1976, and a list of state latitudes and longitudes from Inkplant to make the "geobubble" map.

The first question was explored by first, searching through the column titled "Race" in the "Executions" data table to quantify the number of individuals apart of White, Black, Native American, Asian, and Latino racial groups who were executed using the "find" and "numel" MATLAB functions. The exact process was conducted for female and male gender groups by analyzing the "Gender" column. Age group analyses were conducted by sorting all defendants into seven with a ten-year range using inequalities. The number of individuals in each category was found using the "find" and "numel" MATLAB functions. These findings were represented through bar charts (Figures 1 through 3). With variables from these findings and using the "group counts" function, three comparative tables for race, gender, and age were generated, sorting defendant type (race, gender, and age) and corresponding execution method. The desired values were extracted from these tables and divided by the total number of members of each race, gender, and age group. These analyses were visualized with pie charts (Figures 4 through 17) and demonstrated by asking the user for inputs about the defendant's age, race, and gender. The

algorithm calculates the likelihood of each execution method using the inputs and conditions. Each execution method was assigned to a variable for the given age, race, and gender. These variables were multiplied together to predict the likelihood of the defendant's execution by each method.

Figure 1

Bar Chart Visualizing Quantifications of Death Penalty Administration by Race

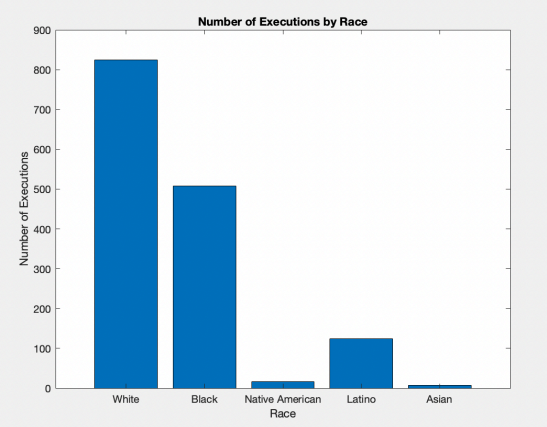


Figure 2

Bar Chart Visualizing Quantifications of Death Penalty Administration by Gender

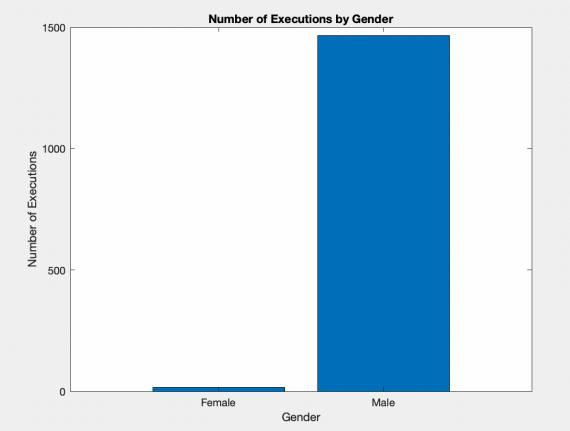


Figure 3

Bar Chart Visualizing Quantifications of Death Penalty Administration by Age

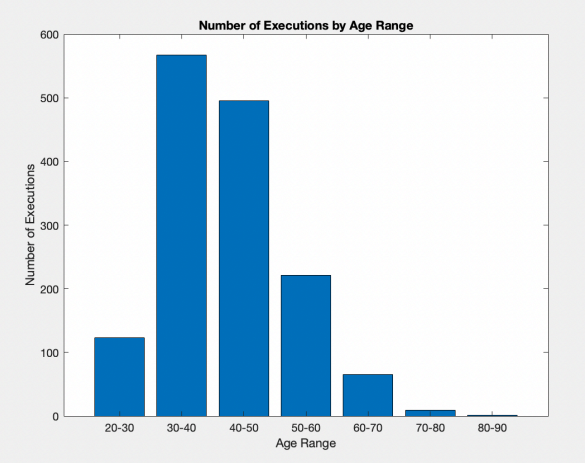


Figure 4

Pie Chart Visualizing Correlations Between Black Racial Group and Execution Method

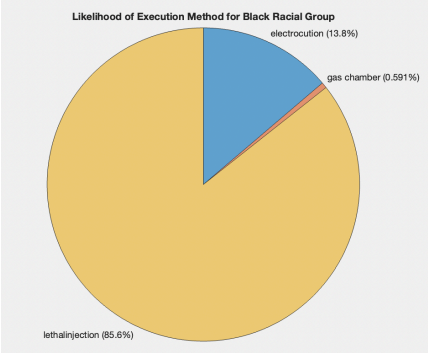


Figure 5

Pie Chart Visualizing Correlations Between White Racial Group and Execution Method

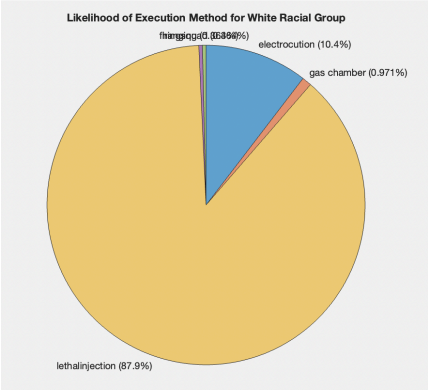


Figure 6

Pie Chart Visualizing Correlations Between Asian Racial Group and Execution Method

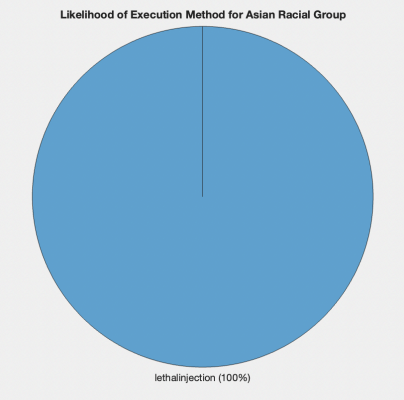


Figure 7

Pie Chart Visualizing Correlations Between Latino Racial Group and Execution Method

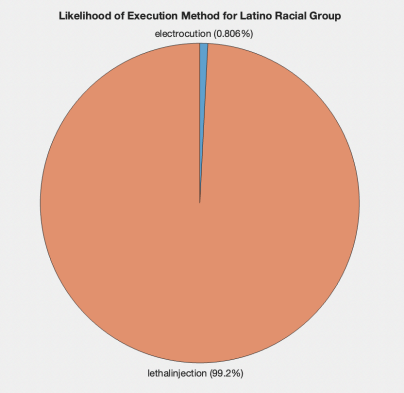


Figure 8

Pie Chart Visualizing Correlations Between Native American Racial Group and Execution Method

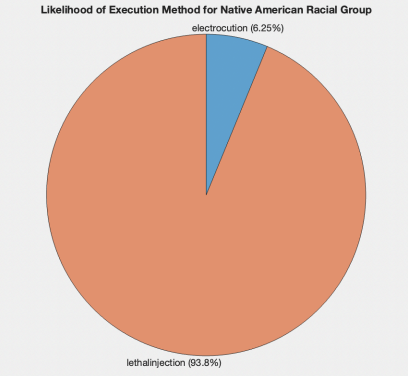


Figure 9

Pie Chart Visualizing Correlations Between Female Gender Group and Execution Method

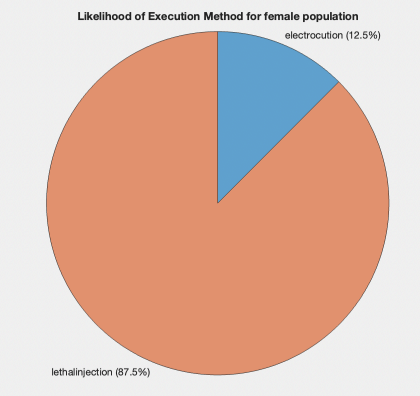


Figure 10

Pie Chart Visualizing Correlations Between Male Gender Group and Execution Method

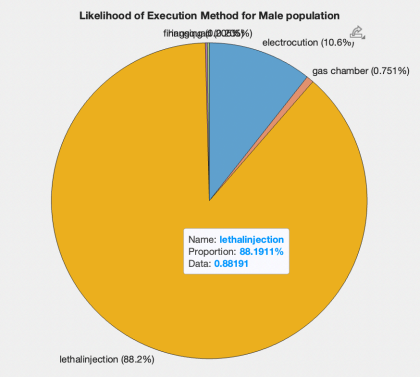


Figure 11

Pie Chart Visualizing Correlations Between 20-30 Age Group and Execution Method

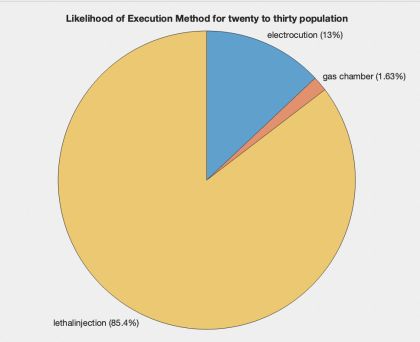


Figure 12

Pie Chart Visualizing Correlations Between 30-40 Age Group and Execution Method

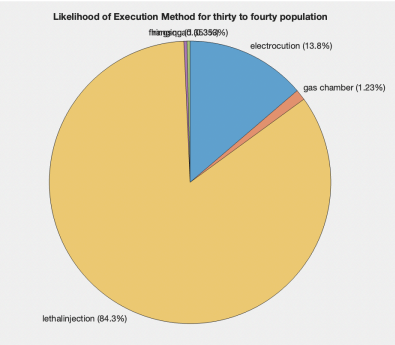


Figure 13

Pie Chart Visualizing Correlations Between 40-50 Age Group and Execution Method

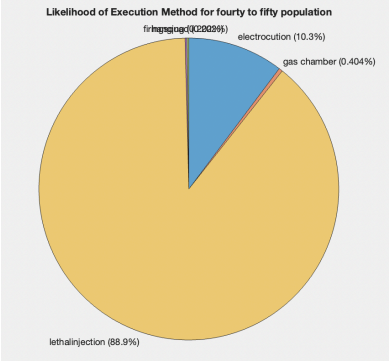


Figure 14

Pie Chart Visualizing Correlations Between 50-60 Age Group and Execution Method

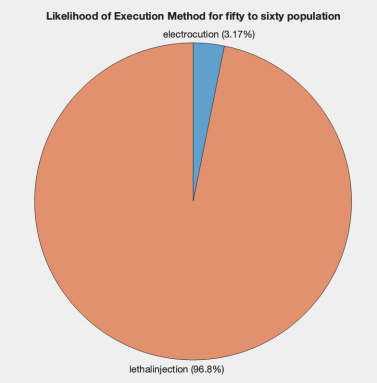


Figure 15

Pie Chart Visualizing Correlations Between 60-70 Age Group and Execution Method

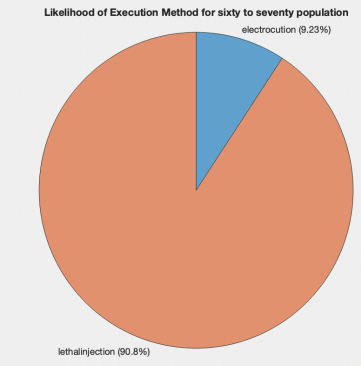


Figure 16

Pie Chart Visualizing Correlations Between 70-80 Age Group and Execution Method

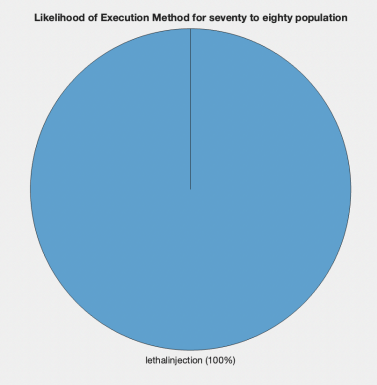
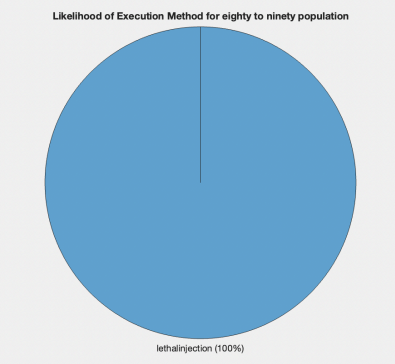


Figure 17

Pie Chart Visualizing Correlations Between 80-90 Age Group and Execution Method



From this analysis, the distinct results were that men, in comparison to women, are executed by the death penalty in much larger quantities and are more often executed by hanging, a firing squad, or a gas chamber (women have no record of being executed by these methods). Additionally, White and Black racial groups are executed by the death penalty in more significant quantities than Latino, Native, American, and Asian racial groups. And, Native American and Asian racial group populations are disproportionately executed by lethal injection in comparison to other races (these groups have no record of being executed by any other method). Lastly, an almost positive linear trend exists between age and the likelihood of being executed by lethal injection. These findings show that despite defendants committing crimes warranting the death penalty as punishment, the specifics of their punishment differ based on their identity, thus providing limited but significant evidence of bias in criminal proceedings. Understanding why these differences in punishment occur could reveal why bias arises and is acted upon in criminal proceedings to help mitigate these occurrences.

The second question was explored by visualizing what the "Executions" data table represented categorically through qualitative analysis. First, the "find" function was employed to total death penalty administration in each state. These values were put into a table with longitude and latitude and inserted into the "geobubble" function to make a map of the United States that used weighted (by size) circular markers to demonstrate how the prevalence of the death penalty varies in each state (Figure 18).

Figure 18

Map of the United States Showing Prevalence of Death Penalty Administration with Weighted Markers

From these analyses, the most distinct trends were that the southeast region of the United States has the most frequent occurrence of the death penalty. Texas outnumbered all the other states significantly with a total of five hundred and fifty-three executions out of the thousand four hundred and eighty total executions. These findings confirm that states in specific regions of the country use the death penalty more than other states and thus prompt further investigation into why these trends occur. For those interest groups who are morally opposed to the death penalty, targeting the southeast region in research and policy implementation would be most effective in mitigating its use.

Further Questions

Based on these analyses, further critical questions regarding racial bias in each state's choice of execution method and the likelihood of death penalty administration based on racial group classifications are of interest. The first part of these questions can be investigated using the "Executions" data table using the "groupcounts" function. Through these processes, a table will be generated comparing the defendants' racial group, state, and execution method. From these tables and methods used in the algorithm to prepare pie charts, new pie charts could display the likelihood of execution based on race and state. These pie charts would visualize how each state

treats members of different racial groups in their administration of the death penalty. To explore the likelihood of the death penalty administration based on the racial group, a data table (either new or the "Executions" data table with appended columns) showing the race of defendants who were found guilty of a standardized crime (for example, murder) by each state and what their punishment was for that crime (death penalty, imprisonment, or isolation) could be analyzed by similar employment of the "groupcounts" function and pie chart visualizations. These are critical questions because they specifically explore how race is correlated with and impacted by the death penalty on a state level.

Bias

The algorithm developed is biased because it does not standardize the crimes committed. It simply shows when and for whom the death penalty was used, but not the degree of the crime committed. Thus, analyses of these data led to correlations between racial, gender, and age groups and how the death penalty was administered without considering context-dependent third variables. These biases could lead to overestimating and underestimating the likelihood of each type of execution method administered to members of all groups. By sorting the data by how many victims were killed and basing the results of the prediction model on these categories, bias could be limited.

Further Sociotechnical Analysis

Although the model does not advantage or disadvantage any individuals in its results, it has gaps in its database that could misrepresent how select individuals are executed as the result of the death penalty. For example, the "Executions" data table lacks data for females who were executed in the gas chamber. Thus, the prediction model will result in a 0% chance of gas

chamber execution for any female defendant. Therefore, although females do not benefit from the results of the algorithm developed, their results are not wholly accurate. Thus, white male defendants have the most data in the "Executions" data table, aligning with historical power imbalances favoring these groups. Collecting more data about why each execution method is administered could help fill these gaps.

Societal values that contribute to bias in administering the death penalty are all forms of xenophobia (racial bias, gender bias, or ageism) are reflected in the "Executions" data table because of the varied representation of select racial, gender, and age groups. The algorithm developed exposes the correlations between race, gender, and age and execution method, thus exposing a mode (unequal punishment) to which xenophobia could lead to unequal treatment under the law. Although employed with limited data, the algorithm is not innately biased in its intent or conclusions.

Much dialogue about the death penalty focuses on moral and political implications in efforts to debate its validity. However, the focus should be on targeted restriction. An example of this would be uncovering why, in states like Texas, the death penalty is over-administered and passing legislation that responds to these findings. Technology can aid these efforts because of its ability to uncover and reveal information. For example, technology can find correlations between defendant identities and death penalty use, as demonstrated. These correlations can be spread to Americans to fuel discussion for, hopefully, interest groups and politicians to respond to. For example, personalities such as Kim Kardashian used her reality fame and internet presence to expose death penalty cases that are potentially falsely concluded, leading to a reversal of death penalty charges. Increasing availability of and access to information about social-political issues makes change feel probable because it leads to action.

References

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Reese, R. J. (1970, January 1). *List of latitudes and longitudes for every State*. Ink Plant. https://inkplant.com/code/state-latitudes-longitudes