

CS 6630 Visualization for Data Science Project



HATE CRIMES IN USA

SAI VARUN u1210409

MAITREY MEHTA u1201309

SHALIN PARIKH u1206312

Project Website:

<https://caffeine96.github.io/hatecrimesinus.github.io>

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OVERVIEW AND MOTIVATION

The current rise in the amount of hate crimes in the United States motivates us as students to use the power of data to present a clean and a correct visualization. We hope that this visualization would enable users to analyze the data and infer vital insights.

We believe that there aren't enough sources currently present that provide an exhaustive analysis into the type of hate crimes that span over a varied number of attributes. We plan to present data over a long period of time and aim to observe some patterns. We also want to inspect the crimes occurring both geographically and demographically over the entire country. This would enable the user to have a holistic view of the data and also focus on the specifics.

PROJECT OBJECTIVES

- To see what kind of hate crimes are prevalent over the United States.
- To see which states are unsafe.
- To see trends in the crimes over the years.
- Provide a metric for comparison between various states based on the crimes committed.
- To analyse how a particular race has been affected over the years.

DATA

The data is a 12 table dataset, obtained from

<https://ucr.fbi.gov/hate-crime/2016/topic-pages/incidentsandoffenses>.

We would be using the years from 2008 - 2016 for our trend analysis. The only missing data in the dataset is certain blank rows for crime values in a city. They can be safely set to 0 and the aggregate values of the other tables aren't affected.

Our data can be categorised into:

- Statistics of the Incidents and offenses.
- Statistics on the victims.
- Statistics on the offenders.
- Split of the above statistics based on jurisdiction (i.e. state)

DATA

Since we have this data over several years, we can use it to view trends or patterns in the crimes. On the whole, our visualization will be split into a visualization for the current year and a trend visualization over the years.

The different tables in the dataset give different aggregations. We'll be using the tables individually for our charts.

Examples of tables in our dataset are as follows

DATA

Incidents, Offenses, Victims, and Known Offenders
by Bias Motivation, 2016

| Data Declaration Download Excel | | | | |
|--|-----------|----------|----------------------|------------------------------|
| Bias motivation | Incidents | Offenses | Victims ¹ | Known offenders ² |
| Total | 6,121 | 7,321 | 7,615 | 5,714 |
| Single-Bias Incidents | 6,063 | 7,227 | 7,509 | 5,714 |
| Race/Ethnicity/Ancestry: | 3,489 | 4,229 | 4,426 | 3,344 |
| Anti-White | 720 | 876 | 909 | 834 |
| Anti-Black or African American | 1,739 | 2,122 | 2,220 | 1,544 |
| Anti-American Indian or Alaska Native | 154 | 161 | 169 | 114 |
| Anti-Asian | 113 | 131 | 137 | 114 |
| Anti-Native Hawaiian or Other Pacific Islander | 9 | 9 | 9 | 9 |
| Anti-Multiple Races, Group | 136 | 178 | 190 | 114 |
| Anti-Arab | 51 | 56 | 57 | 64 |
| Anti-Hispanic or Latino | 344 | 449 | 483 | 344 |
| Anti-Other Race/Ethnicity/Ancestry | 223 | 247 | 252 | 174 |
| Religion: | 1,273 | 1,538 | 1,584 | 834 |
| Anti-Jewish | 684 | 834 | 862 | 414 |
| Anti-Catholic | 62 | 63 | 65 | 44 |
| Anti-Protestant | 15 | 20 | 22 | 14 |
| Anti-Islamic (Muslim) | 307 | 381 | 388 | 244 |
| Anti-Other Religion | 74 | 90 | 91 | 64 |
| | | | | |

DATA

Table 2

Incidents, Offenses, Victims, and Known Offenders
by Offense Type, 2016

[Data Declaration](#) [Download Excel](#)

| Offense type | Incidents ¹ | Offenses | Victims ² | Known offenders ³ |
|--|------------------------|----------|----------------------|------------------------------|
| Total | 6,121 | 7,321 | 7,615 | 5,770 |
| Crimes against persons: | 3,765 | 4,720 | 4,720 | 4,353 |
| Murder and nonnegligent manslaughter | 5 | 9 | 9 | 9 |
| Rape (revised definition) ⁴ | 24 | 24 | 24 | 29 |
| Rape (legacy definition) ⁵ | 0 | 0 | 0 | 0 |
| Aggravated assault | 684 | 873 | 873 | 1,031 |
| Simple assault | 1,458 | 1,687 | 1,687 | 1,857 |
| Intimidation | 1,577 | 2,109 | 2,109 | 1,409 |
| Other ⁶ | 17 | 18 | 18 | 18 |
| Crimes against property: | 2,519 | 2,519 | 2,813 | 1,618 |
| Robbery | 134 | 134 | 163 | 249 |
| Burglary | 123 | 123 | 138 | 87 |
| Larceny-theft | 231 | 231 | 253 | 173 |
| Motor vehicle theft | 20 | 20 | 21 | 14 |
| Arson | 39 | 39 | 51 | 33 |
| Destruction/damage/vandalism | 1,913 | 1,913 | 2,122 | 1,015 |
| Other ⁶ | 59 | 59 | 65 | 47 |
| Crimes against society ⁸ | 82 | 82 | 82 | 97 |

EXPLORATORY DATA ANALYSIS

We have decided to implement our design using the Five Design Sheet Methodology.

The following images represents a sequential and a iterative process of our thinking.

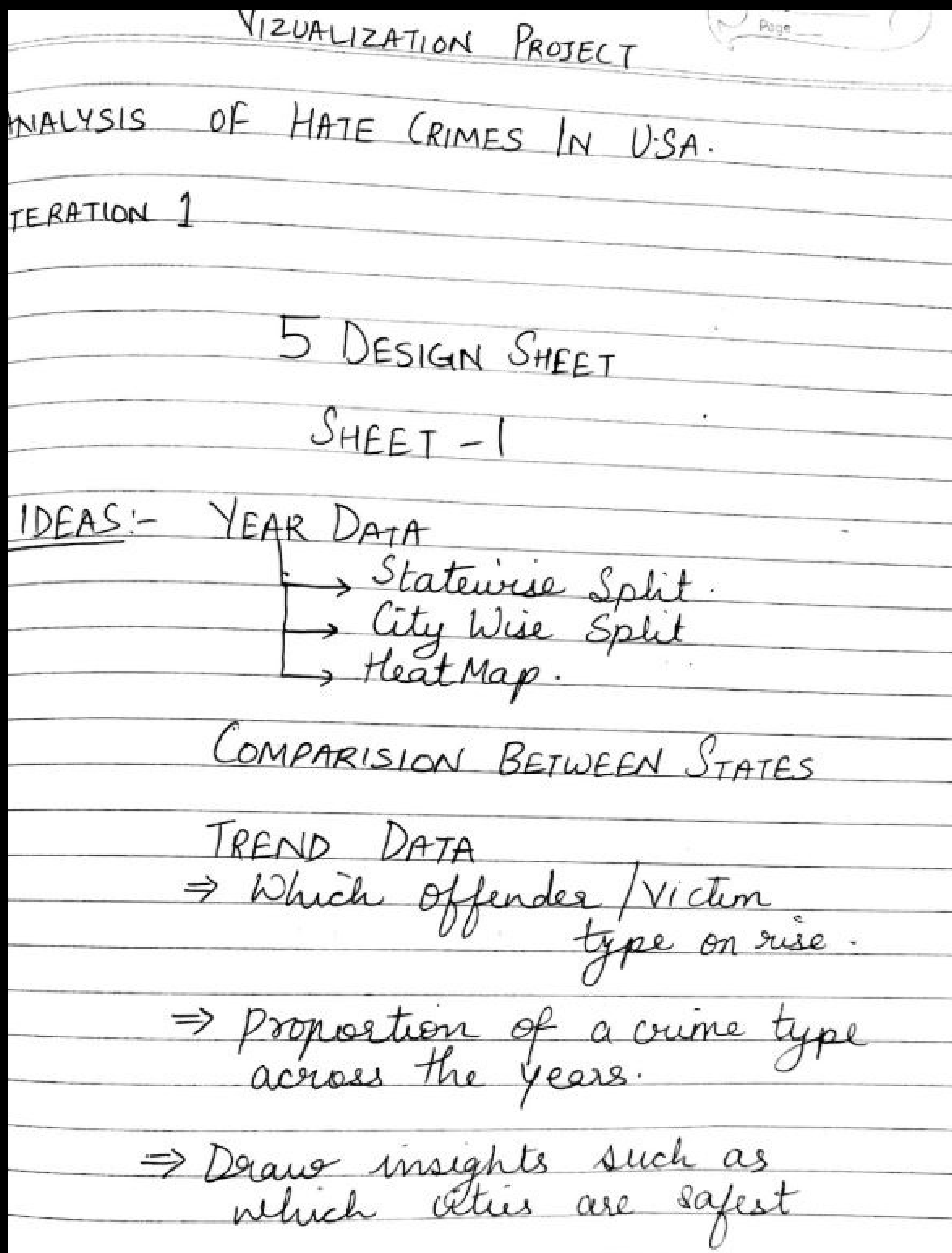
We have sketched our interpretation of the data representation that according to us would be the most apt in visualizing the data.

We have thoroughly analyzed our data set to show each entity true to its data value that it encodes.

We have followed the standard design guidelines to the best of our capabilities to minimize any form of discrepancies between the data and its realization.

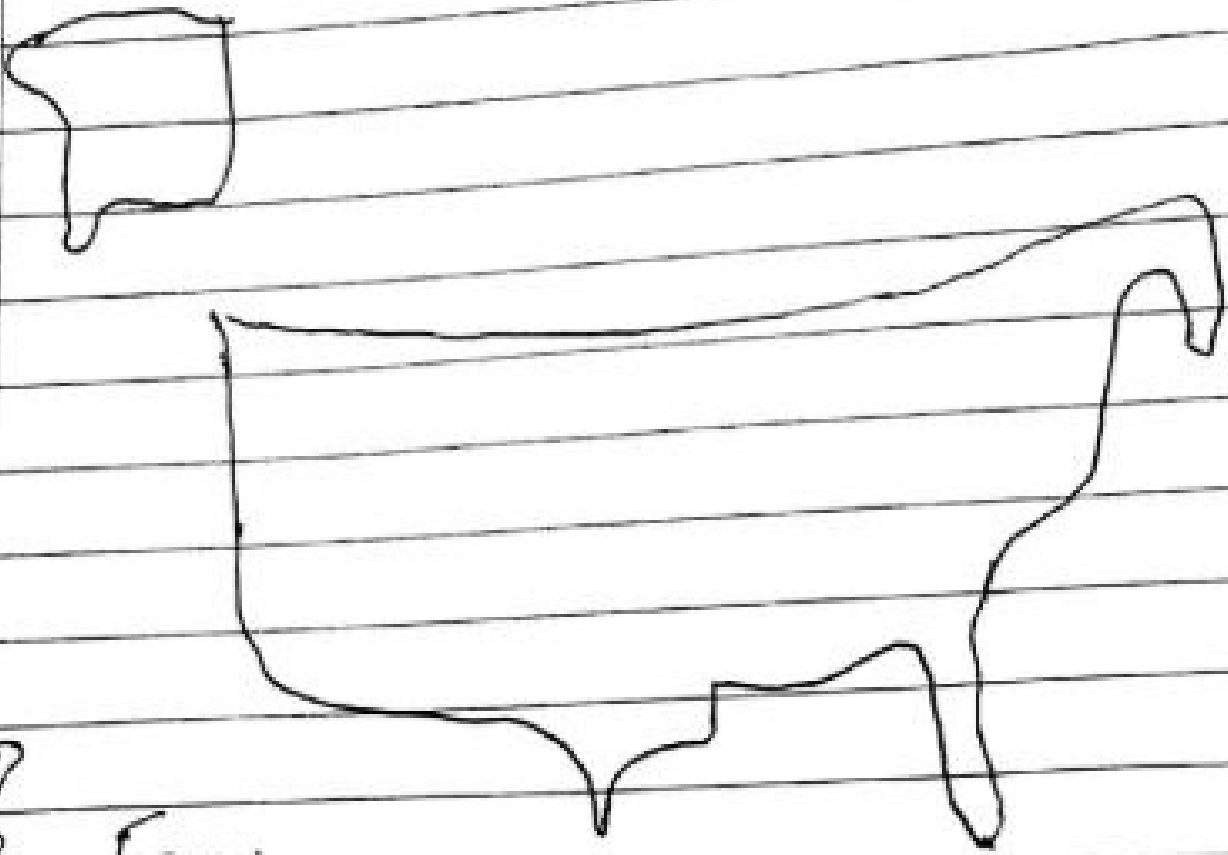
Each chart and or diagram has been carefully sketched, keeping in mind the larger demographic of users and using the most suitable Marks and Channels.

EXPLORATORY DATA ANALYSIS



EXPLORATORY DATA ANALYSIS

SHEET- 2



Focus

1. Color encode ^{or heatmap} each state on crimes/pop
2. Clicking on state will switch the other charts.
3. * Allow semantic zooming, zoom to a treemap or a particular state.

How user operates

1. Picking an year to change colors on map
2. Clicking to filter by state
- 3.

Disadvantage/Advantage.

1. Looks on exact map, size of the states is visible.
2. Smaller states won't be efficiently visualized.
3. In cartogram, everything is space equal.
4. Adv, most accurate representation of map.

EXPLORATORY DATA ANALYSIS

SHEET T-3

Tree map + Bar graph

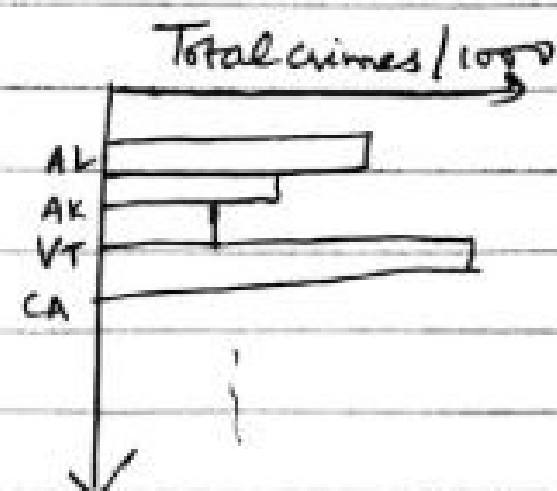
↓ Crime type

| | |
|--------|--------------|
| Murder | Robbery |
| Abuse | |
| | Rape Assault |

OR

Motivation ~~State~~ type

| | |
|----------|---|
| Religion | R |
| | A |
| GENDER | C |
| | E |



Focus

1. We want to show the total crimes committed in a state for that year.
2. length is the best encoding for values.
3. We will use tree map to show proportions of crimes / Motivations.
4. These charts change on the basis of state selected.

How user operates

1. User can select a new state to modify this chart.
2. User can click radio buttons on bar chart to sort it.
3. User can select a value from tree map to modify trend lines below.

Advantage/Disadvantage

1. Tree map would show area proportion better.
2. Sorting in bar chart, the labels have to be maintained.

EXPLORATORY DATA ANALYSIS

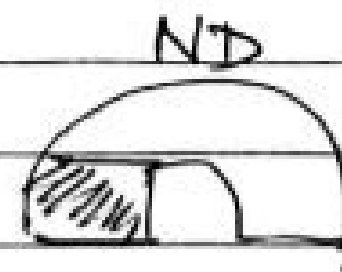
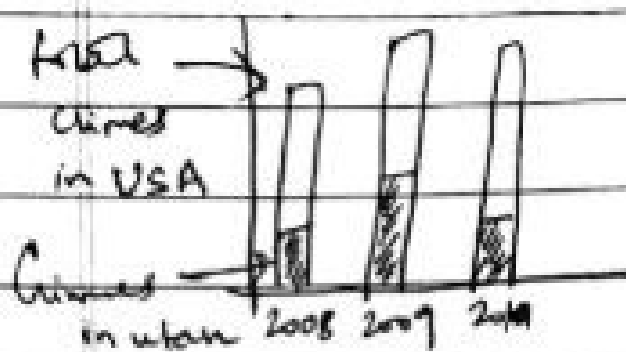
SHEET - 4

Trend charts

- Proportions of crime types in a year ~~year~~, visualise the trend.
- Trends across a crime type / motivation type / offender type.

Comparing different states

- Donut charts ~~to~~ compare state values



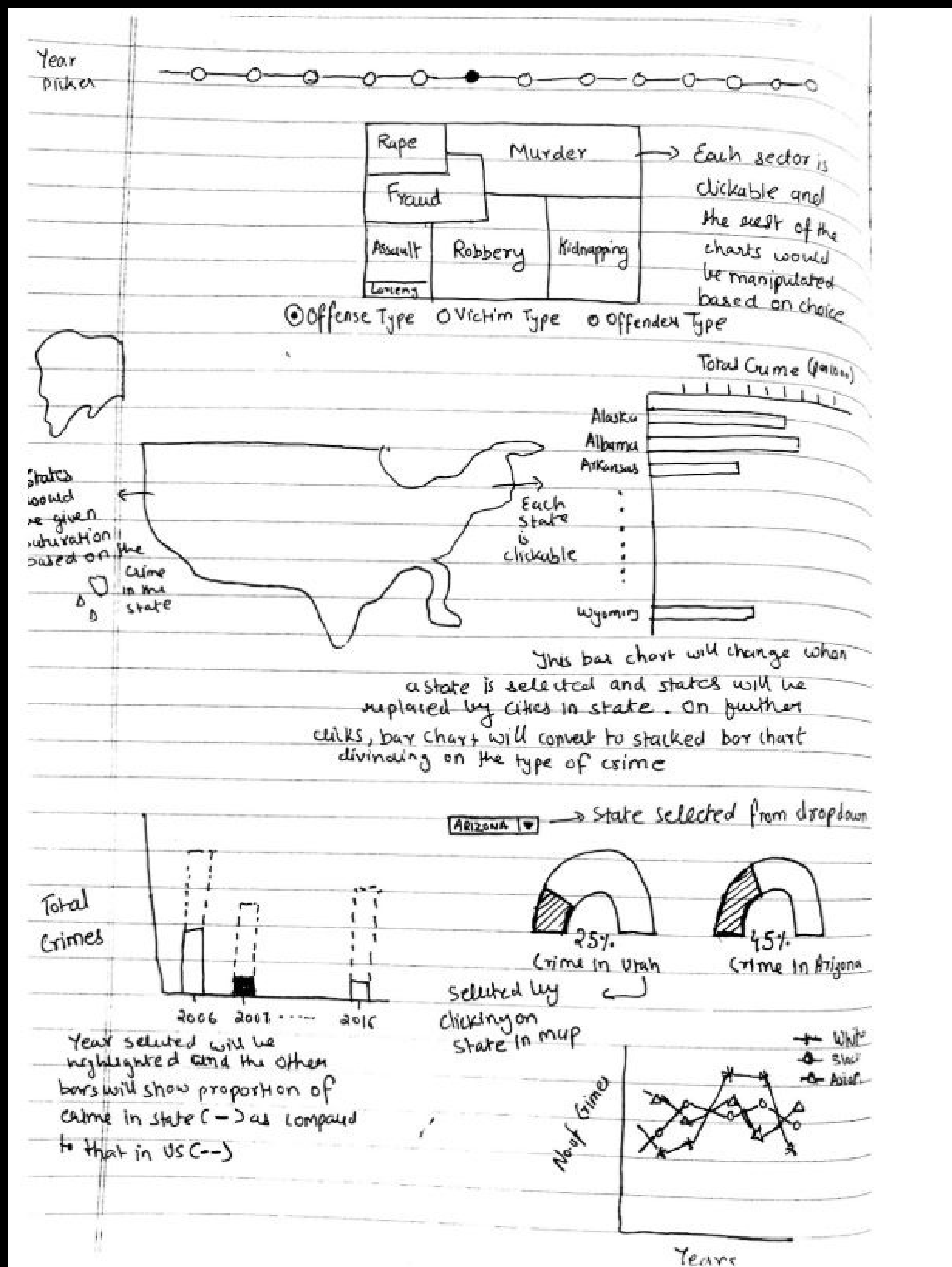
Focus

1. In trends we want to show both proportion & change in proportion over time. Length is best to use to show proportion.
2. For comparison we use donut charts as we have used length encoding everywhere else.
3. State selection from map affects both charts.
4. Dropdown for second state to compare with.

Advant/Disadvantage

1. Bar chart has two different info.
2. Donut has area encoding but looks better for comparison.
3. We need to have a dropdown for states.

EXPLORATORY DATA ANALYSIS



DESIGN EVOLUTION AND IMPLEMENTATION

We have many charts to be represented so we selected a **Tabbed View**.

This enables a user to choose and select what it wants to choose.

In this way we avoid clutter and also visual overload

Summary

Stats on a Map

Stats Breakdown

Compare States

Victims

DESIGN EVOLUTION AND IMPLEMENTATION

We use a Spiral Chart to represent how various races are affected by the hate crimes that have been inflicted over the years.

Each bar height encodes the number of crimes.

The years are encoded by color to be easily distinguishable.

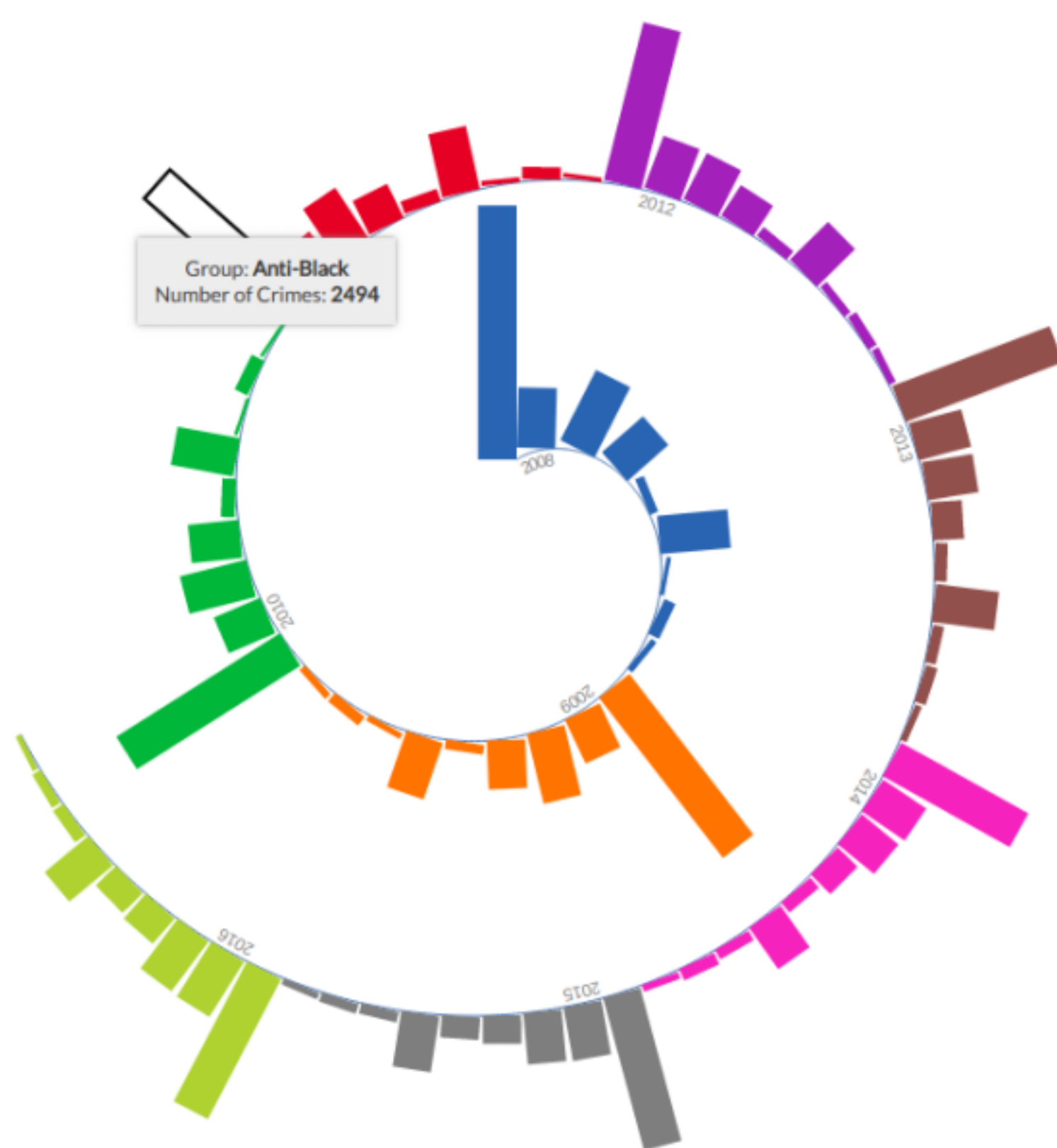
This provides a holistic view of the data.

The victim type and the number of crimes inflicted can be viewed on hovering.

DESIGN EVOLUTION AND IMPLEMENTATION

The chart below represents the number of crimes each year on different ethnic groups

Hover on the bars to see the values



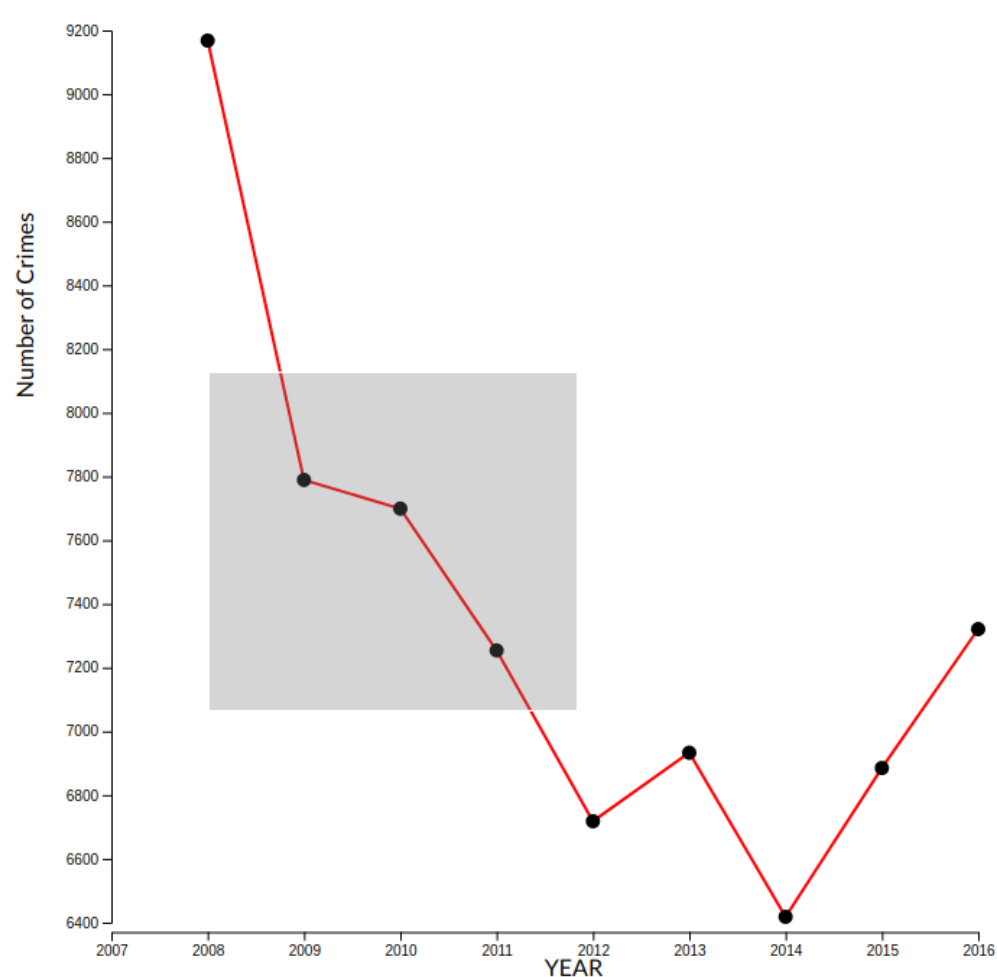


DESIGN EVOLUTION AND IMPLEMENTATION

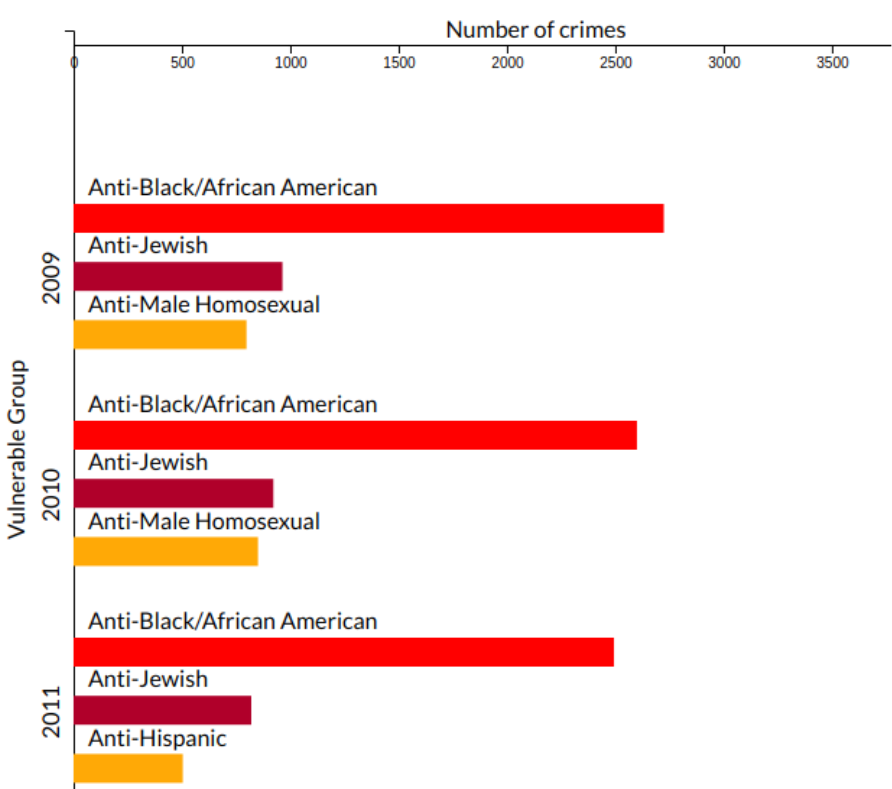
We use a Line Chart to show the trend that can be derived from the number of hate crimes. We have applied Brushing enabling the user to select multiple years and observe the top 3 affected race providing a comparative analysis.

DESIGN EVOLUTION AND IMPLEMENTATION

Below are the total number of crimes across the years
Brush on a point to know the vulnerable groups for that year



In this trend, we see
there was a sharp dip in crime from 2008 to 2014,
after which it started to pick up.



DESIGN EVOLUTION AND IMPLEMENTATION

The entire visualisation is controlled by a year picker chart

Visualization of Hate Crimes in United States

Summary Stats on a Map Stats Breakdown Compare States Victims

2008 2009 2010 2011 2012 2013 2014 2015 2016

DESIGN EVOLUTION AND IMPLEMENTATION

In the first tab we show the statistics on the map of USA, along with the crimes per million per state on a bar chart.

Both the charts are linked, hovering over one or the other highlights the respective state or the bar.

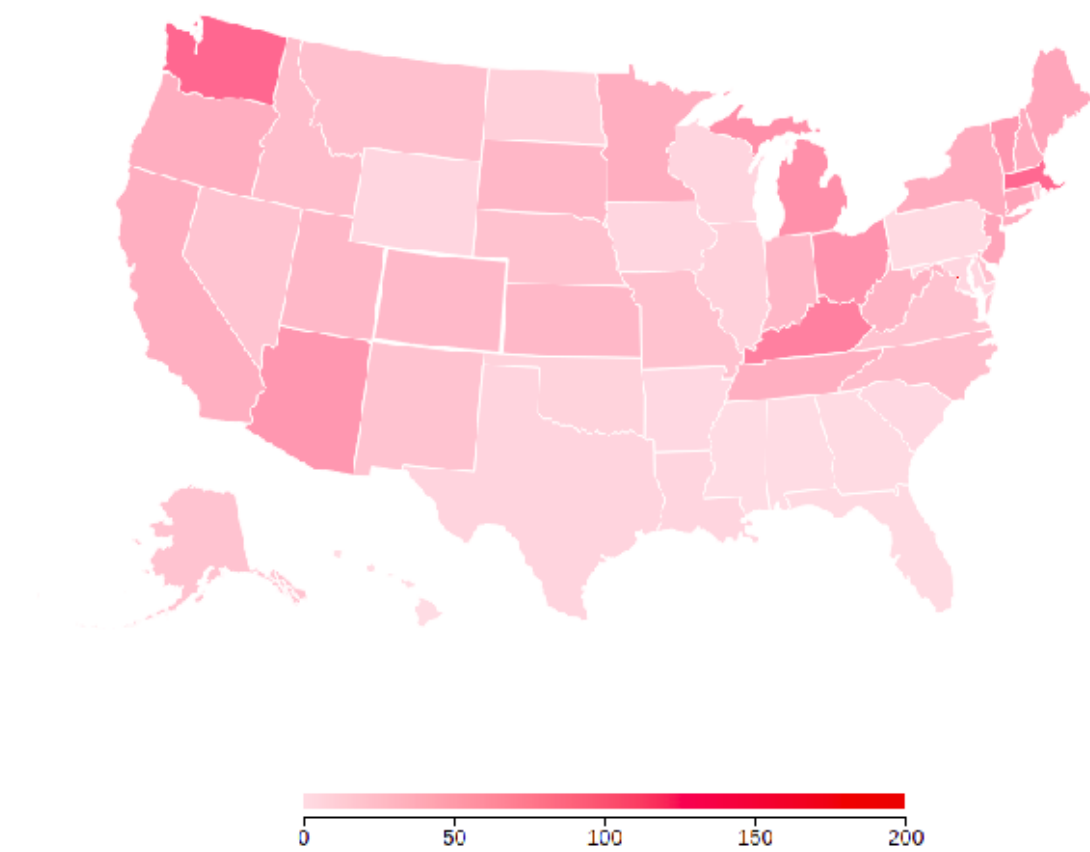
We have also implemented a scale to show the severity of the crime statistics in the particular state.

We also depict the exact crime numbers in an info box, providing accurate information.

DESIGN EVOLUTION AND IMPLEMENTATION

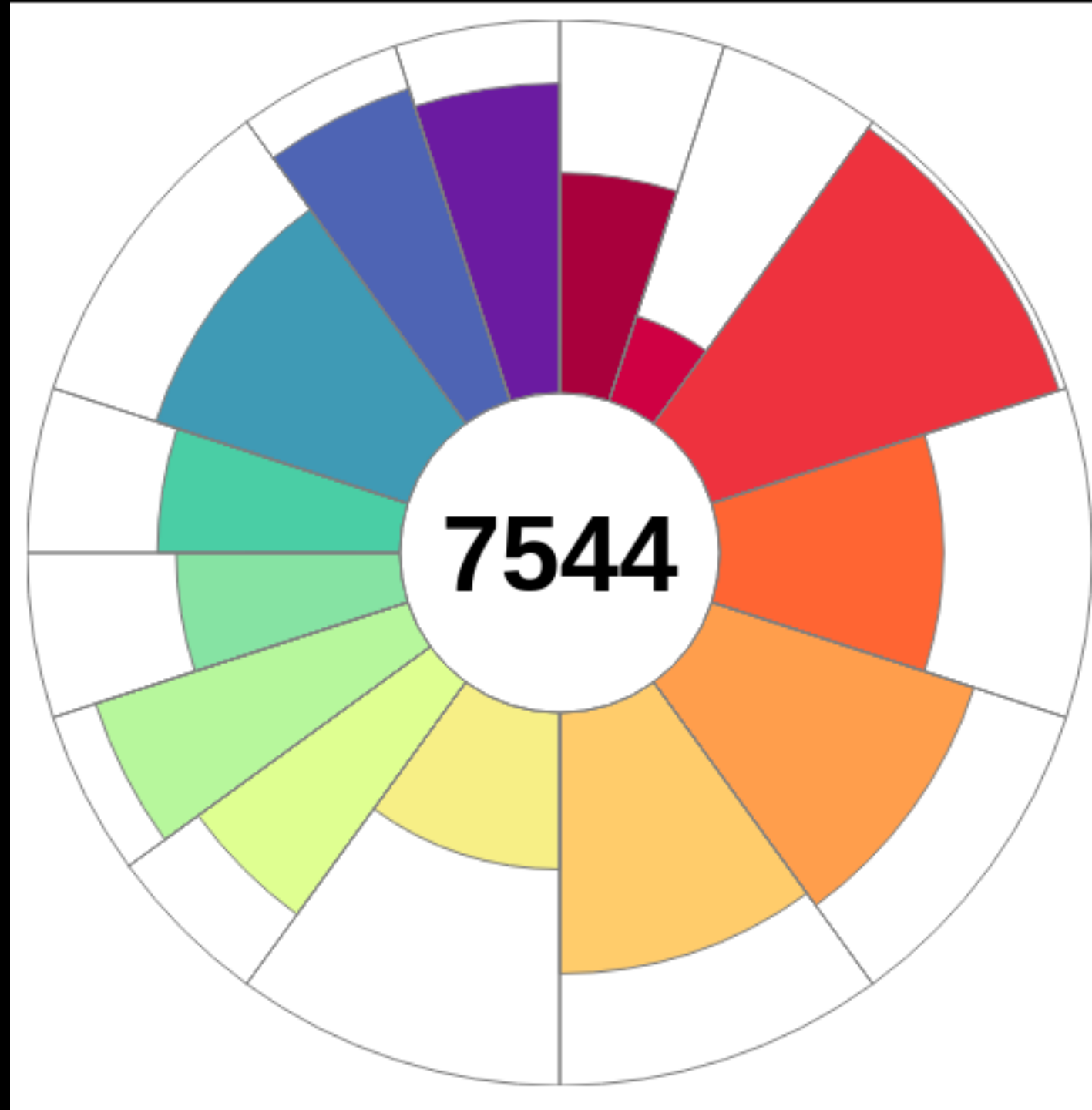
This chart shows the geographical distribution of the crimes
Hover on a state to know more of its details for that year

Colorado
Crime per million: 22.78



DESIGN EVOLUTION AND IMPLEMENTATION

The yearly distribution of the crimes are represented by proportion using an Aster Chart. Each segment of the aster represents the crime type and the area occupied is representative of the quantitative value of the number of offenses of those type



DESIGN EVOLUTION AND IMPLEMENTATION

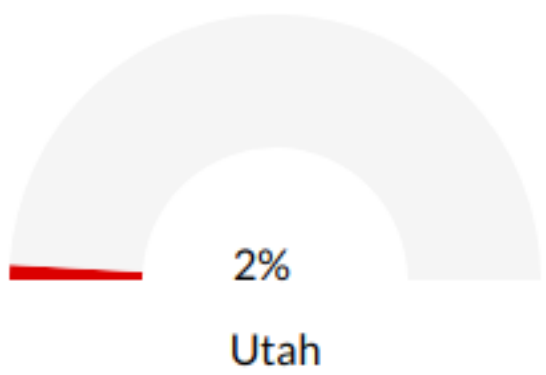
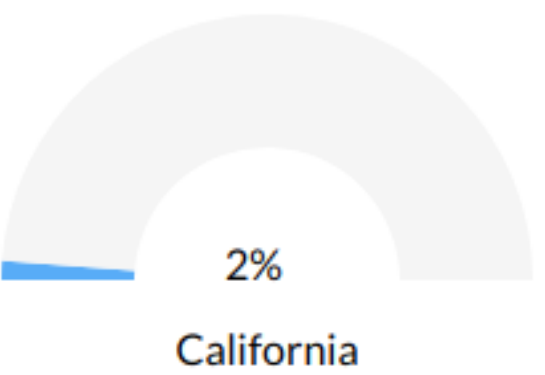
We wish to provide an in depth comparison between the states so we plot the various crimes committed in the state on a Radar Chart. This gives the user an accurate inspection of how various states are stacked against each other. We also provide a drop down to facilitate easy selection of states. To provide a more zoomed-out view we also show 2 Semi-Donuts filled with the percentages of the crime occurring in the selected states when compared to USA in its entirety.

DESIGN EVOLUTION AND IMPLEMENTATION

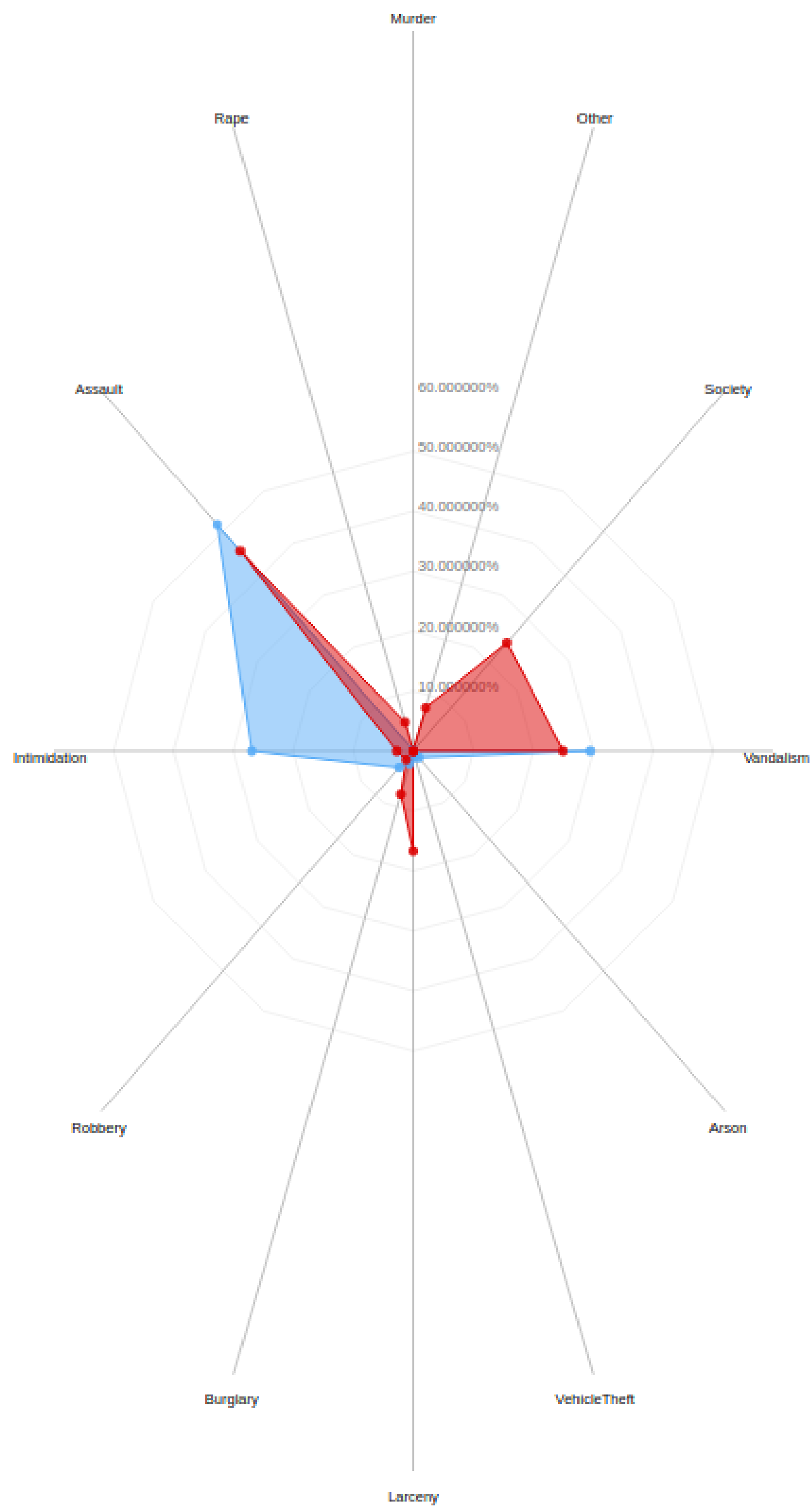
Use the charts below to compare the states
The radar chart depicts the comparison on various parameters

California ▼

Utah ▼



DESIGN EVOLUTION AND IMPLEMENTATION



The background of the slide is a solid black triangle pointing upwards, centered on the page. The top-left corner of the slide features a red background with white polka dots. The bottom-right corner also features a red background with white polka dots. The title is written in a bold, white, sans-serif font, centered within the black triangle.

DESIGN EVOLUTION AND IMPLEMENTATION

Finally, in the last tab we show a slowing growing chart to depict the number of crimes occurring based on race and religion.

We choose a slow growing animation to hit the point home about the severity of the crimes and how people are getting affected.

DESIGN EVOLUTION AND IMPLEMENTATION

This chart depicts statistics on the victims of the crime
Most of the crimes across the years were Anti-Race and Anti-Religion



Total victims of hate crime
this year
4,820



Total victims of racial crime
this year
4,426



Total victims of anti-religion crime
this year
862

EVALUATION

We believe that we have represented the data with utmost integrity.

We have adhered to the principles of expressiveness and effectiveness while still maintaining an aesthetically pleasing visualisation.

We have drilled down our data to represent the necessary and correct information.

Our visualisation works in a seamless manner, we make sure to not overload the screen while ensuring the message is conveyed.

In hindsight, we could have inculcated a tad more animation to make it visually appeasing.

