

# **Visualization of Unemployment and Crime Rate across USA**

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## **Basic Info.**

Project repository:

<https://github.com/blackispower/Unemployment-in-USA>

## **Overview and Motivation.**

Unemployment is describing the state that a person above some specified age is not in paid employment or self-employment and are currently available for work during the reference period. It is measured by the unemployment rate. Factors influencing unemployment rate may be caused by the recession of economy, new technologies, policies of the government and so forth.

Crime rate is defined by the ratio of crimes in an area to the population of the area, which is a count of crimes complied to assess the effectiveness of a crime control policy, and the impact of the policy on the risk of crime victimization.

In our project, we decided to visualize the unemployment and crime rates across USA between 2007 to 2018. We would like to reveal the trend of unemployment of specific regions (country- level, state- level and county- level) over time. Since the data for crime rate, we only have country-level and state- level, we will visualize the trend of crime rate at country- level and state- level between 2007 to 2018. Meantime, we will analyze the relationship between Unemployment rate and Crime rate, and visualize their change trend over time. We also want to look at the unemployment rate and crime rate difference under the leadership with different presidents. We are interested in this topic because this is very relevant to our daily life. For individuals, these information could help them find an ideal place to settle down. For government, knowing the relationship between unemployment rate and crime rate could help goverment to make more effective crime control policy.

## Related Work.

Local Area Unemployment Statistics Map  
[https://data.bls.gov/lausmap/showMap.jsp;jsessionid=79A96FEAED81F05DC79399CE15D59304.\\_t3\\_07v](https://data.bls.gov/lausmap/showMap.jsp;jsessionid=79A96FEAED81F05DC79399CE15D59304._t3_07v)

## Questions.

1. Reveal the trend of unemployment and crime rate of specific regions over time.
2. Explore and compare the country- level, state- level and county- level unemployment rate. Same analysis for the country- level and state- level crime rate.
3. Find the regions with extremely high or low unemployment or crime rate.
4. Visualize the trend of unemployment and crime both for specific regions. Check whether there might be an relationship between crime rate and unemployment rate.

## Data

### Data sources

#### ***Unemployment rate data:***

Kaggle: <https://www.kaggle.com/jayrav13/unemployment-by-county-us>  
Bureau of Labor Statistics <https://data.bls.gov/timeseries/LNS14000000>

#### ***Crime rate data:***

Crime in the U.S. <https://ucr.fbi.gov/crime-in-the-u.s>

### Data Clean

The dataset provides us with the unemployment rate data in different counties across USA from 2007 to 2018.

#### ***Unemployment rate data:***

First, we acquire the unemployment rate data for each county of each state from the website of UNITED STATES DEPARTMENT OF LABOR (<https://data.bls.gov/lausmap/showMap.jsp;jsessionid=79A96FEAED81F05DC793>)

99CE15D59304.\_t3\_07v). Since the raw data is county-level, we need to preprocess the data to get aggregation of the data from county to state. Finally, we have the county level- unemployment rate data shown as Figure 1, and state level unemployment data shown as Figure 2.

A	B	C	D	E	F	G	H
County	State	Labor Force	Employed	Unemployed	Unemployment Rate	Year	
Autauga County	AL	24,383	23,577	806	3.3	2007	
Baldwin County	AL	82,659	80,099	2,560	3.1	2007	
Barbour County	AL	10,334	9,684	650	6.3	2007	
Bibb County	AL	8,791	8,432	359	4.1	2007	
Blount County	AL	26,629	25,780	849	3.2	2007	
Bullock County	AL	3,653	3,308	345	9.4	2007	
Butler County	AL	9,099	8,539	560	6.2	2007	
Calhoun County	AL	54,861	52,709	2,152	3.9	2007	
Chambers County	AL	15,474	14,469	1,005	6.5	2007	
Cherokee County	AL	11,984	11,484	500	4.2	2007	
Chilton County	AL	19,737	19,067	670	3.4	2007	
Choctaw County	AL	5,183	4,875	308	5.9	2007	
Clarke County	AL	10,358	9,730	628	6.1	2007	
Clay County	AL	6,113	5,775	338	5.5	2007	
Cleburne County	AL	6,483	6,246	237	3.7	2007	
Coffee County	AL	21,077	20,275	802	3.8	2007	
Colbert County	AL	25,386	24,216	1,170	4.6	2007	
Conecuh County	AL	4,965	4,646	319	6.4	2007	
Coosa County	AL	4,686	4,415	271	5.8	2007	
Covington County	AL	17,070	16,409	661	3.9	2007	
Crenshaw County	AL	6,546	6,264	282	4.3	2007	
Cullman County	AL	39,367	38,047	1,320	3.4	2007	
Dale County	AL	20,250	19,450	800	4	2007	
Dallas County	AL	15,555	14,259	1,296	8.3	2007	
DeKalb County	AL	31,013	29,689	1,324	4.3	2007	
Elmore County	AL	35,805	34,620	1,185	3.3	2007	
Escambia County	AL	14,288	13,530	758	5.3	2007	
Etowah County	AL	45,459	43,431	2,028	4.5	2007	
Fayette County	AL	7,387	7,039	348	4.7	2007	
Franklin County	AL	13,742	13,108	634	4.6	2007	
Geneva County	AL	11,535	11,137	398	3.5	2007	
Greene County	AL	3,284	3,075	209	6.4	2007	
Hale County	AL	6,976	6,602	374	5.4	2007	
Henry County	AL	7,540	7,135	405	5.4	2007	
Houston County	AL	47,179	45,607	1,572	3.3	2007	
Jackson County	AL	27,020	25,799	1,221	4.5	2007	
Jefferson County	AL	314,739	302,603	12,136	3.9	2007	
Lamar County	AL	5,854	5,488	366	6.3	2007	

Figure 1. Unemployment data for each county of the US from 2007 to 2018.

	A	B	C
1	State	Unemployment-rate	Year
2	Alabama	4	2007
3	Alabama	5.7	2008
4	Alabama	11	2009
5	Alabama	10.5	2010
6	Alabama	9.6	2011
7	Alabama	8	2012
8	Alabama	7.2	2013
9	Alabama	6.8	2014
10	Alabama	6.1	2015
11	Alabama	5.8	2016
12	Alabama	4.4	2017
13	Alabama	3.9	2018
14	Alaska	6.3	2007
15	Alaska	6.7	2008
16	Alaska	7.7	2009
17	Alaska	7.9	2010
18	Alaska	7.6	2011
19	Alaska	7.1	2012
20	Alaska	7	2013
21	Alaska	6.9	2014
22	Alaska	6.5	2015
23	Alaska	6.9	2016
24	Alaska	7	2017
25	Alaska	6.6	2018
26	Arizona	3.9	2007
27	Arizona	6.2	2008
28	Arizona	9.9	2009
29	Arizona	10.4	2010
30	Arizona	9.5	2011
31	Arizona	8.3	2012
32	Arizona	7.7	2013
33	Arizona	6.8	2014
34	Arizona	6.1	2015
35	Arizona	5.4	2016
36	Arizona	4.9	2017
37	Arizona	4.8	2018
38	Arkansas	5.3	2007
39	Arkansas	5.5	2008

Figure 2. Unemployment data for each state of the US from 2007 to 2018.

### ***Crime rate data:***

For the crime rate data, we collected the data from the website <https://ucr.fbi.gov/crime-in-the-u.s>. After simple data clean process, the crime data is shown as Figure 3.

	A	B	C	D	E
1	Area	Year	Population	number	rate
2	UnitedStates	2007	301,621,157	1,408,337	466.9
3	UnitedStates	2008	304,059,724	1,382,012	454.5
4	UnitedStates	2009	307,006,550	1,325,896	431.9
5	UnitedStates	2010	308,745,538	1,246,248	403.6
6	UnitedStates	2011	311,587,816	1,206,031	387.1
7	UnitedStates	2012	313,914,040	1,214,464	386.9
8	UnitedStates	2013	316,497,531	1,199,684	379.1
9	UnitedStates	2014	318,857,056	1,197,987	375.7
10	UnitedStates	2015	320,896,618	1,234,183	384.6
11	UnitedStates	2016	323,127,513	1,283,058	397.1
12	UnitedStates	2017	325,147,121	1,283,875	394.9
13	UnitedStates	2018	327,167,434	1,245,065	380.6
14	Connecticut	2007	3,502,309	8,965	256
15	Connecticut	2008	3,501,252	10,427	297.8
16	Connecticut	2009	3,518,288	10,588	300.9
17	Connecticut	2010	3,574,097	10,057	281.4
18	Connecticut	2011	3,586,717	9,889	275.7
19	Connecticut	2012	3,590,347	10,160	283
20	Connecticut	2013	3,599,341	9,439	262.2
21	Connecticut	2014	3,596,677	8,522	236.9
22	Connecticut	2015	3,584,730	7,938	221.4
23	Connecticut	2016	3,576,452	8,123	227.1
24	Connecticut	2017	3,573,880	8,190	229.2
25	Connecticut	2018	3,572,665	7,411	207.4
26	Maine	2007	1,317,207	1,554	118
27	Maine	2008	1,316,456	1,547	117.5
28	Maine	2009	1,318,301	1,580	119.9
29	Maine	2010	1,328,361	1,621	122
30	Maine	2011	1,328,544	1,638	123.3
31	Maine	2012	1,329,192	1,631	122.7
32	Maine	2013	1,328,702	1,761	132.5
33	Maine	2014	1,330,089	1,700	127.8
34	Maine	2015	1,329,453	1,726	129.8
35	Maine	2016	1,331,479	1,648	123.8
36	Maine	2017	1,335,063	1,610	120.6

Figure 3. the crime data for each state in the US from 2007 to 2018.



## **Exploratory Data Analysis:**

We have used three kinds of visualizations for our data, including map chart, line chart and bar chart.

First, we used map chart to shown the unemployment or crime data. The map chart visualization makes has the ability to more easily understand the distribution of the organization's presence across the city, state, or country, to compare the activity across several locations at a glance, and contextualizing data in the real world. Second, to visualize the data change trend, we used line chart. Line chart can show data variables and trends very clearly. It's also useful to compare the trend of two kinds of data and show their relationship. Third, bar chart was used to visualize the data for each state or county. Compare to map chart, bar chart was margined by length. The benefits of bar chart includes displaying relative differences of multiple categories, summarize the extremely value of the data.

We also used several interaction in our project that including hover, zoom, sorting, linking among different graph.

## **Design Evolution**

### **The original design:**

#### ***Overview***

The overview of the visualization consists of three parts: map chart, line chart and bar chart, and can toggle between the unemployment rate, the crime rate and the combined view.

Map chart is coded by color, suggesting the rate of unemployment/crime rate in each state. And on the combined view, the color indicates the unemployment rate while the crime rate is represented by the size of a circle. A year slider on the bottom can switch between different years. A tool tip should appear on hover. If a state is clicked, the map would zoom in and show a more detailed unemployment rate information in different counties. (Figure 4 -6).

Line chart for the first two view shows the change over the years and it would highlight the corresponding line for a state when hovering on a specific one. It changes into a scatter plot with X-axis and Y-axis showing the stastitics. When clicking on a state, because we only have data for unemployment rate for each county, the line chart only show changes for the unemployment rate for each county. A description box shows the crime rate and overall unemployment rate in the state. (Figure 4 -6).

Bar chart shows the comparison between states/counties for a specific year. Hovering on map or a bar would highlight each other. The whole chart could sort by alphabetic order or the statistics (Figure 4 -6).

Additional functions: we are thinking of let users to choose over 2 states to compare the unemployment rate of those states (Figure 7).

***Must-Have Features.***

Three views for the map chart and the corresponding functions in line and bar charts

***Optional Features.***

Zooming function for each counties' data.

We still follow our proposal. However, we will try to add more feature and interactive to our project.

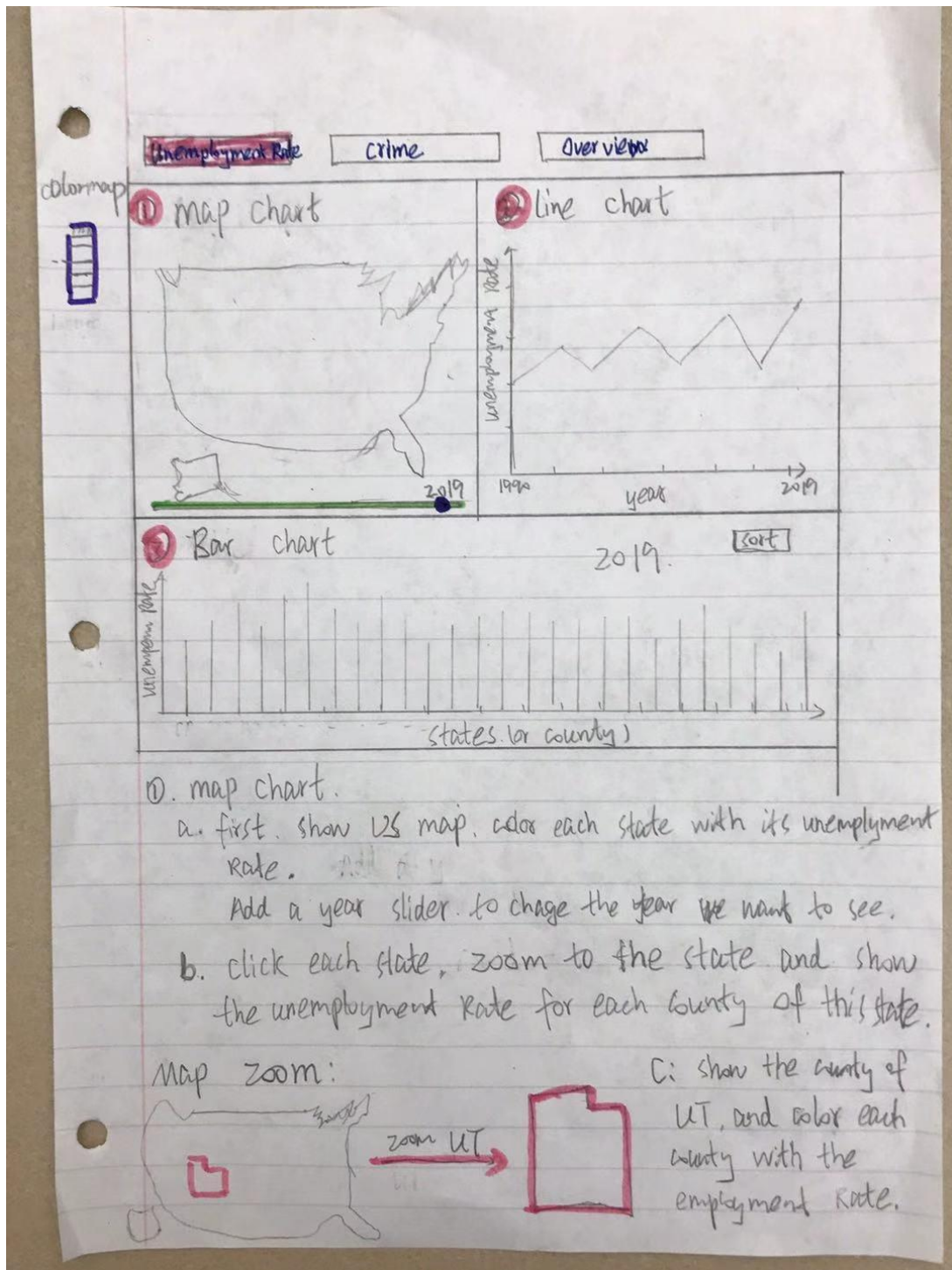


Figure 4



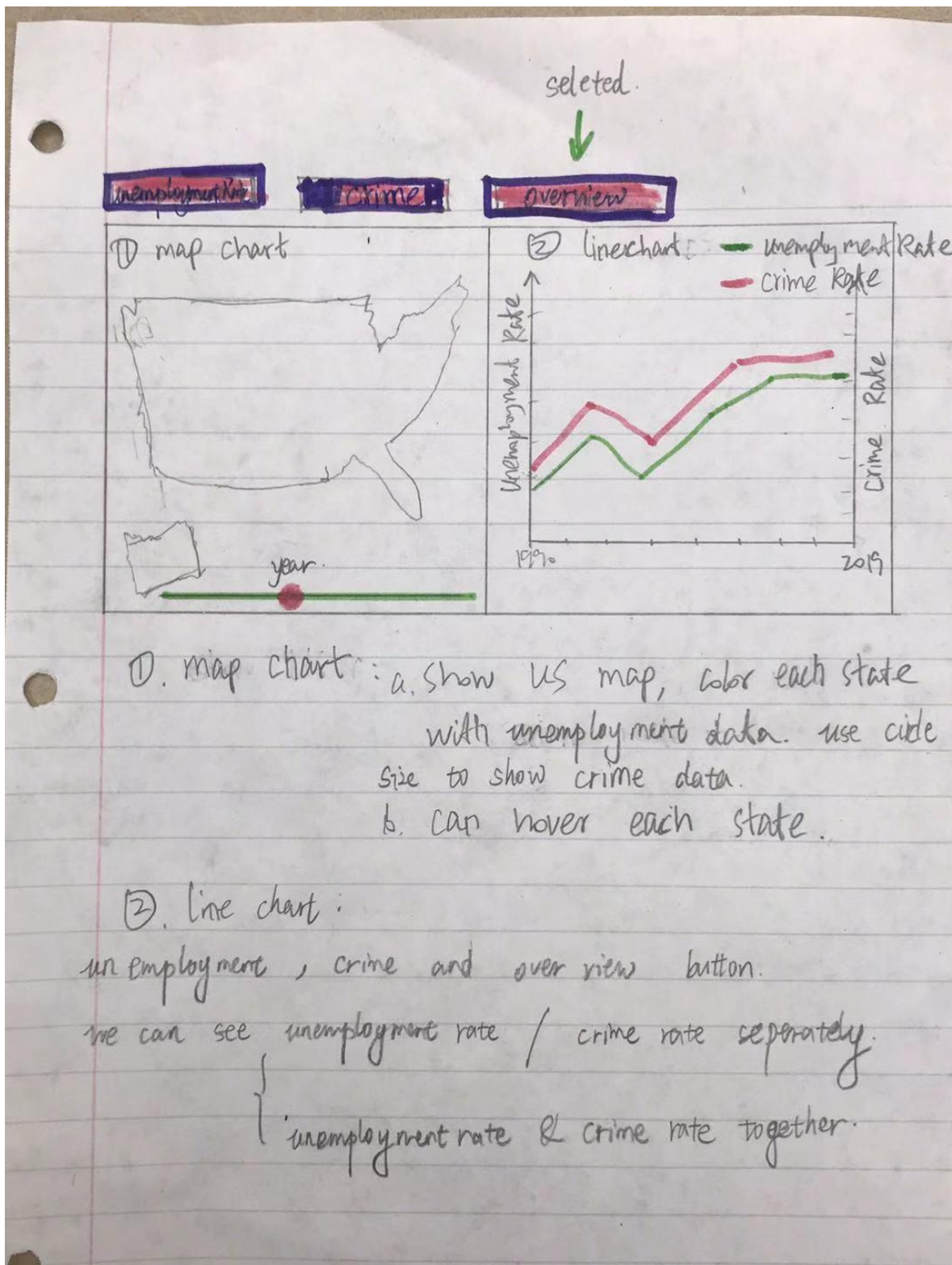
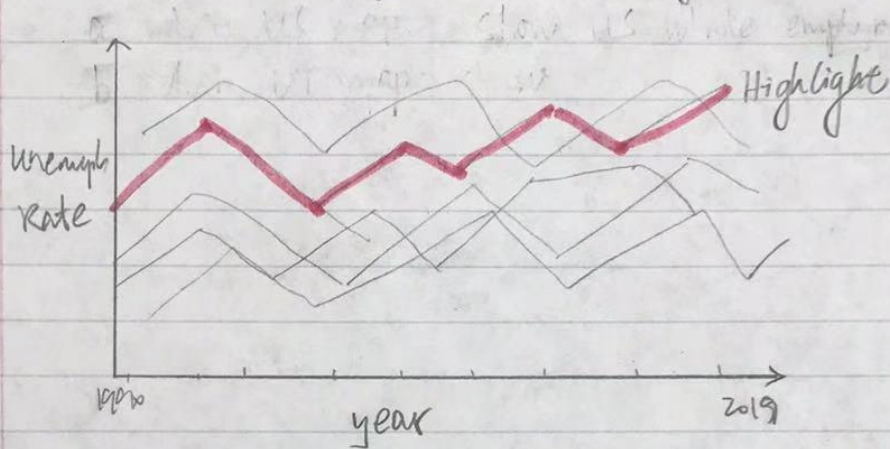


Figure 5

② line chart.

show the unemployment Rate change over year.



a. map chart: US. show all states unemployment Rate with dark color.

when hover one state at the map, highlight the change line of the state on line chart.

b. zoom map chart to state. show all counties unemployment Rate change data line with dark color.

Hover each county and highlight the line on line chart.

③ bar chart: can sort the chart ascending / descending

a. us map: show the unemployment rate in each state in selected year.

b. state map: show the unemployment rate in each county in selected year.

Figure 6.

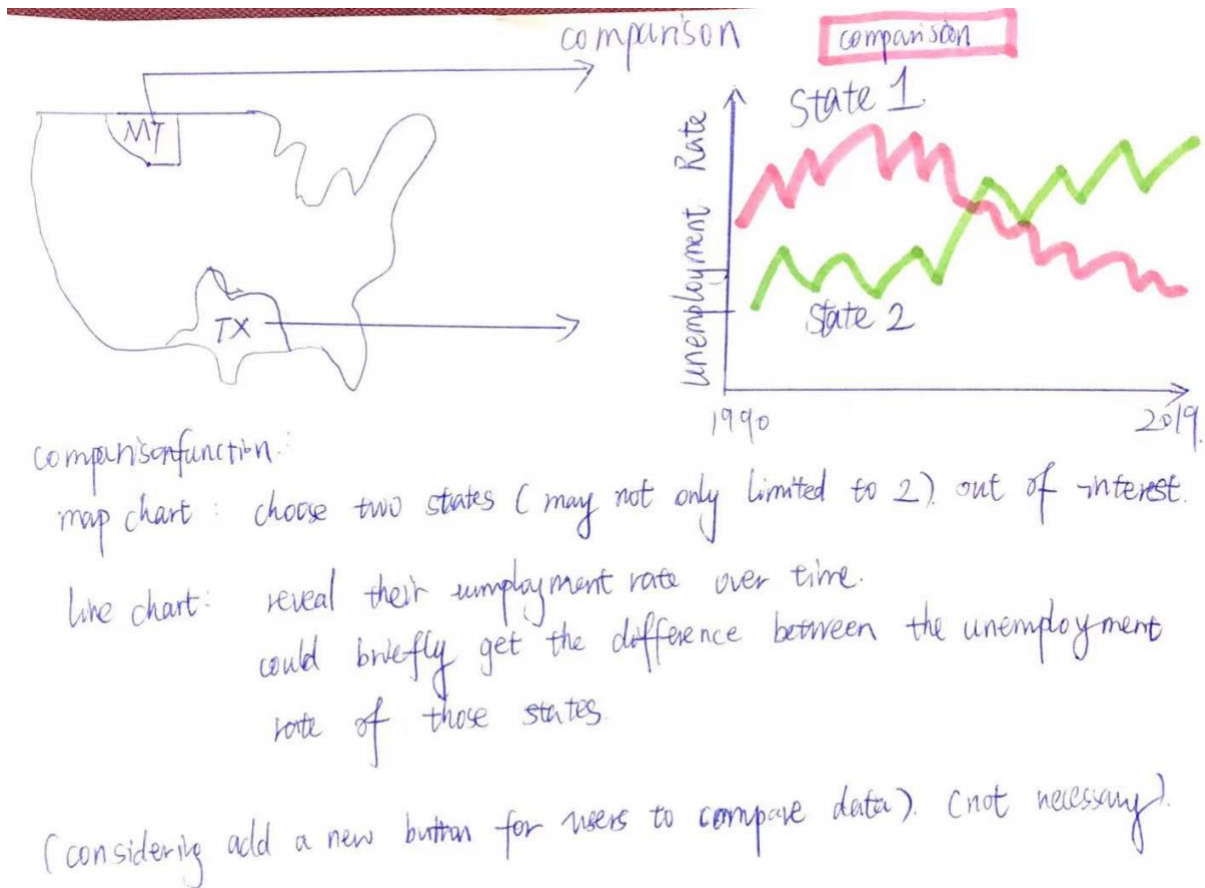


Figure 7. Compare the unemployment rate and crime rate for specific area.

## Implementation.

### **The map chart**

In the map chart, shown as figure 8, we colored the unemployment rate for each state.

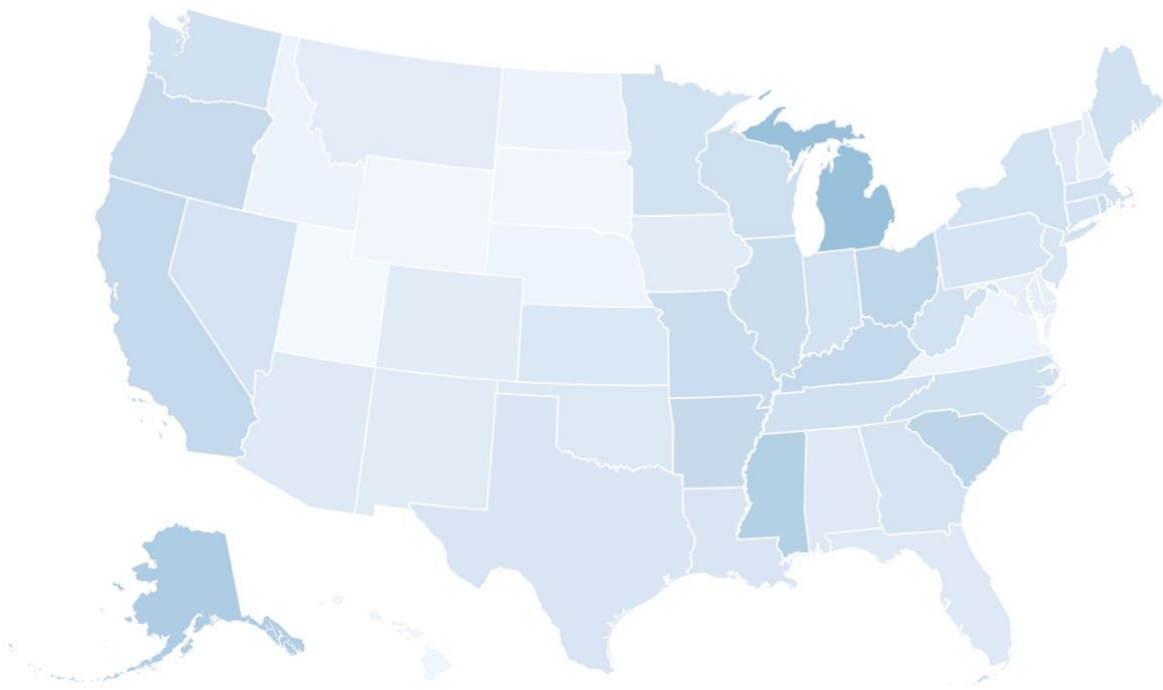


Figure 8. the map chart of Unemployment rate of the US.

We can zoom each state (shown as Figure 9) and shown its county data (we are still working on it).

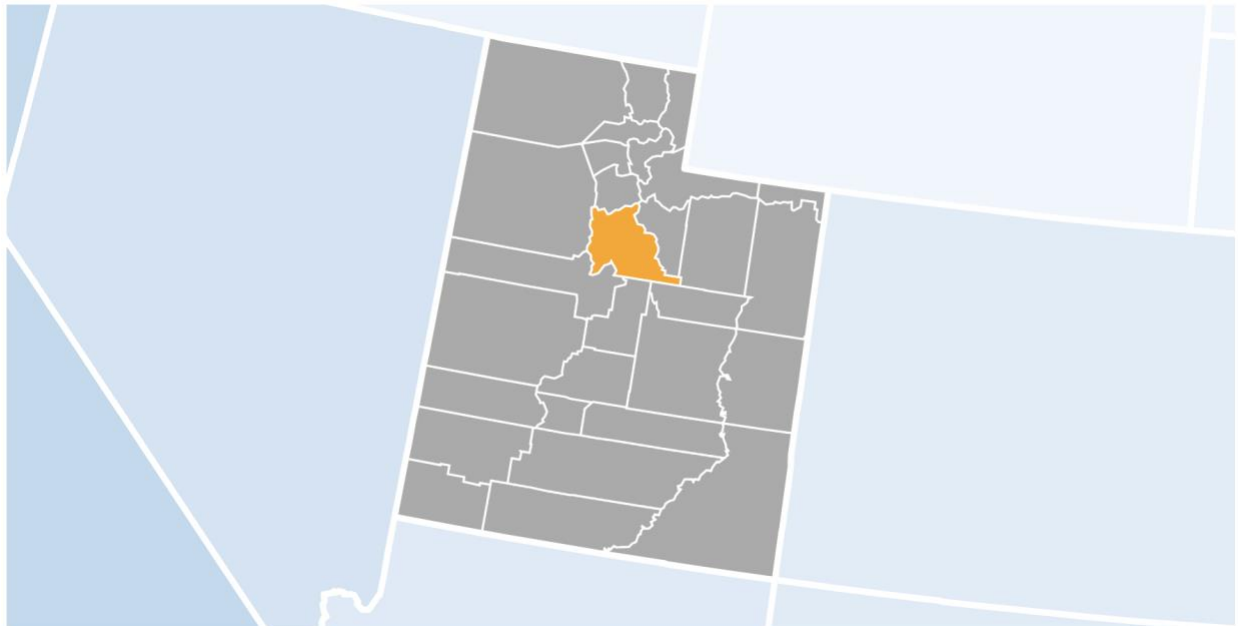


Figure 9. Zoom to Utah (we will add the county data later). For each county, we can hover it.



## The line chart

The change trend of unemployment or crime rate for specific area.

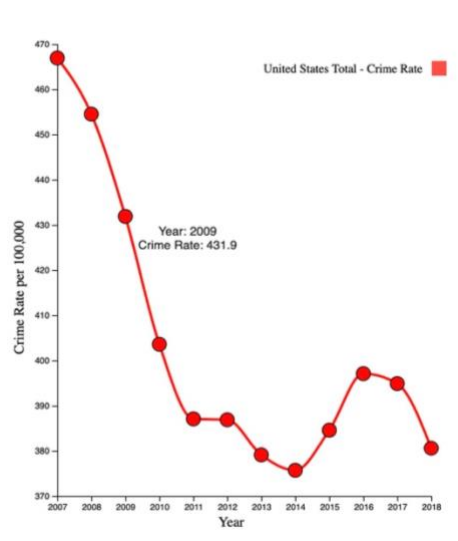


Figure 9. the trend of crime rate at the US from 2007 to 2018.

## The bar chart

For the bar chart, in unemployment rate page or crime page, when we select specific year with year slider, the bar chart shows the unemployment rate or crime rate for all states. The bars can be sorted by “Alphabetical”, “Frequency, ascending” or “Frequency, descending”. Each bar can be hovered as Figure 10.

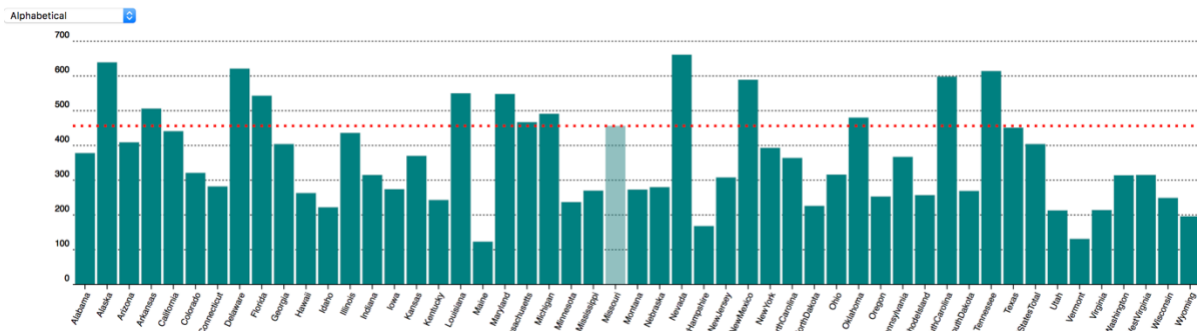


Figure 10. the crime rate of each state in the US at 2010.

## Overview of map chart and bar chart

The overview of map chart and bar chart shows the data in two difference visualizations. When hover map chart or bar chart, another chart could be hovered in the meantime.

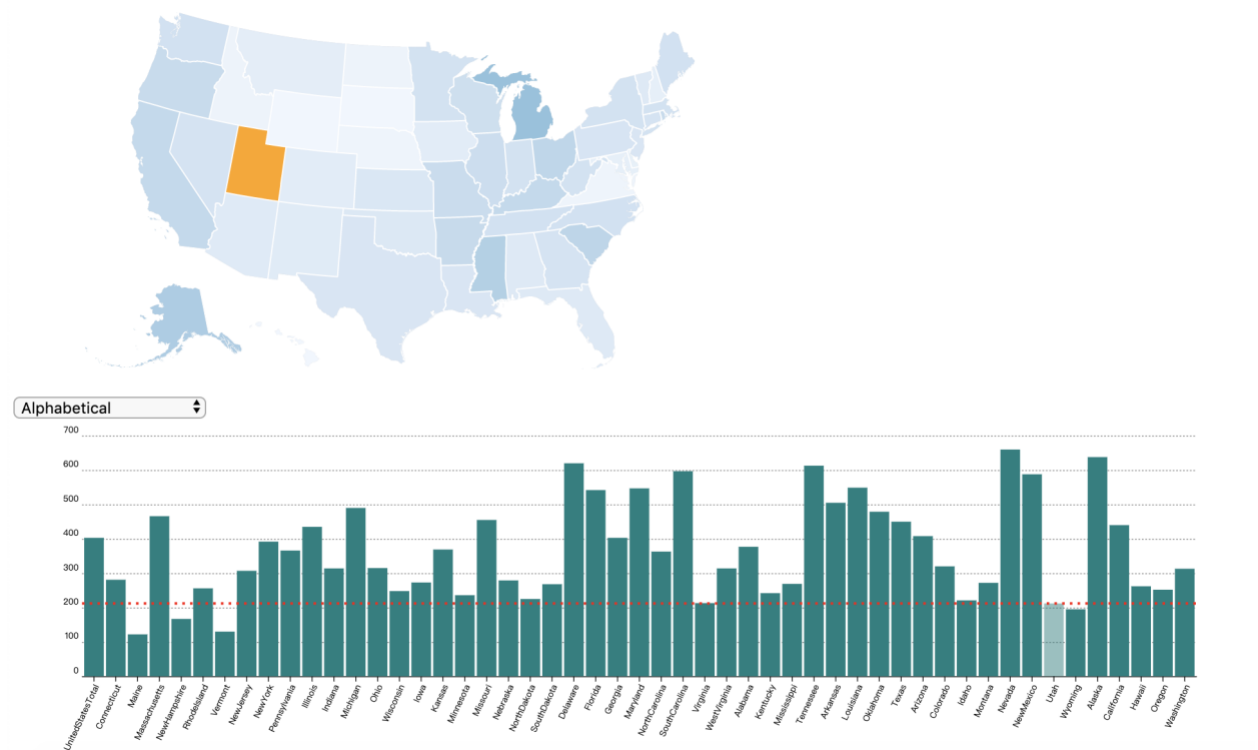


Figure 11. the overview of map chart and bar chart.

## Evaluation.

### Learning:

1. Based on the map chart, we could know the unemployment or crime rate difference around the distributions of the US.
2. Based on the bar chart, the unemployment or crime rate order of specific state could be identified. With sorting, the extremely value (the highest and the lowest) of data are easy to distinguished.
3. Based on the line chart, the change trend of data is easy to understand.

### Improvement:

More interactives, storytelling will be implemented.