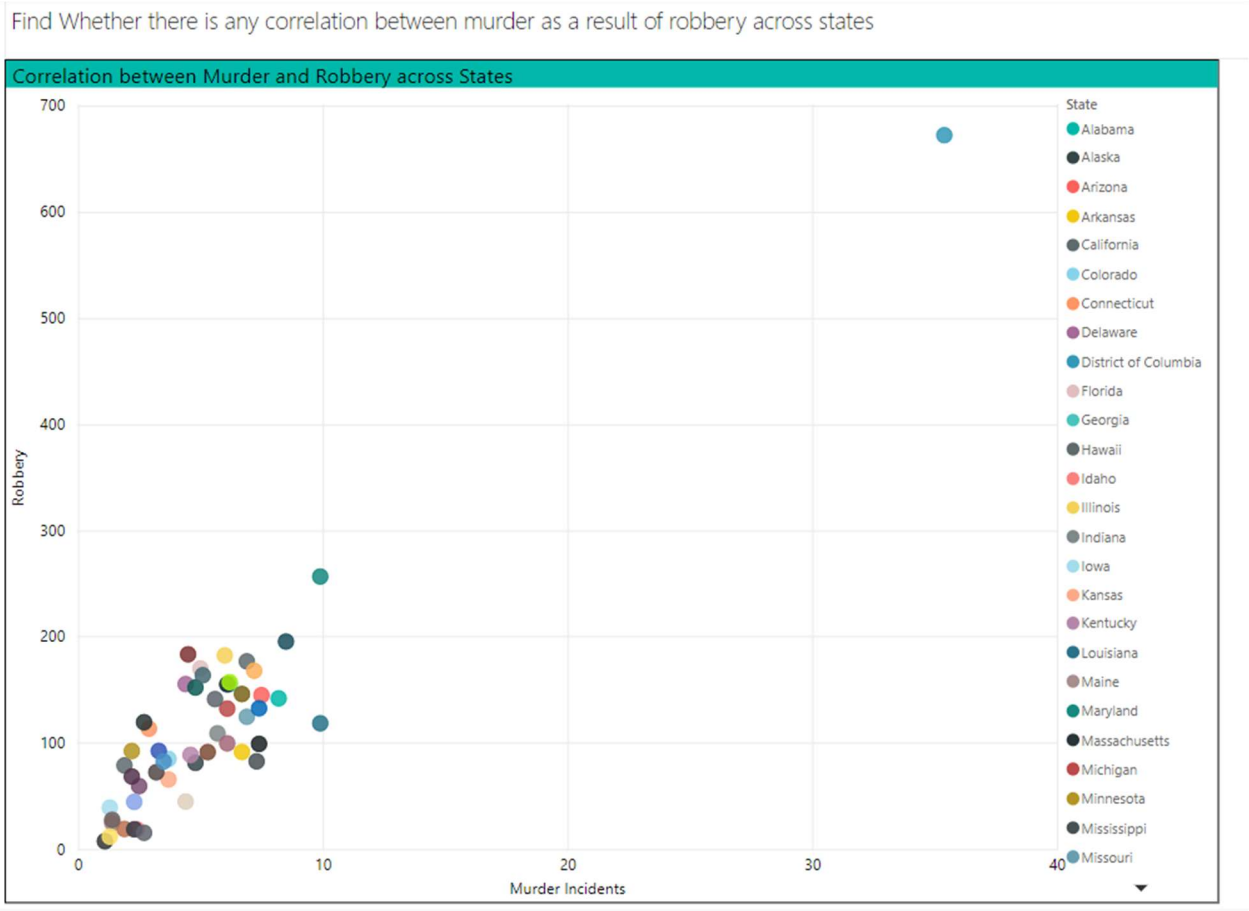
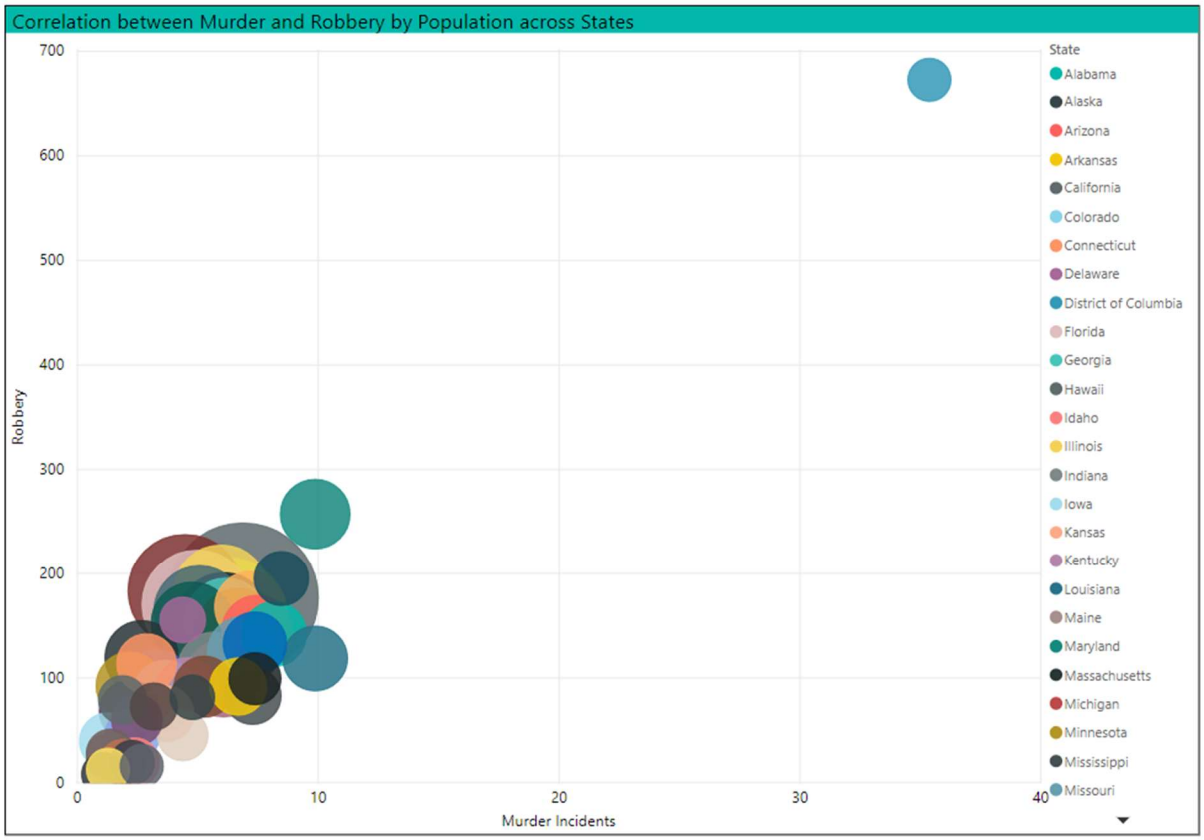
Sri R Sankaranarayanan – Week 7 & 8 - DSC640 – Data Visualization

1. Power BI -Scatter Plot

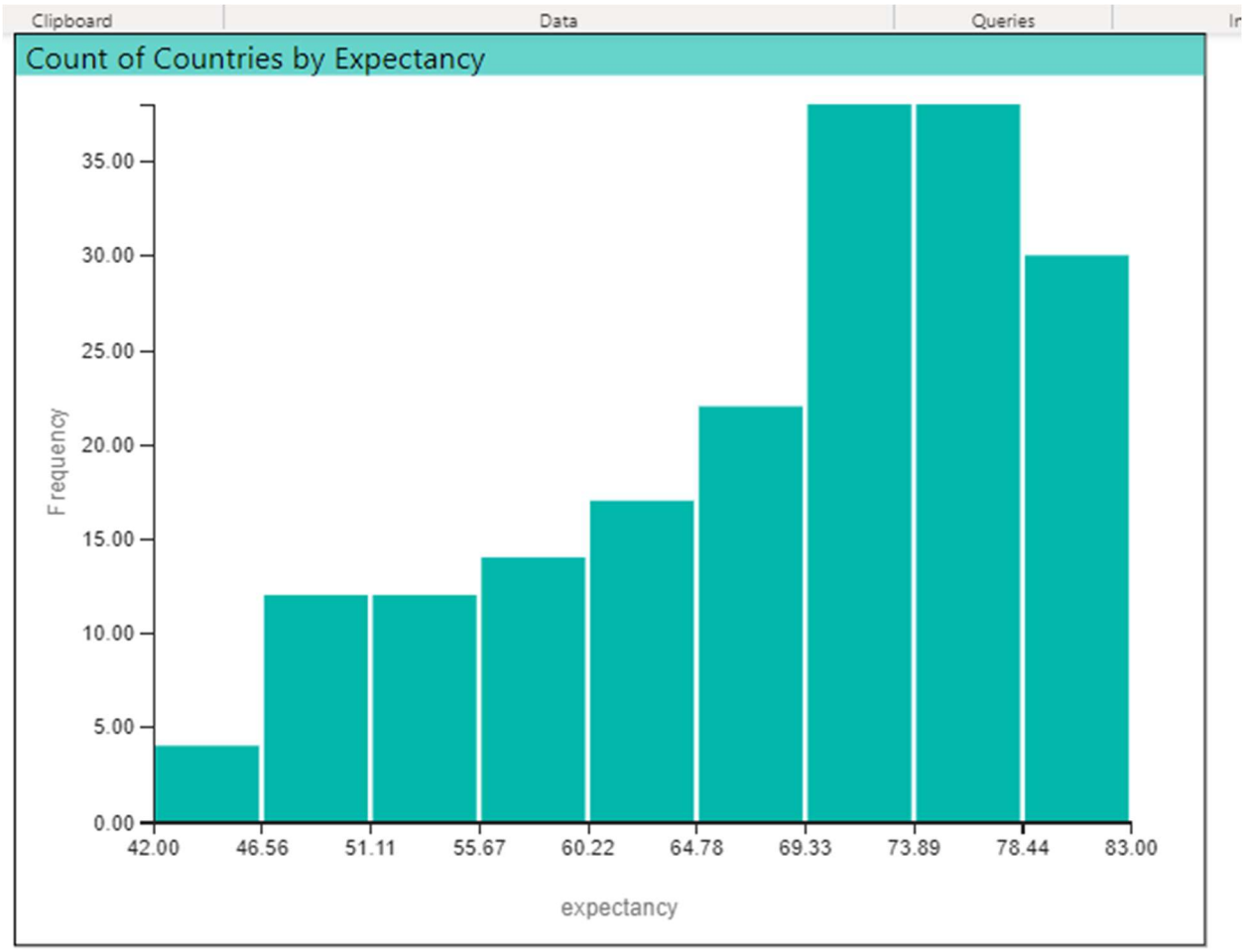


Bubble Plot

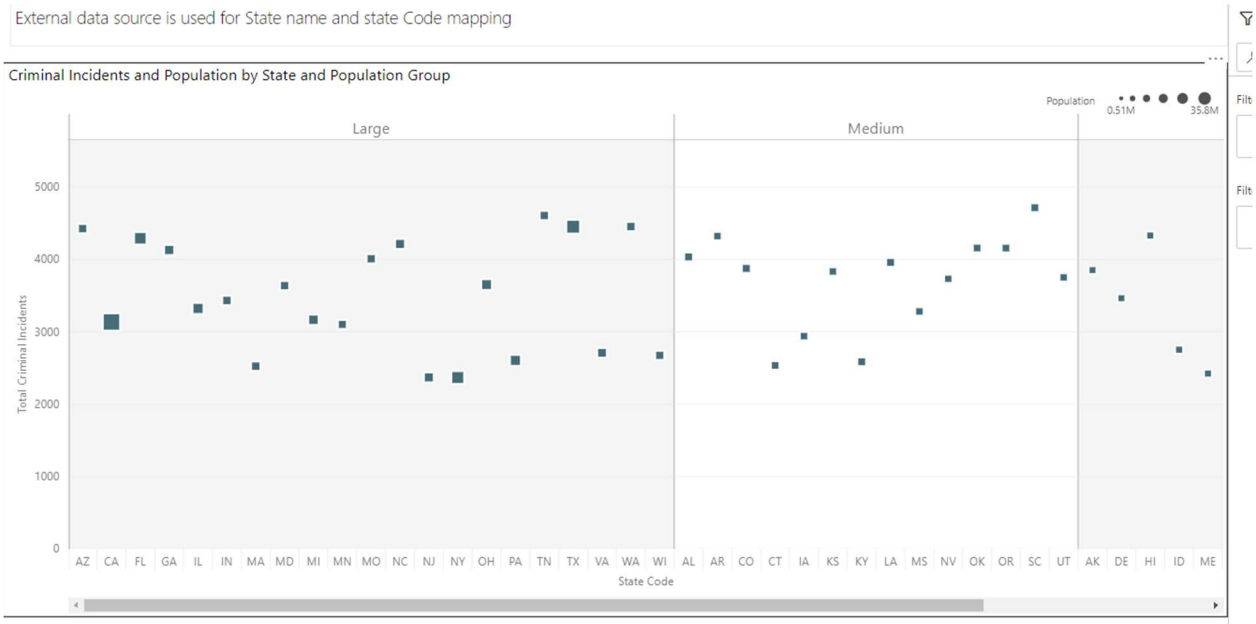
Find Whether there is any correlation between murder as a result of robbery across states and population



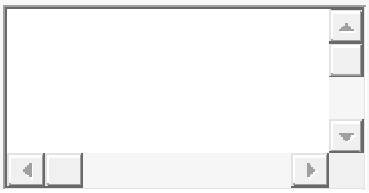
Density Plot


Clipboard
Data
Queries
Count of Countries by Expectancy
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Frequency
42.00
46.56
51.11
55.67
60.22
64.78
69.33
73.89
78.44
83.00
expectancy

Dot Plot

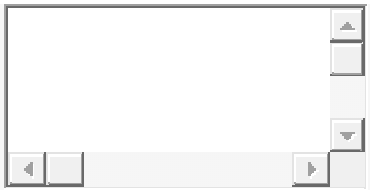

External data source is used for State name and state Code mapping
Criminal Incidents and Population by State and Population Group
Population
0.51M
35.8M
Large
Medium
5000
4000
3000
2000
1000
0
Total Criminal Incidents
AZ CA FL GA IL IN MA MD MI MN MO NC NJ NY OH PA TN TX VA WA WI AL AR CO CT IA KS KY LA MS NV OK OR SC UT AK DE HI ID ME
State Code

2. Python



```
# Import libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import plotly.plotly as py
import cufflinks as cf
import seaborn as sns
```

In [58]:



```
# Read world population data
dirData = 'ex4-2/'
f_crime = 'crimerates-by-state-2005.csv'

dir_crime = dirData+f_crime
crime = pd.read_csv(dir_crime)
crime_state = crime[crime['state']!='United States']

print(crime_state.head())
```

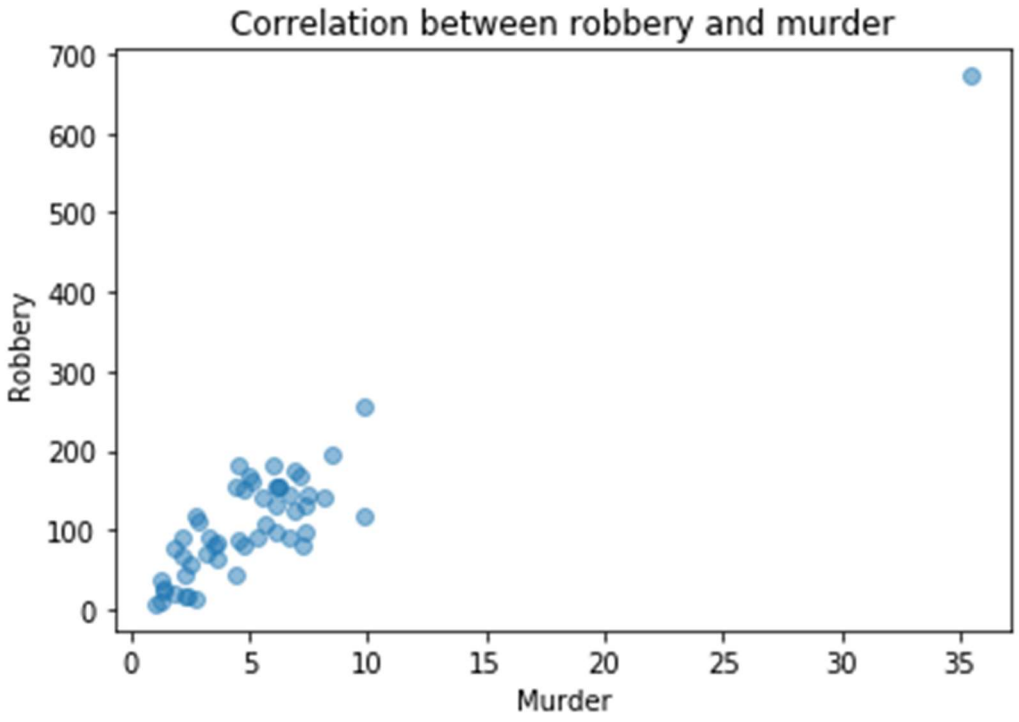
```
          state  murder  forcible_rape  robbery  aggravated_assault  bur
glary  \
1     Alabama     8.2           34.3    141.4               247.8
953.8
2      Alaska     4.8           81.1     80.9               465.1
622.5
3     Arizona     7.5           33.8    144.4               327.4
948.4
4    Arkansas     6.7           42.9     91.1               386.8    1
084.6
5  California     6.9           26.0    176.1               317.3
693.3
```

	larceny_theft	motor_vehicle_theft	population
1	2650.0	288.3	4545049
2	2599.1	391.0	669488
3	2965.2	924.4	5974834
4	2711.2	262.1	2776221
5	1916.5	712.8	35795255

1. Scatter plot

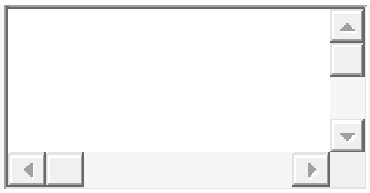
In [3]:

```
# Create a scatter plot showing correlation between murder and robbery

plt.scatter(x=crime['murder'], y=crime['robbery'],alpha=0.5)
plt.title('Correlation between robbery and murder')
plt.xlabel('Murder')
plt.ylabel('Robbery')
plt.show()
```



2. Bubble Chart

In [47]:

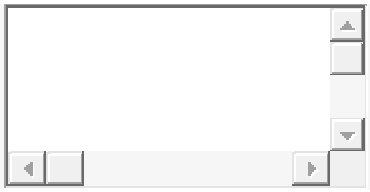


```
# For this excercise I used the API service from plotly (https://plot.ly/)
# Cufflinks binds plotly to pandas dataframes in IPython notebook
# I replaced my username and API for security

py.plotly.tools.set_credentials_file(username='username', api_key='apikey')
cf.set_config_file(offline=False, world_readable=True, theme='pearl')

crime_state.iplot(kind='bubble', x='murder', y='robbery', size='population', text='state',
        xTitle='Murder', yTitle='Robbery',
        filename='Murder vs Robbery by Population')
```

Out[47]:

3. Density plot

In [68]:

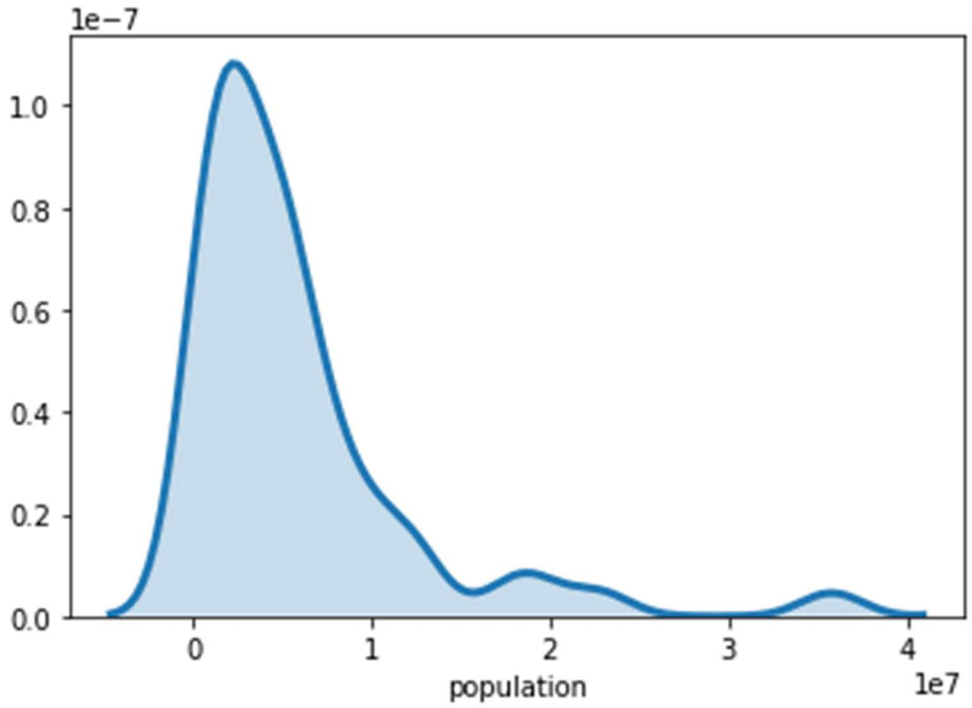


```
# Plotting distribution of population

sns.distplot(crime_state['population'], hist = False, kde = True,
             kde_kws = {'shade': True, 'linewidth': 3})
```

```
c:\users\anirban\appdata\local\programs\python\python36-32\lib\site-packages\scipy\stats\stats.py:1713: FutureWarning:

Using a non-tuple sequence for multidimensional indexing is deprecated; use `arr[tuple(seq)]` instead of `arr[seq]`. In the future this will be interpreted as an array index, `arr[np.array(seq)]`, which will result either in an error or a different result.
```

Out[68]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x14aa0970>
```



73.

3. R – Scatter, Bubble and Density Plots.

You need to submit 3 scatterplots, 3 bubble charts and 3 density plot charts using Tableau or PowerBI, Python and R using the data below (or your own datasets). You can also submit using D3. You can choose which library to use in Python or R, documentation is provided to help you decide and as you start to play around in the libraries, you will decide which you prefer.

In [38]:

```
library('magrittr')

# Set data paths
dirdata <- 'ex4-2/'
file1 <- 'crimerates-by-state-2005.csv'
file2 <- 'life-expectancy.csv'
file3 <- 'states_detail.xlsx'
```

```r
# Load crime rate data
# Creating additional variable state_cont to convert the unique state variable from categorical to continuous
crimerate <- read.csv2(paste(dirdata,file1,sep=''), header=TRUE, sep=',', fill=TRUE, stringsAsFactors=FALSE)
%>%
 dplyr::mutate(murder = as.numeric(murder),
           forcible_rape = as.numeric(forcible_rape),
           robbery = as.numeric(robbery),
           aggravated_assault = as.numeric(aggravated_assault),
           burglary = as.numeric(burglary),
           larceny_theft = as.numeric(larceny_theft),
           motor_vehicle_theft = as.numeric(motor_vehicle_theft),
           population = as.integer(population),
           total_crime = murder+
            forcible_rape+
            robbery+
            aggravated_assault+
            burglary+
            larceny_theft+
            motor_vehicle_theft,
           state_cont = rank(state, ties.method = 'first'))

# For the additional data, I used US State to region mapping
# I marked the mid west states and rest of USA in the region column in the states_detail.xlsx file
# The file is uploaded in the same github repository
state_detail <- xlsx::read.xlsx2(paste(dirdata,file3,sep=''),sheetIndex = 1, stringsAsFactors = FALSE)

# Remove USA as a state and add region
crimerate_states <- crimerate %>%
 dplyr::left_join(state_detail, by='state') %>%
 dplyr::filter(state !='United States') %>%
 dplyr::mutate(midwest = as.integer(midwest))

# Replace NA
crimerate_states[is.na(crimerate_states)] <- 0

# Load life expectancy data
lifeexp <- read.csv2(paste(dirdata,file2,sep=''), header=TRUE, sep=',', fill=TRUE, stringsAsFactors=FALSE)

head(crimerate_states)
head(lifeexp)
```

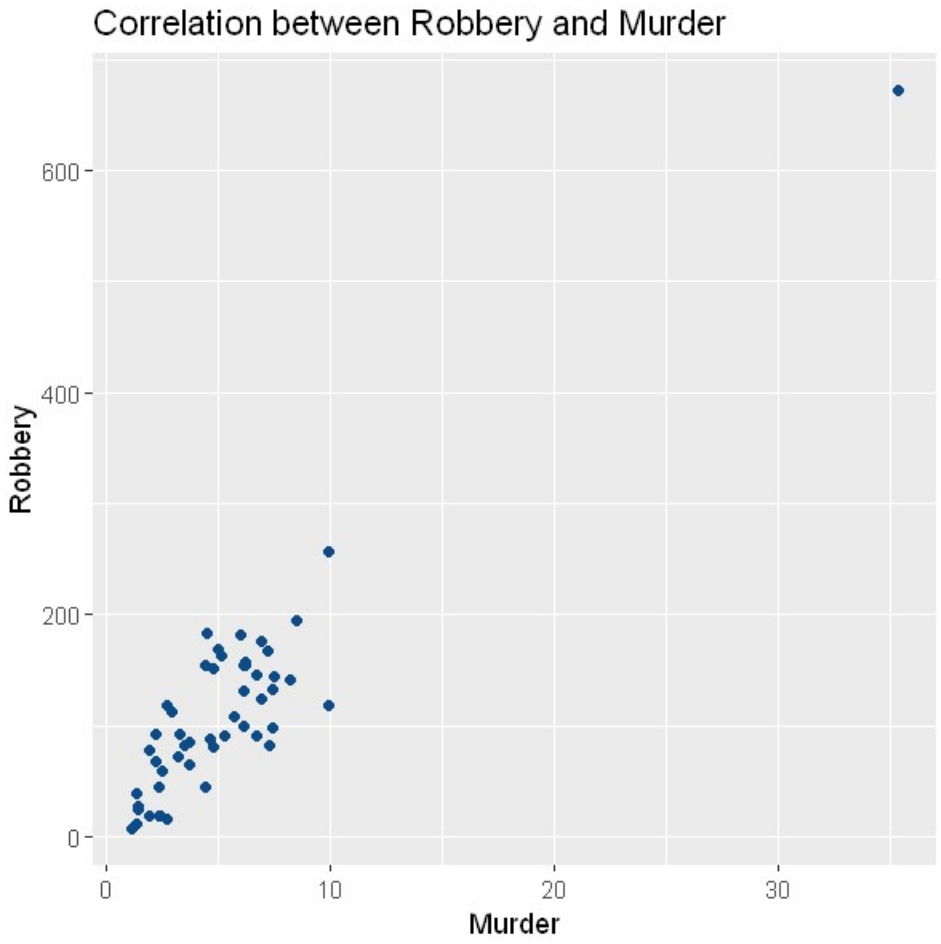
state	murder	forcible_rape	robbery	aggravated_assault	burglary	larceny_theft	motor_vehicle_theft	population	total_crime	state_cont	name_caps	abbr	midwest
Alabama	8.2	34.3	141.4	247.8	953.8	2650.0	288.3	4545049	4323.8	1	ALABAMA	AL	0
Alaska	4.8	81.1	80.9	465.1	622.5	2599.1	391.0	669488	4244.5	2	ALASKA	AK	0
Arizona	7.5	33.8	144.4	327.4	948.4	2965.2	924.4	5974834	5351.1	3	ARIZONA	AZ	0
Arkansas	6.7	42.9	91.1	386.8	1084.6	2711.2	262.1	2776221	4585.4	4	ARKANSAS	AR	0
California	6.9	26.0	176.1	317.3	693.3	1916.5	712.8	35795255	3848.9	5	CALIFORNIA	CA	0
Colorado	3.7	43.4	84.6	264.7	744.8	2735.2	559.5	4660780	4435.9	6	COLORADO	CO	0

country	year	expectancy
Afghanistan	2008	42
Albania	2008	73
Algeria	2008	71
Angola	2008	46
Antigua and Barbuda	2008	74
Argentina	2008	76

Plot 1: Create scatter plot

In [32]:

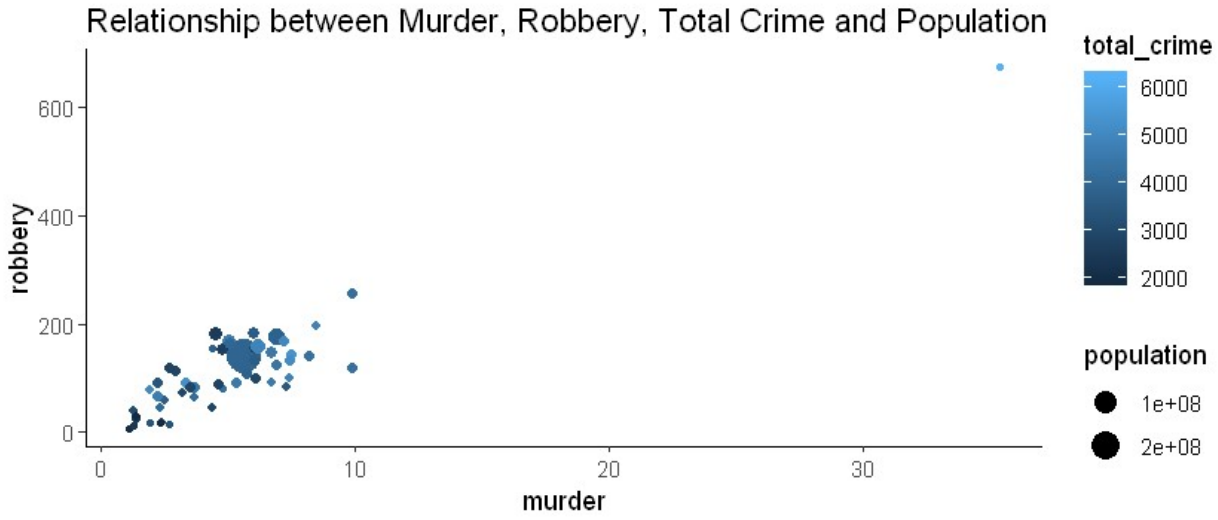
```
# Format graph size
options(repr.plot.width = 5, repr.plot.height = 5)

# Plot
ggplot2::ggplot(data = crimerate_states) +
 ggplot2::aes(x = murder, y = robbery) +
 ggplot2::geom_point(color = "#0c4c8a") +
 ggplot2::labs(title = "Correlation between Robbery and Murder",
     x = "Murder",
     y = "Robbery") +
 ggplot2::theme_grey()
```



Plot 2: Create bubble plot

In [44]:

```
# Format graph size
options(repr.plot.width = 7, repr.plot.height = 3)

# Plot
ggplot2::ggplot(data = crimerate) +
 ggplot2::aes(x = murder, y = robbery, color = total_crime, size = population) +
 ggplot2::geom_point() +
 ggplot2::labs(title = "Relationship between Murder, Robbery, Total Crime and Population") +
 ggplot2::theme_classic()
```

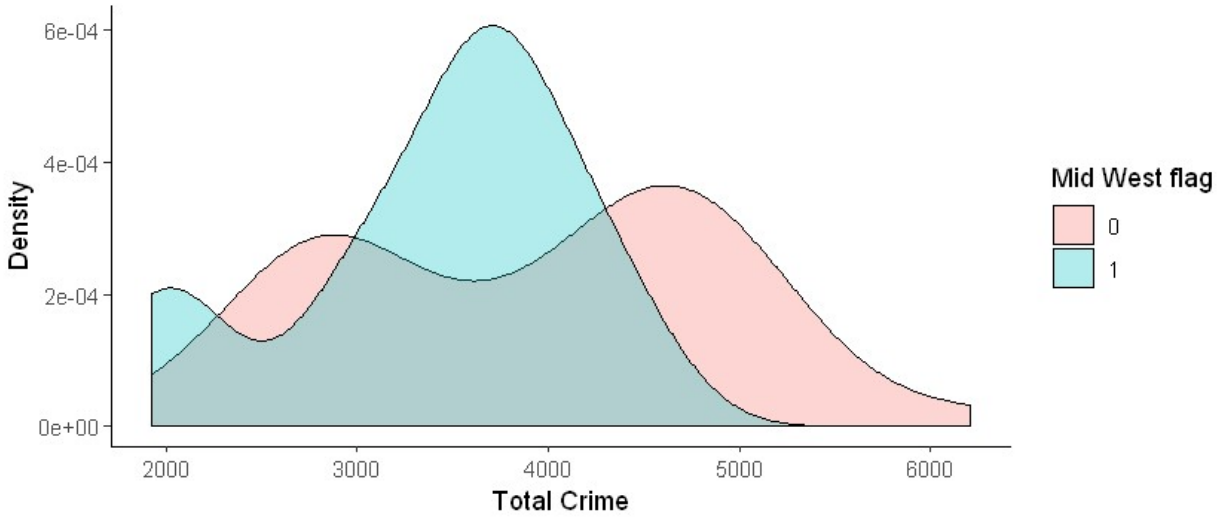


Plot 3: Create density plot

In [46]:

```
# For this I want to compare total crime rate of mid west states to the rest of the states
crimerate_compare <- crimerate_states[,-1]
rownames(crimerate_compare) <- crimerate_states[,1]

ggplot2::ggplot(crimerate_compare) +
 ggplot2::aes(total_crime, fill=as.factor(crimerate_compare$midwest)) +
 ggplot2::geom_density(alpha = 0.3) +
```

```
ggplot2::labs(x='Total Crime', y='Density') +
ggplot2::theme_classic() +
ggplot2::guides(fill=ggplot2::guide_legend(title="Mid West flag"))
```



End of Code