CS 590V: Data Visualization and Exploration

Homework 4: April 11th, 2017

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Dataset: Crime in Context, 1975-2015

https://www.kaggle.com/marshallproject/crime-rates

This data was collected and analyzed under the Marshall Project. They collected the last 40 years' crime reports from 61 police agencies. These reports contain information on the four major crimes that the FBI classifies as violent — homicide, rape, robbery and assault — in 68 police jurisdictions with populations of 250,000 or greater. They calculated the rate of crime in each category and for all violent crime, per 100,000 residents in the jurisdiction, based on the FBI's estimated population for that year.

Metadata:

The table contains around 2.8k records and 15 columns (planning to add up to 15k records).

File size: 257.75 KB

Column Description:

Column Name	Description	Data Type
report_year	Year the data was reported (1975-2015)	Numeric
agency_code	Code of the agency which reported the data	String
agency_jurisdiction	Jurisdiction area of the agency (City, State code)	String
population	Population of the area	Numeric
violent_crimes	Total number of violent crimes in the area	Numeric
homicides	Number of homicides	Numeric
rapes	Number of rapes	Numeric
assaults	Number of assaults	Numeric
robberies	Number of robberies	Numeric
months_reported	Month of the year for which the data was reported	Numeric
crimes_percapita	Number of crimes per 100,000 residents	Numeric
homicides_percapita	Number of homicides per 100,000 residents	Numeric
rapes_percapita	Number of rapes per 100,000 residents	Numeric
assaults_percapita	Number of assaults per 100,000 residents	Numeric
robberies_percapita	Number of robberies per 100,000 residents	Numeric

Data preprocessing tasks:

1. To learn how to work with larger datasets, I will write a report to create additional records (up to 15k) and combine it with the existing dataset.
2. Missing values (technique to be decided)
3. Separate the city and state code values from *agency_jurisdiction* column.
4. Find the latitude and longitude values for the location (city, state code).

Interest

By analyzing and visualizing this data, I am trying to find the answers to the following questions-

- Is crime in America rising or falling?
- Which cities have a higher crime rate? Which cities are safer?
- Is there a relation between the time of the year and the crime rate?
- What type of crime are you more susceptible to in a given area?
- Is the crime rate dependent on the population of the area? If yes, how?

Analytics

1. Aggregation:
   - For every year,
     - For every state,
       1. calculate the total and average number of violent crimes
       2. calculate the crime per capita
       3. calculate the total and average number of rapes, assaults, robberies and homicides
     - For every city,
       1. calculate the total and average number of violent crimes
       2. calculate the crime per capita
       3. calculate the total and average number of rapes, assaults, robberies and homicides
2. Clustering: clustering the cities into 2 groups *safe* and *unsafe* based on
   - Total violent crimes
   - Crimes per capita
   - Total rapes/assaults/homicides/robberies

The user will be able to select one of the above-mentioned criteria to cluster the cities. The threshold for clustering will vary with each criterion and still needs to be decided.

Visualizations

The following visualizations will be used:

1. Geo-spatial (US map) heatmap: To show the crime rate in different regions of the US
2. Time series chart: To select a range of years between 1975 to 2015
3. Scatter plot: To show the cluster of *safe* and *unsafe* cities
4. Pie chart: To show the distribution of crimes (rape, assault, homicide and robberies)
5. Line Chart: To show the trend in different type of crimes over the years (zoom to months)
6. Histogram: To show how the population of an area affects the crime rate
7. Table: To show detailed crime records of an area

Interactions

All visualizations will be linked with each other.

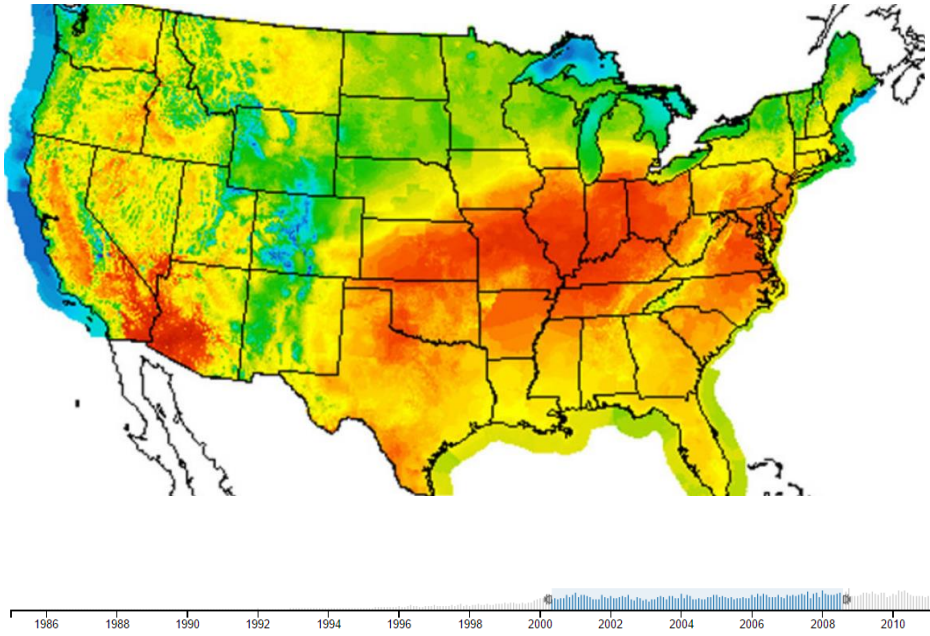
1. Geo-spatial (US map) heatmap: Zoom (view details of cities in the selected area), selection and probing (display the crime statistics of the area)
2. Time series chart: Selection (a range of years)
3. Scatterplot: Selection (select a group of cities) and probing (display the details of a city)
4. Pie Chart: Selection (select specific types of crime) and probing (display the numbers and percentage of the chosen crime type)
5. Line Chart: Zoom (view the crime rate trend over a selected year) and probing (display number of each crime type for the selected year)
6. Histogram: Selection (select population ranges) and probing (display crime statistics for the selected population range)
7. Table: Selection (select specific crime records of interest) and sorting (sort table based on different columns)

Other features:

1. Parameter Selection for heatmap: View visualizations on Total Crimes (default) or Crimes per capita
2. Parameter Selection for scatterplot: Select criterion for clustering cities
3. Reset all graphs (clear all filters)

CRIME IN CONTEXT: 1975-2015

Descriptive text goes here --- Is crime in America rising or falling? Which cities have a higher crime rate? Which cities are safer? Is there a relation between the time of the year and the crime rate? What type of crime are you more susceptible to in a given area? I s the crime rate dependent on the population of the area? If yes, how? -- Descriptive text goes here --- --- Descriptive text goes here ------ Descriptive text goes here ------ Descriptive text goes here ----- Descriptive text goes here --- Descriptive text goes here --- Descriptive text goes here --- Descriptive text goes here --- Descriptive text goes here ---



Reset All

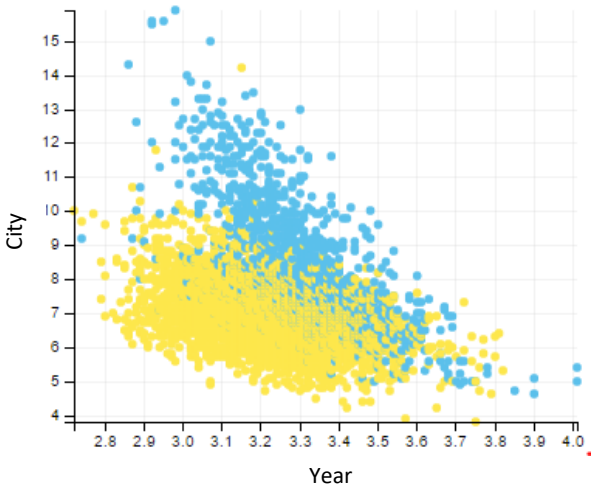
Change Color

Select Parameter:

- Total Crimes (default)
- Crimes per capita

---Color Legend for heatmap goes here---

Crime distribution across the US over the years (color: Total number of violent crime by default)

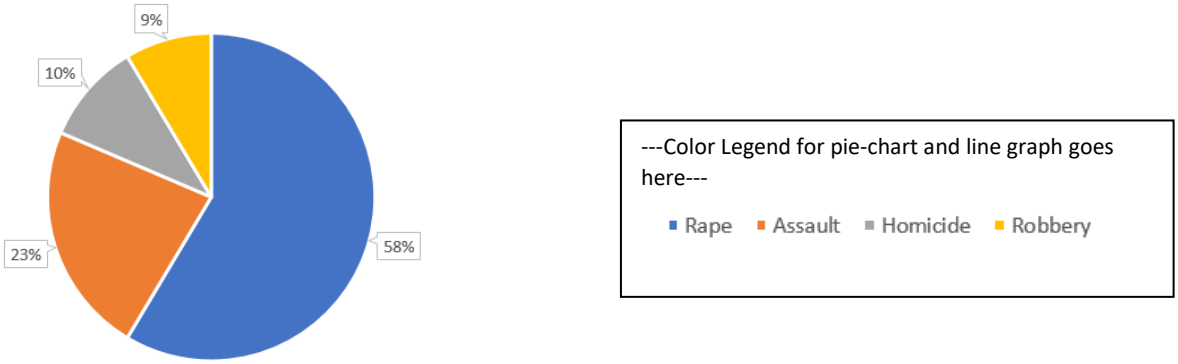


Select criterion for clustering:

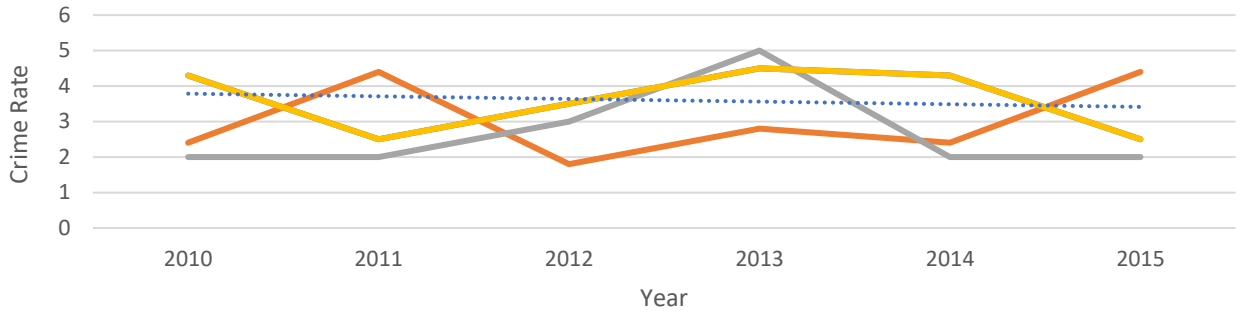
- Total Crimes (default)
- Crimes per capita
- Rapes
- Assaults
- Homicides
- Robberies

---Color Legend for scatterplot goes here---

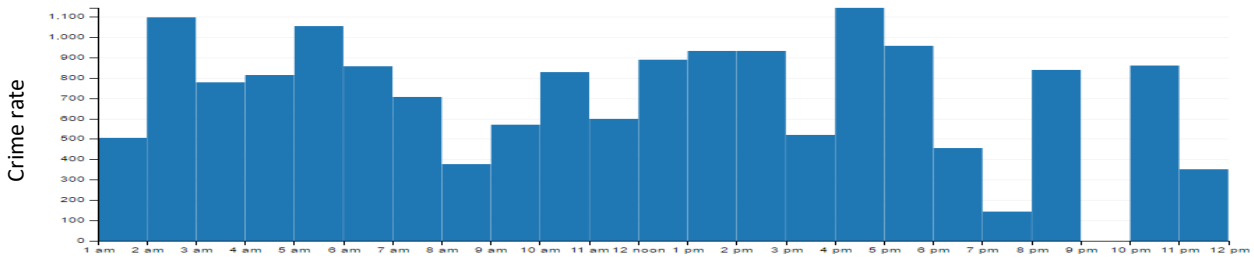
Crime distribution across the US over the years (color: Total number of violent crime by default)



Type of Crime



Trend in crime rate over the years (Dotted line shows total crime trend)



Population

Effect of population on crime rate (population vs the average number of crimes)

3,446 selected out of **6,724** records

Sort By

Date	Rape	Assault	Homicide	Population
1992/06				
06/01/1992	315.3	318.98	3.68	1415700
06/02/1992	318.98	317.23	-1.75	1649600
06/03/1992	317.23	317.34	0.11	1718600
06/04/1992	317.34	315.93	-1.41	1681200
06/05/1992	315.93	313.24	-2.69	1683900
06/08/1992	313.24	310.23	-3.01	1290500
06/09/1992	310.23	304.86	-5.37	1822200
06/10/1992	304.86	302.6	-2.26	1570300
06/11/1992	302.6	302.58	-0.02	1601500
06/12/1992	302.58	304.11	1.53	1495100