DSC 640: WEEK 7&8

Author: Yousof Rahimian

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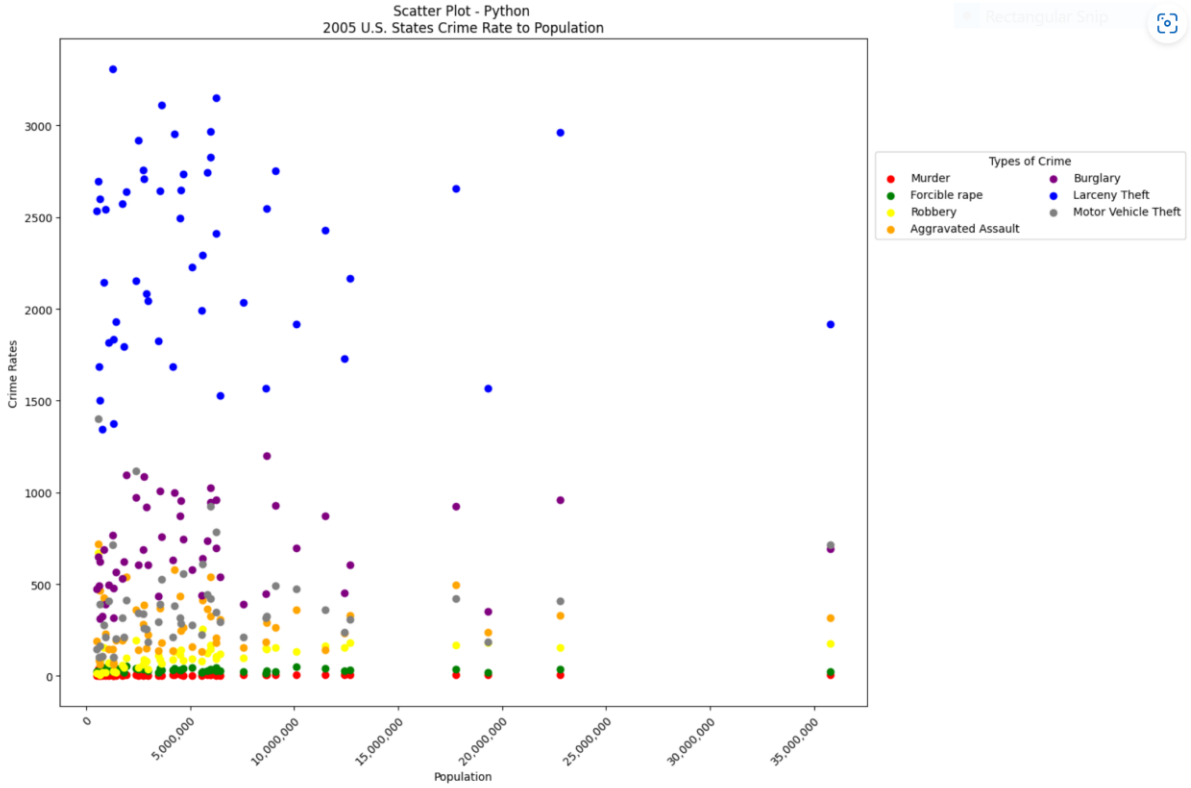
Exercise 4.2 Scatter Plot, Bubble Plot, and Density Plot/Map

Scatterplot

Pyhton

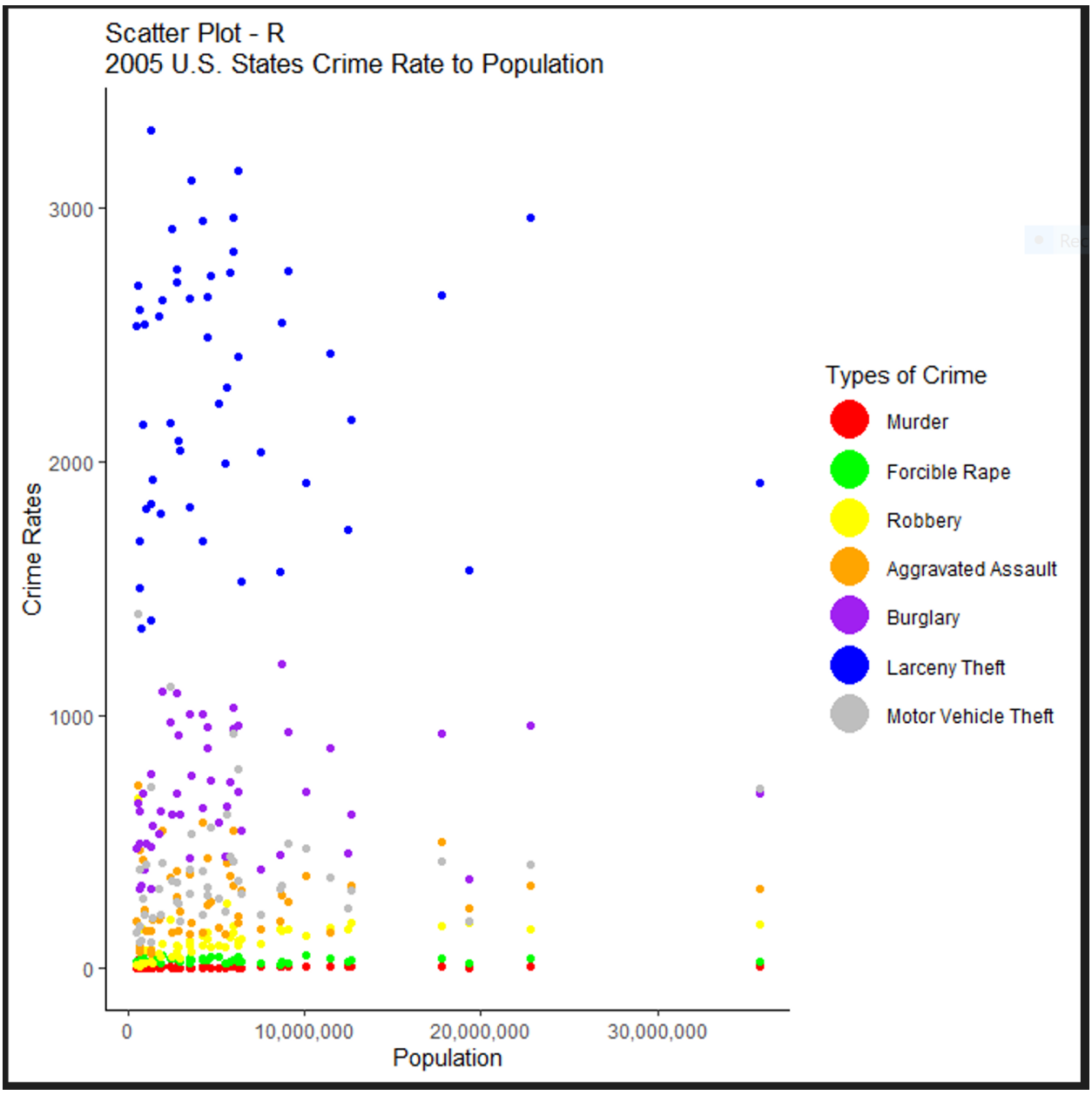
```python
# display the state crime rate based on population of each estates
# Use scatterplot

fig, ax = plt.subplots(figsize = (15, 10))

plt.scatter(states_crime['population'], states_crime['murder'], c = 'red', label = 'Murder')
plt.scatter(states_crime['population'], states_crime['forcible_rape'], c = 'green', label = 'Forcible rape')
plt.scatter(states_crime['population'], states_crime['robbery'], c = 'yellow', label = 'Robbery')
plt.scatter(states_crime['population'], states_crime['aggravated_assault'], c = 'orange', label = 'Aggravated Assault')
plt.scatter(states_crime['population'], states_crime['burglary'], c = 'purple', label = 'Burglary')
plt.scatter(states_crime['population'], states_crime['larceny_theft'], c = 'blue', label = 'Larceny Theft')
plt.scatter(states_crime['population'], states_crime['motor_vehicle_theft'], c = 'gray', label = 'Motor Vehicle Theft')

ax.get_xaxis().set_major_formatter(
    tick.FuncFormatter(lambda x, p: format(int(x), ',')))

plt.xlabel("Population")
plt.xticks(rotation = 45, ha = 'right', rotation_mode = 'anchor')
plt.ylabel("Crime Rates")
plt.title("Scatter Plot - Python \n2005 U.S. States Crime Rate to Population")

ax.legend(loc=(1.01, 0.7), ncol = 2, title = 'Types of Crime')
plt.tight_layout()

plt.show()
```



R

```r
#| label: mutatestates
crimes_df <- melt(states_crime, id.vars = c('state', 'population'), variable.name = 'crimes')
crimes_df
```

```r
#| label: scatterplot
#| echo: false
fig <- crimes_df %>%
  ggplot(aes(x = population, y = value, color = crimes)) +
  geom_point() +
  ggtitle("Scatter Plot - R \n2005 U.S. States Crime Rate to Population") +
  guides(size = 'none') +
  xlab("Population") +
  ylab("Crime Rates") +
  scale_x_continuous(labels = scales::comma) +
  guides(color = guide_legend(title = "Types of Crime", override.aes = list(size = 8))) +
  scale_color_manual(values = c("murder" = "red",
                                "forcible_rape" = "green",
                                "robbery" ="yellow",
                                "aggravated_assault" = "orange",
                                "burglary" = "purple",
                                "larceny_theft" = "blue",
                                "motor_vehicle_theft" = "gray"),
                     labels = c("Murder", "Forcible Rape", "Robbery", "Aggravated Assault",
                                "Burglary", "Larceny Theft", "Motor Vehicle Theft"))
fig
```


Scatter Plot - R
2005 U.S. States Crime Rate to Population
Crime Rates
3000
2000
1000
0
0
10,000,000
20,000,000
30,000,000
Population
Types of Crime
Murder
Forcible Rape
Robbery
Aggravated Assault
Burglary
Larceny Theft
Motor Vehicle Theft

Tableau

Bubble Plot

Python

In [7]:

```
fig, ax = plt.subplots(figsize = (20, 3))

plt.scatter(us_crime['murder'], us_crime['state'],
            c = 'purple', label = 'Murder', s = us_crime['murder'] * 5,
           alpha = 0.5)
plt.scatter(us_crime['forcible_rape'], us_crime['state'],
            c = 'green', label = 'Forcible rape', s = us_crime['forcible_rape'] * 2,
           alpha = 0.5)
plt.scatter(us_crime['robbery'], us_crime['state'],
            c = 'yellow', label = 'Robbery', s = us_crime['robbery'] * 2,
           alpha = 0.5)
plt.scatter(us_crime['aggravated_assault'], us_crime['state'],
            c = 'orange', label = 'Aggravated Assault', s = us_crime['aggravated_assault'] * 2,
           alpha = 0.5)
plt.scatter(us_crime['burglary'], us_crime['state'],
            c = 'blue', label = 'Burglary', s = us_crime['burglary'] * 2,
           alpha = 0.5)
plt.scatter(us_crime['larceny_theft'], us_crime['state'],
            c = 'red', label = 'Larceny Theft', s = us_crime['larceny_theft'] * 2,
           alpha = 0.5)
plt.scatter(us_crime['motor_vehicle_theft'], us_crime['state'],
            c = 'gray', label = 'Motor Vehicle Theft', s = us_crime['motor_vehicle_theft'] * 2,
           alpha = 0.5)

plt.xlabel("Crime Rates")
plt.title("Bubble Chart - Python \n2005 U.S. Crime Rate")

crimes_list = ["Murder", "Forcible Rape", "Robbery", "Aggravated Assault", "Burglary",
               "Larceny Theft", "Motor Vehicle Theft"]
color_list = ["purple", "green", "yellow", "orange", "blue", "red", "gray"]
legend_list = []
for i in range(0, len(crimes_list)):
    legend_list.append(mpatches.Patch(color = color_list[i],
                               alpha = 0.5,
                               label = crimes_list[i]))
ax.legend(handles = legend_list, loc = (1.05, 0), title = 'Types of Crime')

plt.tight_layout()

plt.show()
```

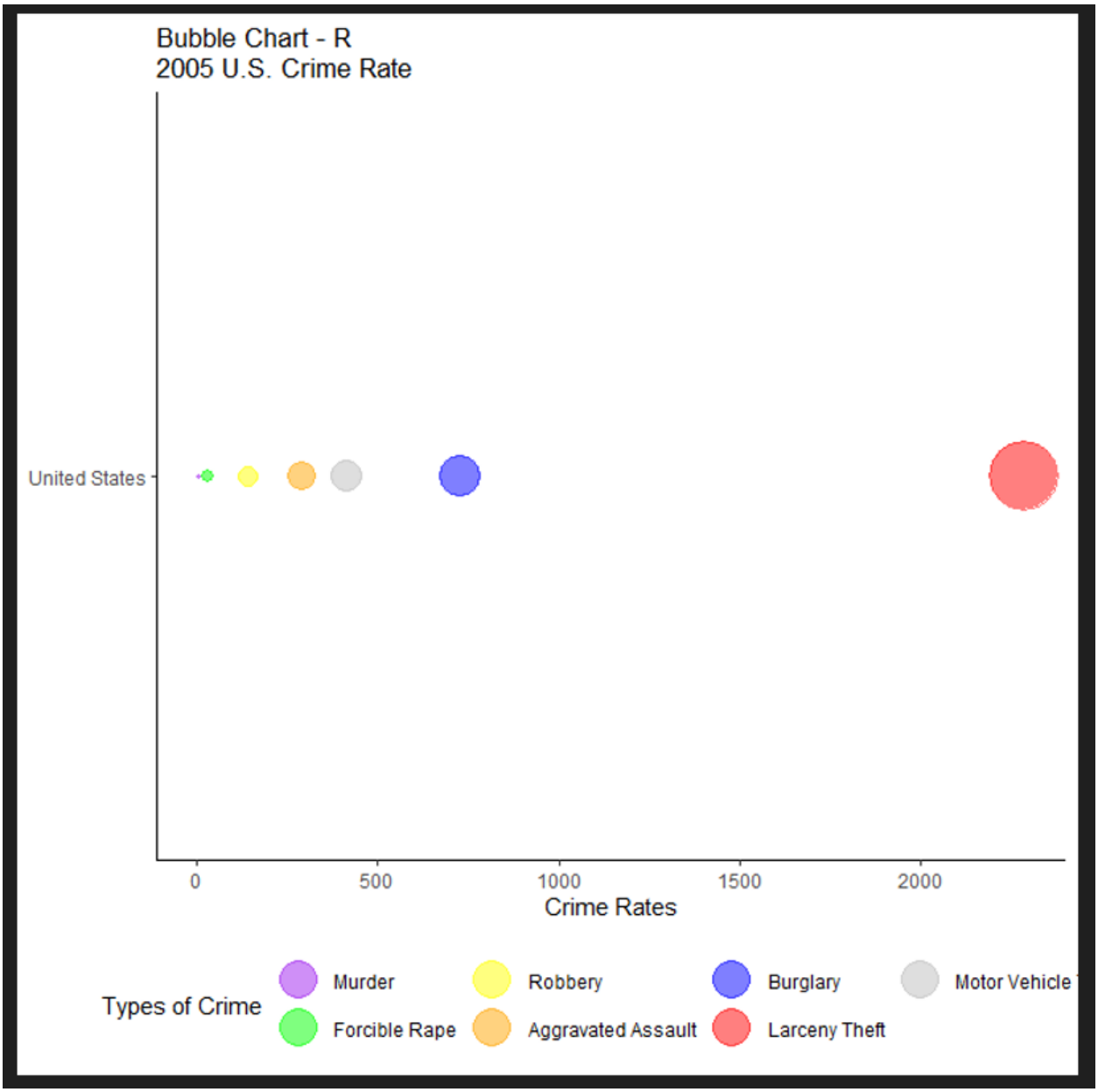
R

```r
### 2. Bubble Chart

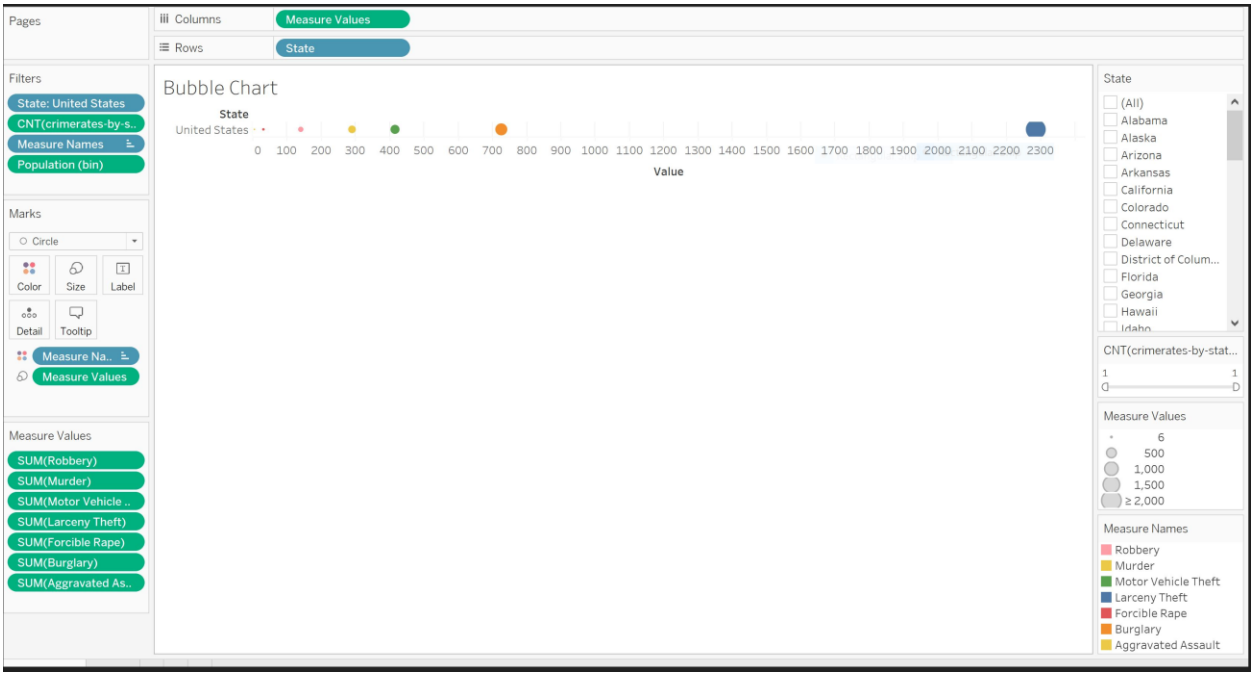
```{r}
#| label: uscrime
us_crime <- crimerate_df[crimerate_df$state == 'United States', ]
us_crime
```

```{r}
#| label: mutateus
uscrimes_df <- melt(us_crime, id.vars = c('state', 'population'), variable.name = 'crimes')
uscrimes_df
```

```{r}
#| label: bubblechart
#| echo: false
fig <- uscrimes_df %>%
  ggplot(aes(x = value, y = state)) +
  geom_point(aes(color = crimes, size = value), alpha = 0.5) +
  scale_size(range = c(0.8, 15), guide = 'none') +
  guides(color = guide_legend(title = "Types of Crime", override.aes = list(size = 8))) +
  scale_color_manual(values = c("murder" = "purple",
                                "forcible_rape" = "green",
                                "robbery" ="yellow",
                                "aggravated_assault" = "orange",
                                "burglary" = "blue",
                                "larceny_theft" = "red",
                                "motor_vehicle_theft" = "gray"),
                     labels = c("Murder", "Forcible Rape", "Robbery", "Aggravated Assault",
                                "Burglary", "Larceny Theft", "Motor Vehicle Theft")) +
  ggtitle("Bubble Chart - R \n2005 U.S. Crime Rate") +
  xlab("Crime Rates") +
  ylab(NULL) +
  theme(legend.position="bottom")
fig
```
```


Bubble Chart - R
2005 U.S. Crime Rate
United States
0
500
1000
1500
2000
Crime Rates
Types of Crime
Murder
Robbery
Burglary
Motor Vehicle
Forcible Rape
Aggravated Assault
Larceny Theft

Tableau



Density Plot/Map

Python

```
density = gaussian_kde(states_crime_df['burglary'])

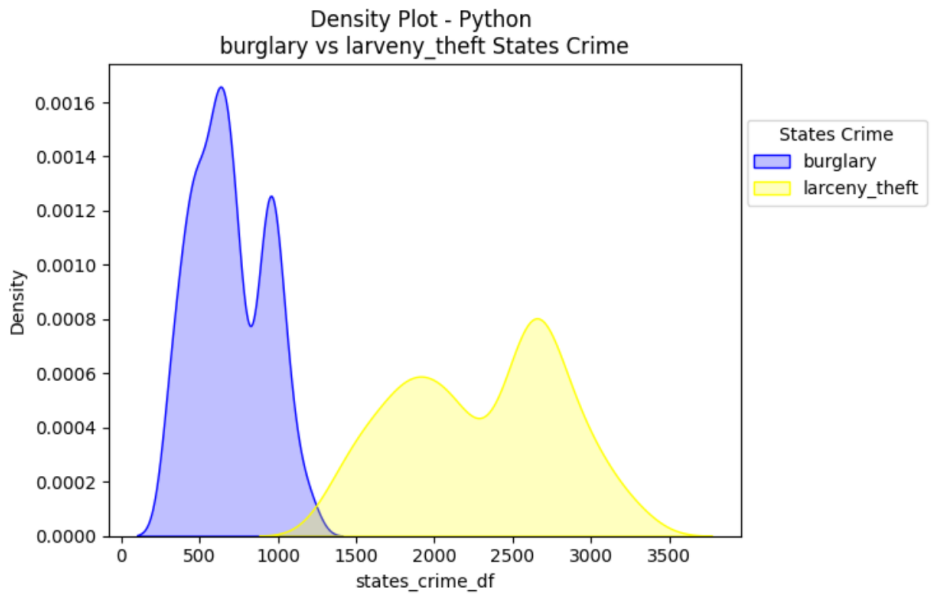
fig, ax = plt.subplots()

sb.kdeplot(states_crime_df['burglary'] , bw_method = 0.3 , fill = True, color = 'blue', label = 'burglary')
sb.kdeplot(larceny_theft_df['larceny_theft'] , bw_method = 0.3 , fill = True, color = 'yellow', label = 'larceny_theft')

plt.title('Density Plot - Python \nburglary vs larveny_theft States Crime')
plt.xlabel('states_crime_df')

ax.legend(loc=(1.01, 0.7), ncol = 1, title = 'States Crime')

plt.show()
```

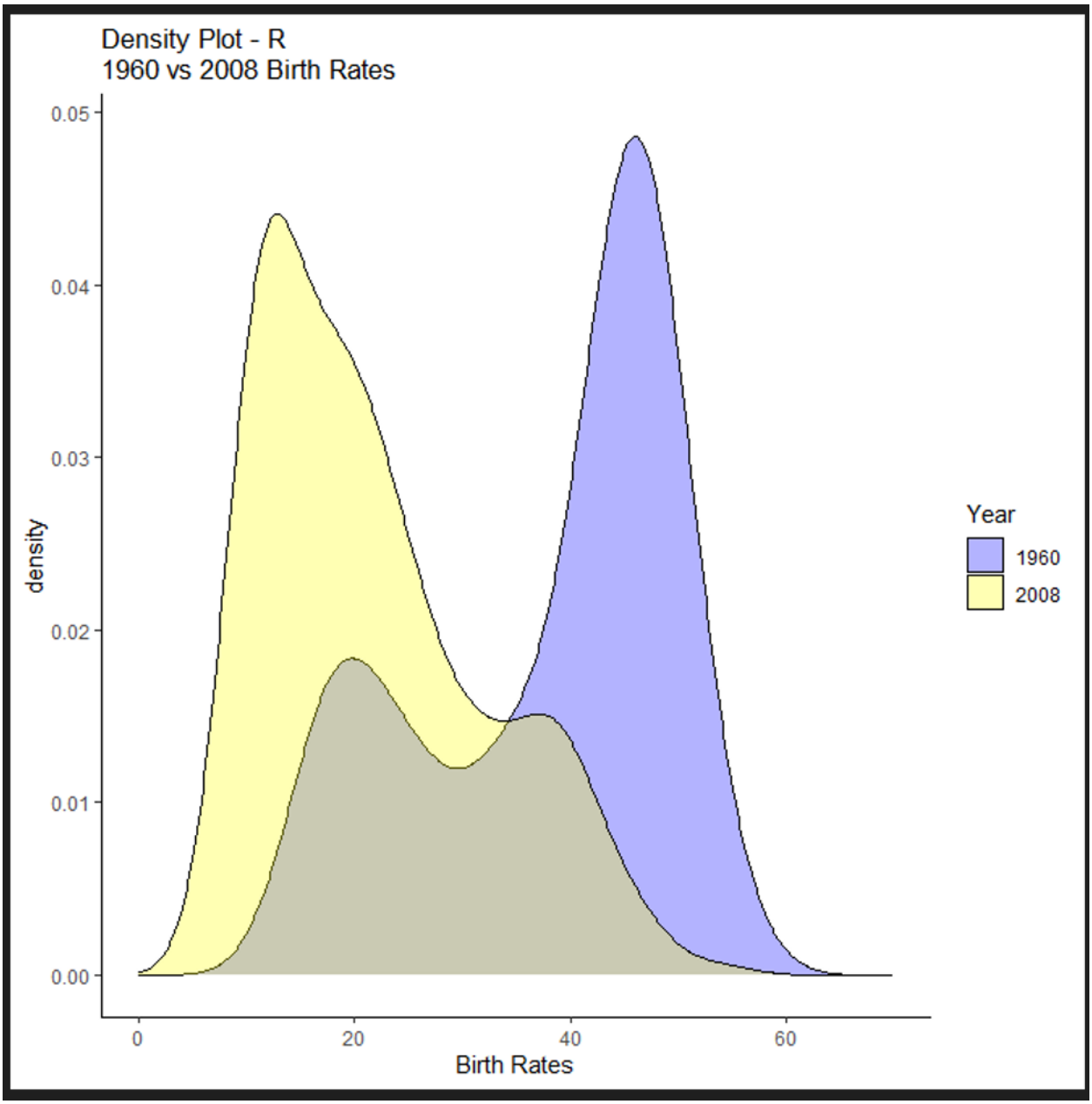


R

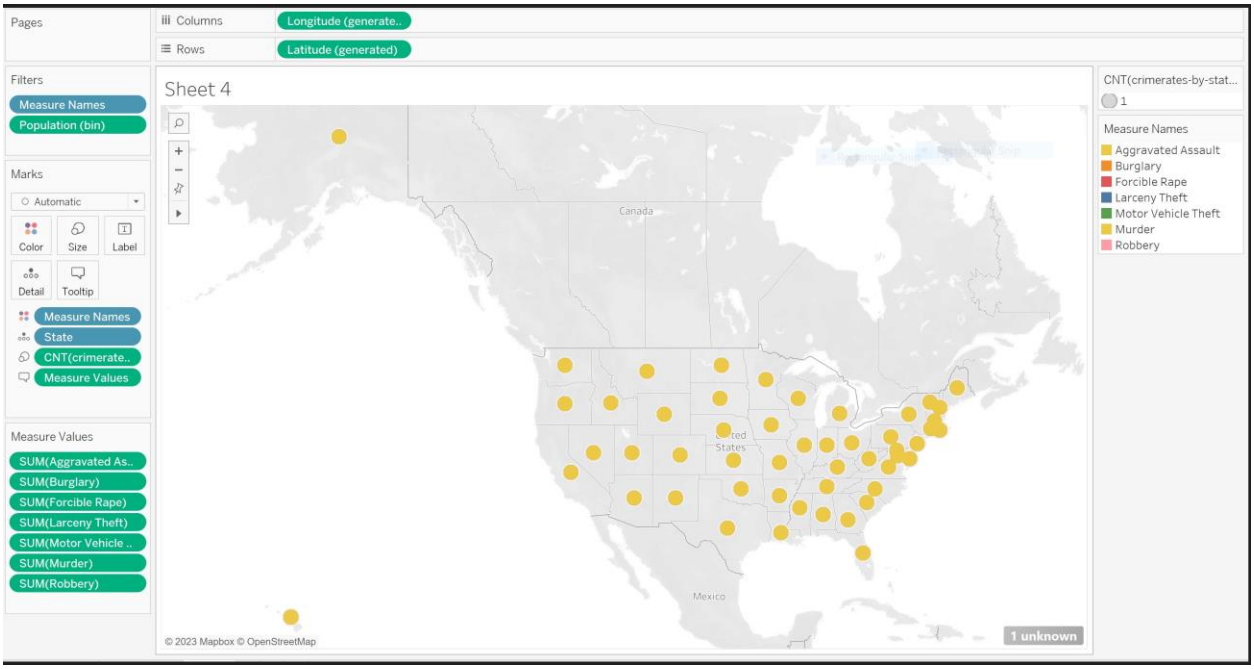
```
### 3. Density Plot

births_df <- birthrate_df %>%
  filter(year == 2008 | year == 1960)
births_df <- births_df[order(births_df$year), ]
births_df$year <- as.character(births_df$year)
births_df
```

```{r}
#| label: densityplot
#| echo: false
fig <- births_df %>%
  ggplot(aes(x = rate, fill = year)) +
  geom_density(alpha = 0.3) +
  ggtitle("Density Plot - R\n1960 vs 2008 Birth Rates") +
  labs(fill = 'Year') +
  scale_x_continuous(name="Birth Rates", limits=c(0, 70)) +
  scale_fill_manual(values = c("blue", "yellow"))
fig
```


Density Plot - R
1960 vs 2008 Birth Rates
0.05
0.04
0.03
0.02
0.01
0.00
density
0
20
40
60
Birth Rates
Year
1960
2008

Tableau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Measure Values
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SUM(Burglary)
SUM(Forcible Rape)
SUM(Larceny Theft)
SUM(Motor Vehicle ..
SUM(Murder)
SUM(Robbery)
Sheet 4
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Mexico
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Measure Names
Aggravated Assault
Burglary
Forcible Rape
Larceny Theft
Motor Vehicle Theft
Murder
Robbery