NOVA IMS Information Management School

EXECUTIONS IN THE US

DATA VISUALIZATION
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INTRODUCTION

Our project aims to present a comprehensive analysis of the data related to the number of executions carried out in the US, as well as the race, sex, and regional distribution of the executed individuals. Through the use of interactive charts and filters, we provide a platform developed using Plotly and Dash to visualize and analyze the data in a user-friendly manner.

Our project's unique features include the ability to filter the data according to race, sex, and region, enabling users to draw insights and identify patterns within the data. By doing so, we aim to contribute to the ongoing discourse surrounding the death penalty and its impact on different communities within the United States.

DATA AND METHODS

In order to approach this theme, we used a dataset from Kaggle that contains data about people that were executed in the United States, between the years 1977 and 2023, including the number of victims the perpetrator murdered, their races, the sex of the executed person, and the date of their execution. This publicly available dataset is owned by Johnny Shollaj and was last updated in February 2023.

We performed data preparation, which consisted of the correction of incoherences, and ended up with a final dataset that contained only the variables that would be used in our visualizations, which may be observed in *Table 1*, as well as a brief explanation of the variables.

Variable	Type	Description
Number of Victims	int64	Number of victims of the perpetrator
Country	object	Perpetrator's country ('United States')
Race	object	Perpetrator's race
Sex	object	Perpetrator's sex
Region	object	Perpetrator's region ('West', 'South', 'Midwest', 'Northeast')
Execution Volunteer	object	Did the perpetrator volunteered to be executed? (yes or no)
State	object	Perpetrator's state
Foreign National	object	Is the perpetrator a foreign national? (Yes or No)
Execution Date	datetime64	The date the perpetrator was executed
Execution Year	int64	The year the perpetrator was executed
Number of White Victims	int64	Number of white victims of the perpetrator
Number of Black Victims	int64	Number of black victims of the perpetrator
Number of Latino Victims	int64	Number of latino victims of the perpetrator
Number of Asian Victims	int64	Number of asian victims of the perpetrator
Number of Native American Victims	int64	Number of native american victims of the perpetrator
Number of Other Race Victims	int64	Number of other race victims of the perpetrator
State Code	object	Code of the perpetrator's state

Table 1 - Variables' description

This project was carried out using Plotly, with Dash software, and was finally deployed online using the 'Onrender' platform. Our code can be consulted in this GitHub page, and our final dashboard can be seen here.

INTERACTIVE CHOICES

This Dashboard allows the user to select all available data by using a total of 5 different filters, namely: drop-down for sex and race, check box for volunteer executions and non-USA nationals, and a “range slider” that allows the user to select a specific period in time. It’s also worth noticing that the user doesn’t have to use all available filters, it can use how many filters it wants to visualize the desired information. Furthermore, it´s important to note that whilst all filters affect all available data visualization, the race drop-down filter only influences the USA map (the first available output).

VISUALIZATIONS

Filtered data is displayed by using 6 different visualizations, each focusing on different ways of showing the users desired information. The two first visualizations are the more generic ones, the USA map showing the number of executions per state, and a multi-level pie chart with the number of executions by sex and race. Subsequently, the dashboard also displays the data by using more specific and detailed charts, namely executions per race over time, executions per race and region, executioners´ race vs victims' race, and execution date vs region.

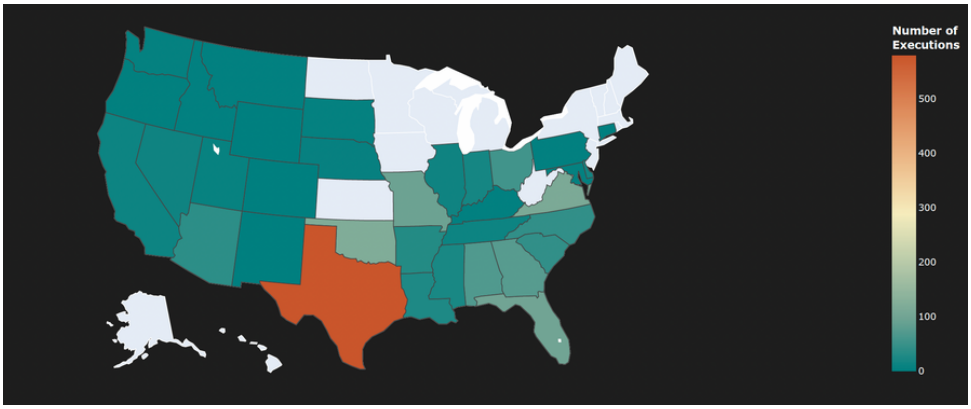
Regarding the first visualization, it is a choropleth map, in which colours represent the number of people who were executed in each state, where warmer colours represent higher values and colder ones represent lower values. Then, we have a multi-level pie chart, in which the interior layer corresponds to the sex, and the outer layer to the race. Thus, this graphic represents the total number of executions by sex and by race.
Furthermore, we created a line chart that shows the yearly evolution of the number of executions by race, and a nested bar chart that shows the total number of executions by race and region, where the race is represented in the x-axis, and the regions of the perpetrators are displayed with different colors in each bar. Regarding this bar chart, we decided to apply a logarithmic function to the values, so that we would be able to better identify the differences among the several races, since, with the original data, the columns corresponding to the white and black races were huge, whilst the remaining columns had almost no values and no distinction could be made.
It was also included a heatmap that correlates the race of the executed people with their victims' race and, finally, a scatter plot that shows the number of people executed per year and region, where the size of the circles represents the number of executions.

RESULTS AND DISCUSSION

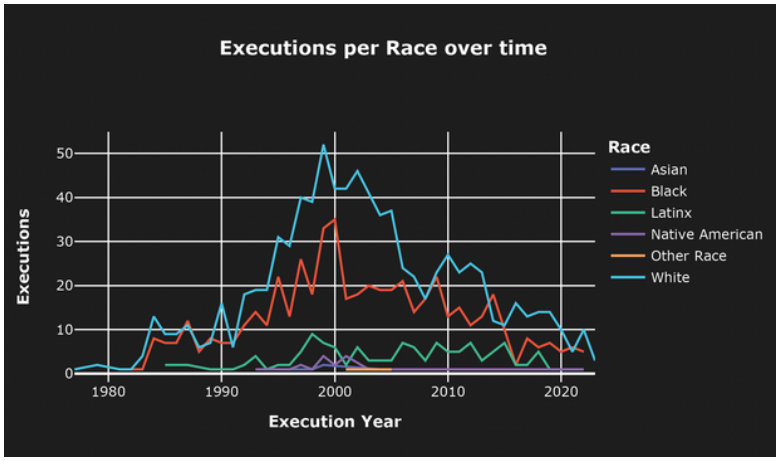
Regarding the encoding choices on our visualisations, we took the opportunity of having data of executions with categorical labels of regions and states to add to our visualisations a positional channel. In the case of the US map, we summarise the executions by state, adding color/saturation encoding to express the extent of the executions in the specific state. Furthermore, we make use of region information to segregate data and summarise it based on the regional positioning of the executions, allowing to understand the area-specific numbers and distinctions.

We also utilize size encoding to capitalize on understanding the volume of executions through the years in the scatter plot. On our heatmap, we use color to express the extent of murders between the different races and we also use color to distinguish the diferent races on the line graph with executions per race.

In a more interpretive light, it is evident that death penalty executions are much more prominent in the South that in other regions, with Texas being a state that stands out very clearly when compared with its vicinity.



Executions have also been on a steady decline since the turn of the century, with some states even abolishing the practice completely.



We opted to also explore with a more racial perspective. Based on the population estimates from the U.S. Census Bureau, the Caucasian to African American ethnicity population ratio is of about 6:1. This means that for every one Black or African American person in the United States, there are roughly six Caucasian people. However, the execution data over the years shows a ratio of white to black executions ratio closer to 4:3, rising even to 1:1 in some years, proving that people of African American ethnicity are much more likely to be executed than people of Caucasian ethnicity (considering the population sizes).

CONCLUSION

In conclusion, this project provides valuable insights into the history and current state of death penalty executions in the United States.

Through the use of interactive visualisations, we explored trends in execution rates over time, as well as variations in the number of executions by state, race and sex. The data showed a decline in the use of the death penalty in recent years, with fewer executions taking place overall and a decreasing number of states using the death penalty as a form of punishment. However, there still remain significant disparities in the use of the death penalty across different states, with some states in the south continuing to use the punishment much more frequently than others. We also identify some racial disparities in the application of the death penalty. Even though African Americans represent a minority in the population, they have accounted for a disproportionate number of executions in the country.

By providing an interactive and engaging way to explore this complex data, this project has helped to shed light on a critical issue in the criminal justice system in the United States of America.
It is our hope that this project will contribute to ongoing discussions and debates about the use of the death penalty in the United States, and ultimately help to inform policy decisions that can promote greater equity and justice for all.

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