DSC 640: Weeks 11 – 12
Author: Kimberly Cable
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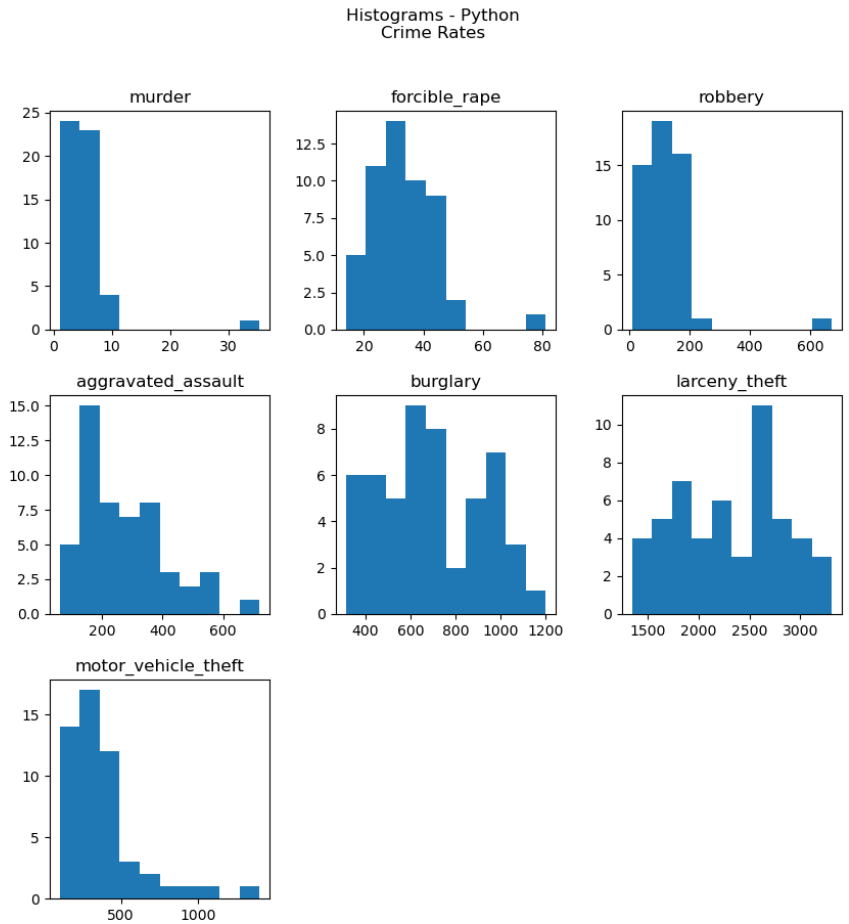
Exercise 6.2 Histograms, Box Plots & Bullet Charts

Histograms

Python

```
axes = crime_df.hist(bins = 10, figsize = (10,10), grid = False)
plt.suptitle("Histograms - Python\nCrime Rates")

plt.savefig('images/histogram-python.png')
```



R

```{r}
#| label: justcrimes

just_crimes_df <- subset(crime_df, select = -c(state) )

just_crimes_df
```

```{r}
#| label: histogram

fig <- ggplot(gather(just_crimes_df), aes(value)) +
  geom_histogram(bins = 10) +
  facet_wrap(~key, scales = 'free_x') +
  ggtitle("Histograms - R\nCrime Rates")

#fig
ggsave("images/histograms-r.png", width = 8, height = 10, units = "in")
```

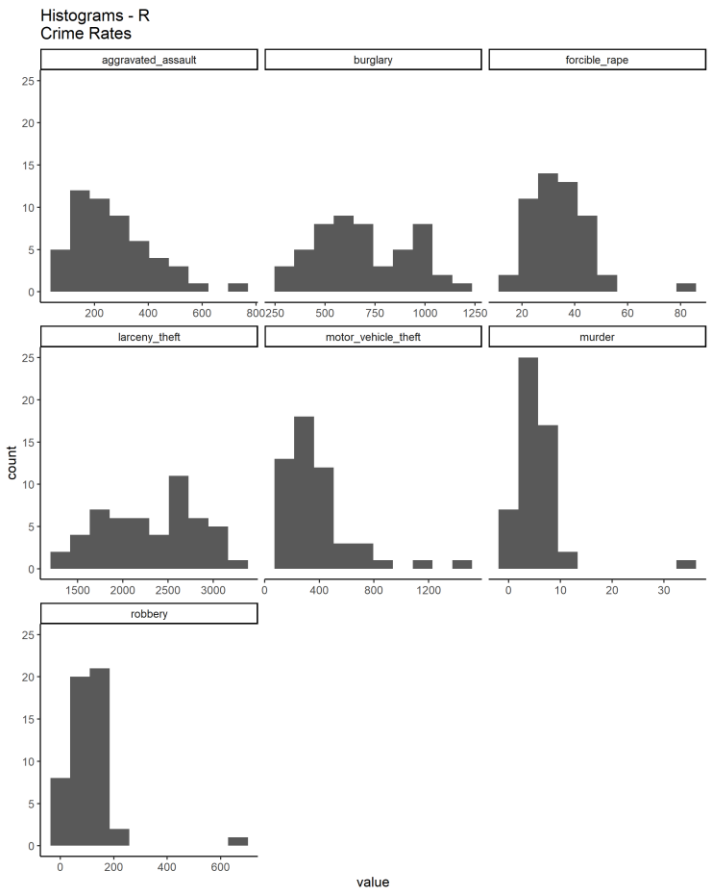
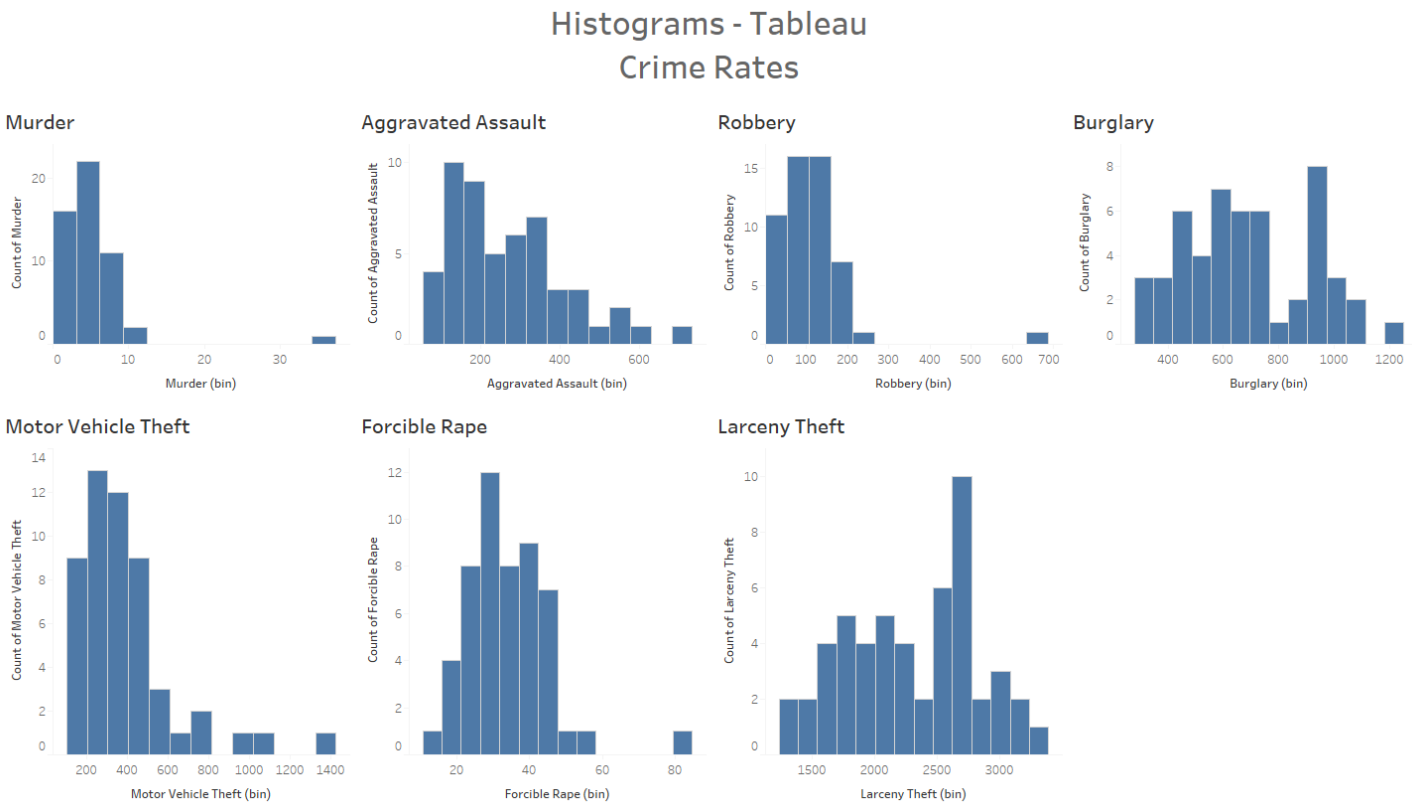


Tableau
(for code please see Weeks11_12_Tableau.twb)

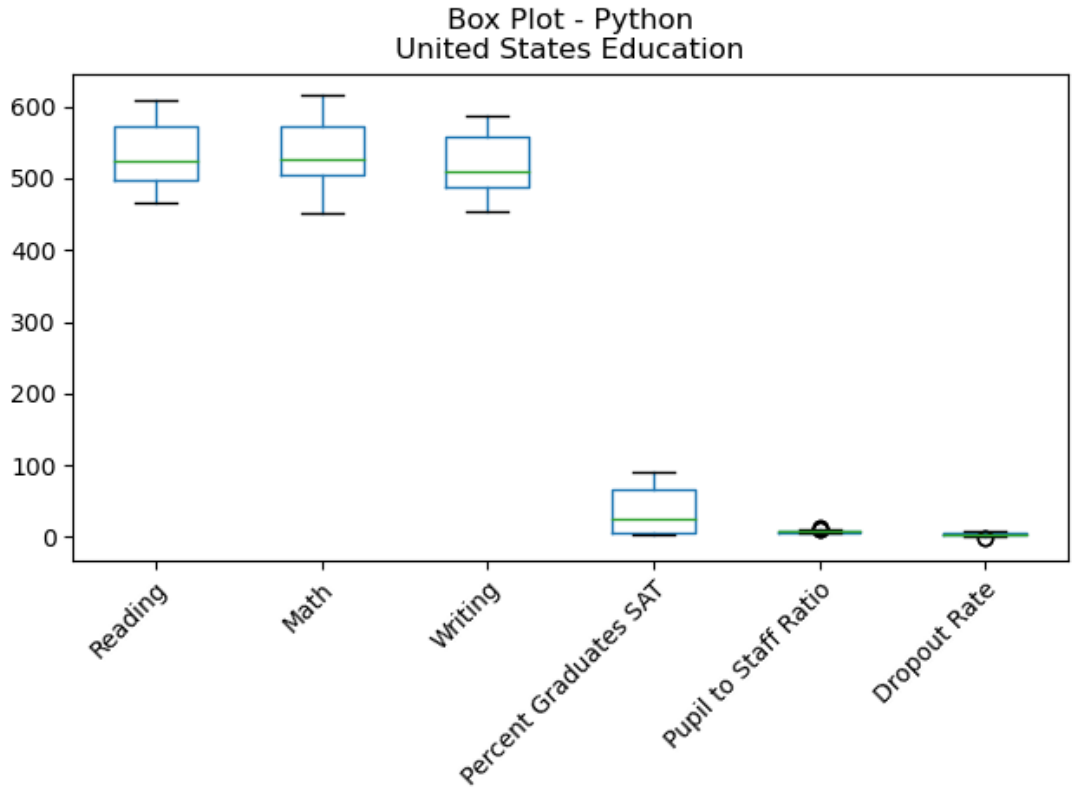


Box Plots

Python

```
states_education = education_df[education_df['state'] != 'United States']
states_education.head()
```

```
fig = plt.figure()

bp = states_education.boxplot(grid = False)

plt.title("Box Plot - Python\nUnited States Education")
plt.xticks([1, 2, 3, 4, 5, 6], ['Reading', 'Math', 'Writing', 'Percent Graduates SAT', 'Pupil to Staff Ratio', 'Dropout Rate'])
plt.xticks(rotation = 45, ha = 'right', rotation_mode = 'anchor')
plt.tight_layout()

plt.show()

fig.savefig('images/boxplot-python.png')
```



R

```{r}
#| label: justscores

just_scores_df <- subset(education_df, select = -c(state) )

just_scores_df
```

```{r}
#| label: boxplot

fig <- ggplot(gather(just_scores_df), aes(value)) +
  geom_boxplot() +
  facet_wrap(~key, scales = 'free_x') +
  ggtitle("Box Plots - R\nUnited States Education")

#fig
ggsave("images/boxplot-r.png", width = 8, height = 10, units = "in")
```

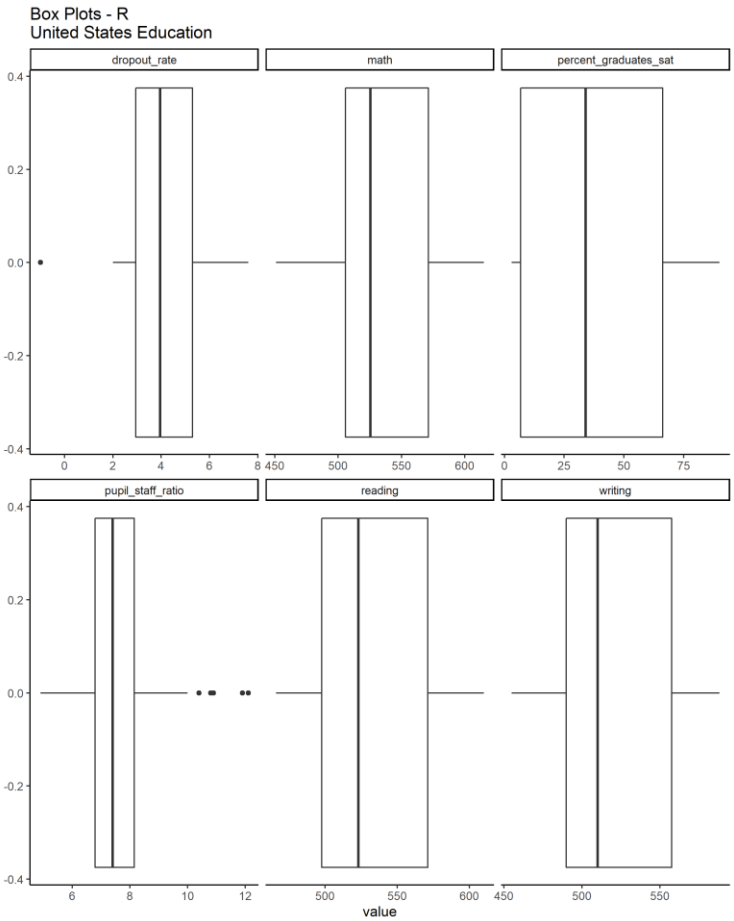
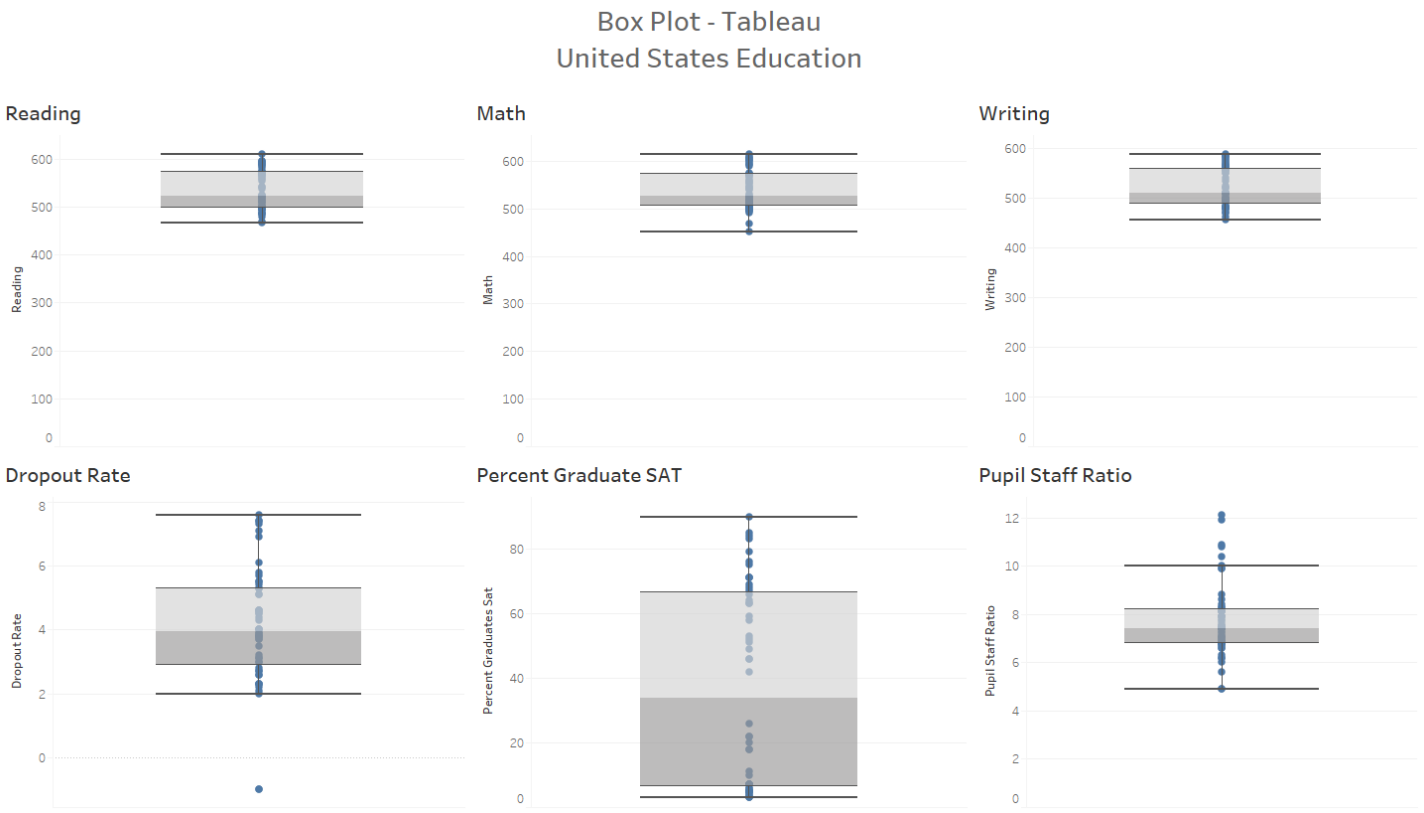


Tableau
(for code please see Weeks11_12_Tableau.twb)



Bullet Chart

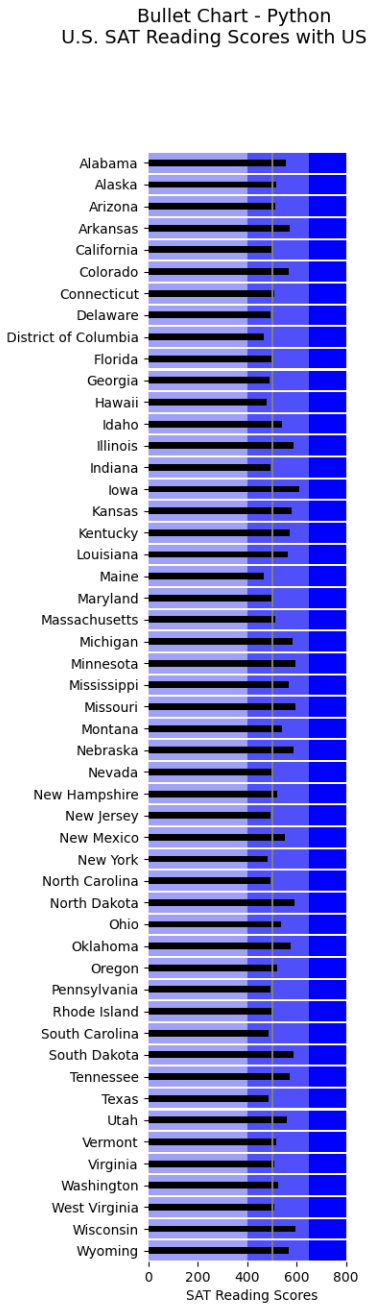
Python

```
def bulletgraph(data = None, limits = None, labels = None, axis_label = None, title = None,
                size=(15, 15), palette = None, formatter = None, target_color = "gray",
                bar_color = "black", label_color = "gray"):
    """ Build out a bullet graph image
        Args:
            data = List of labels, measures and targets
            limits = list of range valules
            labels = list of descriptions of the limit ranges
            axis_label = string describing x axis
            title = string title of plot
            size = tuple for plot size
            palette = a seaborn palette
            formatter = matplotlib formatter object for x axis
            target_color = color string for the target line
            bar_color = color string for the small bar
            label_color = color string for the limit label text
        Returns:
            a matplotlib figure
    """
    # Determine the max value for adjusting the bar height
    # Dividing by 10 seems to work pretty well
    h = limits[-1] / 10

    # Use the green palette as a sensible default
    if palette is None:
        palette = sns.light_palette("blue", len(limits), reverse=False)

    # Must be able to handle one or many data sets via multiple subplots
    if len(data) == 1:
        fig, ax = plt.subplots(figsize=size, sharex=True)
    else:
        fig, axarr = plt.subplots(len(data), figsize=size, sharex=True)

    # Add each bullet graph bar to a subplot
    for idx, item in enumerate(data):

        # Get the axis from the array of axes returned when the plot is created
        if len(data) > 1:
            ax = axarr[idx]

        # Formatting to get rid of extra marking clutter
        ax.set_aspect('equal')
        ax.set_yticklabels([item[0]])
        ax.set_yticks([1])
        ax.spines['bottom'].set_visible(False)
```

```
        ax.spines['top'].set_visible(False)
        ax.spines['right'].set_visible(False)
        ax.spines['left'].set_visible(False)

        prev_limit = 0
        for idx2, lim in enumerate(limits):
            # Draw the bar
            ax.barh([1], lim - prev_limit, left=prev_limit, height=h,
                    color=palette[idx2])
            prev_limit = lim
        rects = ax.patches
        # The last item in the list is the value we're measuring
        # Draw the value we're measuring
        ax.barh([1], item[1], height=(h / 3), color=bar_color)

        # Need the ymin and max in order to make sure the target marker
        # fits
        ymin, ymax = ax.get_ylim()
        ax.vlines(
            item[2], ymin * .9, ymax * .9, linewidth=1.5, color=target_color)

    # Now make some labels
    if labels is not None:
        for rect, label in zip(rects, labels):
            height = rect.get_height()
            ax.text(
                rect.get_x() + rect.get_width() / 2,
                -height * .4,
                label,
                ha='center',
                va='bottom',
                color=label_color)
    if formatter:
        ax.xaxis.set_major_formatter(formatter)
    if axis_label:
        ax.set_xlabel(axis_label)
    if title:
        fig.suptitle(title, fontsize=14)
    fig.subplots_adjust(hspace=0)

    plt.savefig('images/bulletchart-python.png')
```

```
data = []
for index, row in education_df.iterrows():
    if index == 0:
        us_score = row['reading']
    else:
        state_score = row['reading']
        data.append((row["state"], state_score, us_score))
```

```
bulletgraph(data,limits = [0, 400, 650, 800],
        axis_label = 'SAT Reading Scores', title = "Bullet Chart - Python\nU.S. SAT Reading Scores with US Avg")
```



R

```{r}
#| label: formatdata

us_states <- education_df$state
reading_scores <- education_df$reading

data = data.frame(us_states, reading_scores, stringsAsFactors = TRUE)
data <- data[-1,]
data
```

```{r}
#| label: usreading

us_average <- education_df[education_df$state == 'United States', 'reading']
us_average
```

```{r fig.height=15, fig.width=7}
#| label: bulletchart


fig <- ggplot() +
  geom_bar(data = education_df,
           aes(x = state, y = 800), stat = "identity", width = .8, fill = '#0000ff',
           position = "stack") +
  geom_bar(data = education_df,
           aes(x = state, y = 650), stat = "identity", width = .8, fill = '#5050fb',
           position = "stack") +
  geom_bar(data = education_df,
           aes(x = state, y = 400), stat = "identity", width = .8, fill = '#a0a0f7',
           position = "stack") +
  geom_bar(data = education_df,
           aes(x = state, y = reading), fill = "black", width = 0.2,
           stat = "identity") +
  coord_flip(expand = FALSE) +
  labs(title='Bullet Chart - R', subtitle = 'US Reading Scores',
       x = 'State', y = 'Reading Score') +
  geom_errorbar(data = education_df,
                aes(x = state, ymin = us_average, ymax = us_average),
                color = 'red', width = 0.8, size = 1)


#fig
ggsave("images/bulletchart-r.png", width = 8, height = 10, units = "in")
```

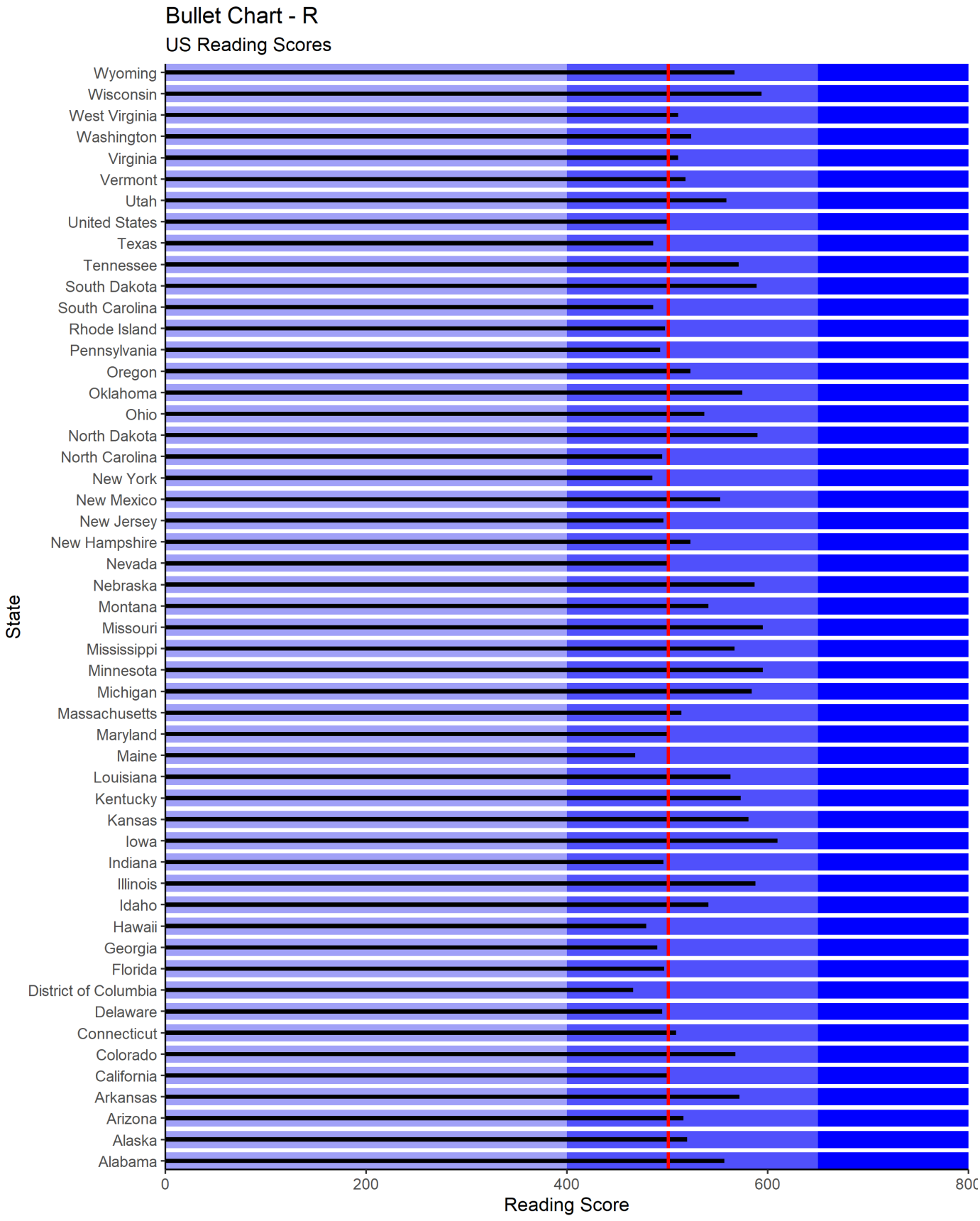
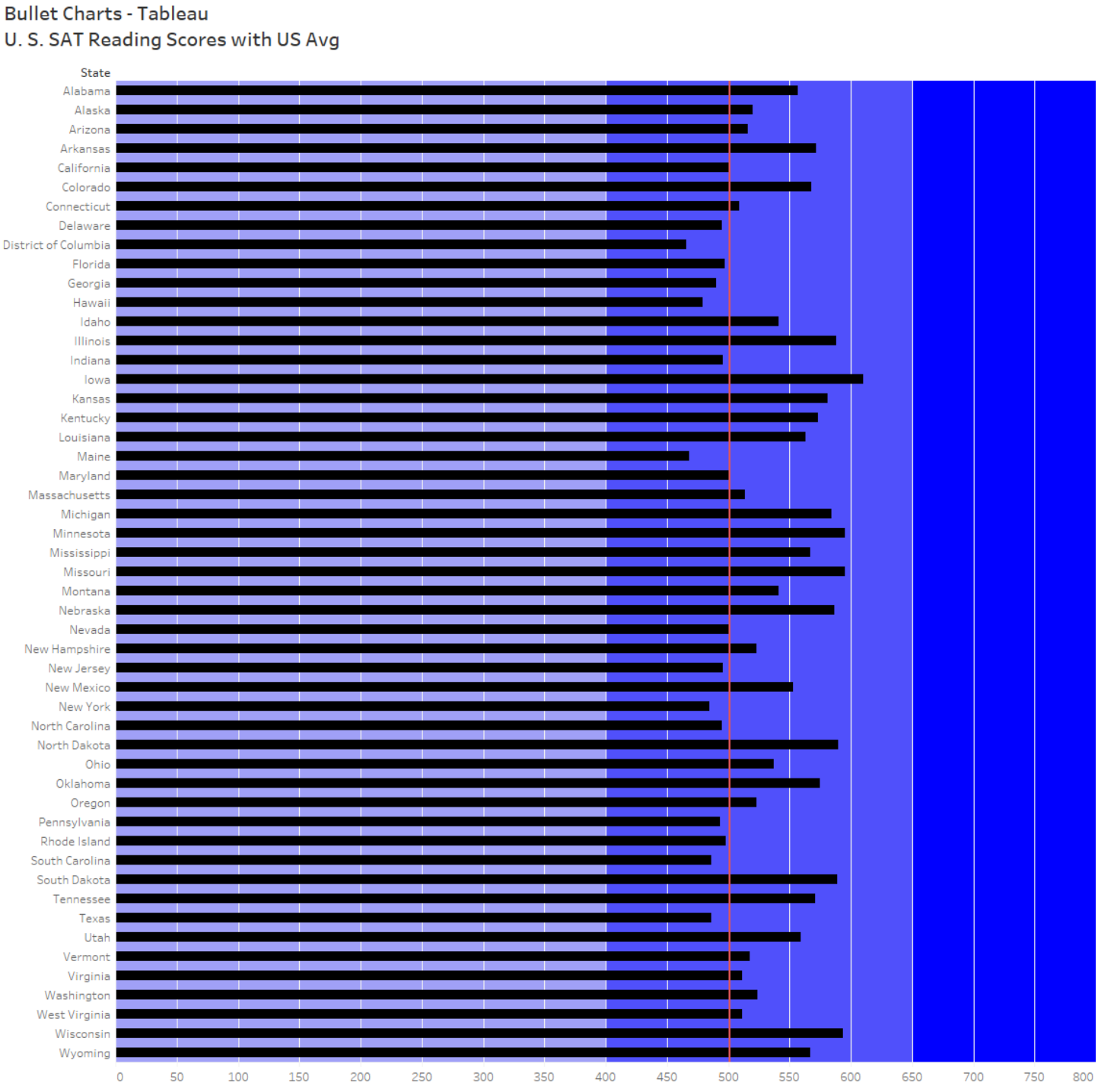

Bullet Chart - R
US Reading Scores
Wyoming
Wisconsin
West Virginia
Washington
Virginia
Vermont
Utah
United States
Texas
Tennessee
South Dakota
South Carolina
Rhode Island
Pennsylvania
Oregon
Oklahoma
Ohio
North Dakota
North Carolina
New York
New Mexico
New Jersey
New Hampshire
Nevada
Nebraska
Montana
Missouri
Mississippi
Minnesota
Michigan
Massachusetts
Maryland
Maine
Louisiana
Kentucky
Kansas
Iowa
Indiana
Illinois
Idaho
Hawaii
Georgia
Florida
District of Columbia
Delaware
Connecticut
Colorado
California
Arkansas
Arizona
Alaska
Alabama
State
0
200
400
600
800
Reading Score

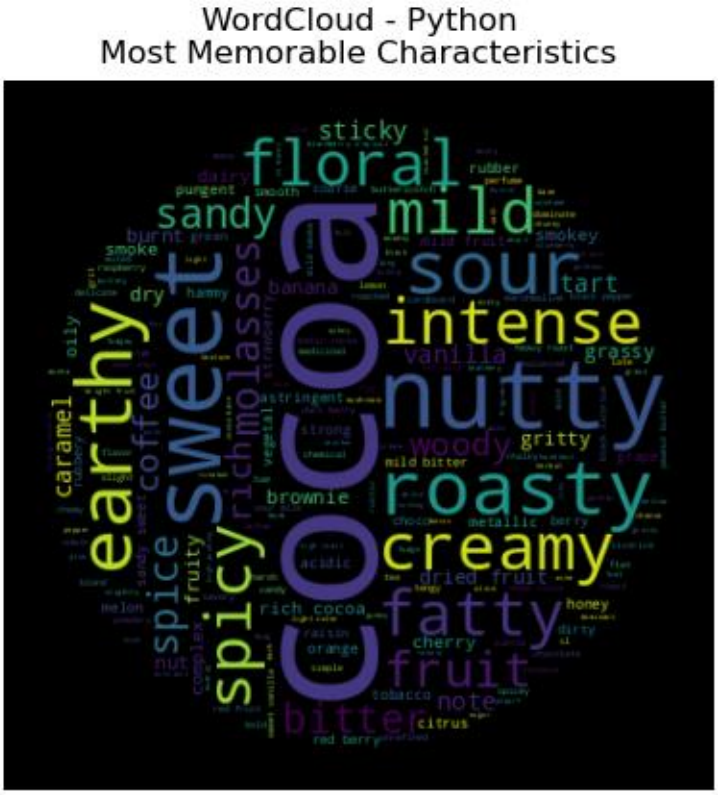
Tableau
(for code please see Weeks11_12_Tableau.twb)



My Choice – Word Cloud

Python

```
# Most frequent words in the Characteristics
word_string = " ".join(chocolate_df['Most Memorable Characteristics'].str.lower())

# Create a circle mask
x, y = np.ogrid[:400, :400]
mask = (x - 200) ** 2 + (y - 200) ** 2 > 180 ** 2
mask = 255 * mask.astype(int)

wc = WordCloud(background_color = "black", repeat = True, mask = mask)
wc.generate(word_string)

plt.axis("off")
plt.imshow(wc, interpolation = "bilinear")
plt.title('WordCloud - Python\nMost Memorable Characteristics')

plt.savefig('images/wordcloud-python.png')
```



R

```{r}
#| label: buildcorpus

# load characteristics as a corpus
docs <- Corpus(VectorSource(chocolate_df['Most Memorable Characteristics']))

```

```{r}
#| label: cleandata

# remove quotation marks
docs <- tm_map(docs, removePunctuation)

# Eliminate extra white spaces
docs <- tm_map(docs, stripWhitespace)

```

```{r}
#| label: buildmatrix

# build term-document matrix

dtm <- TermDocumentMatrix(docs)
m <- as.matrix(dtm)
v <- sort(rowSums(m),decreasing=TRUE)
d <- data.frame(word = names(v),freq=v)

head(d, 10)
```

```{r}

#| label: wordcloud

set.seed(1234)

fig <- wordcloud2(data = d, color = 'random-light', backgroundColor = 'black', shape = 'circle', size = 0.7)

#fig
saveWidget(fig,"tmp.html",selfcontained = F)
webshot("tmp.html", "images/wordcloud-r.png", delay = 5, vwidth = 480, vheight = 480)
```

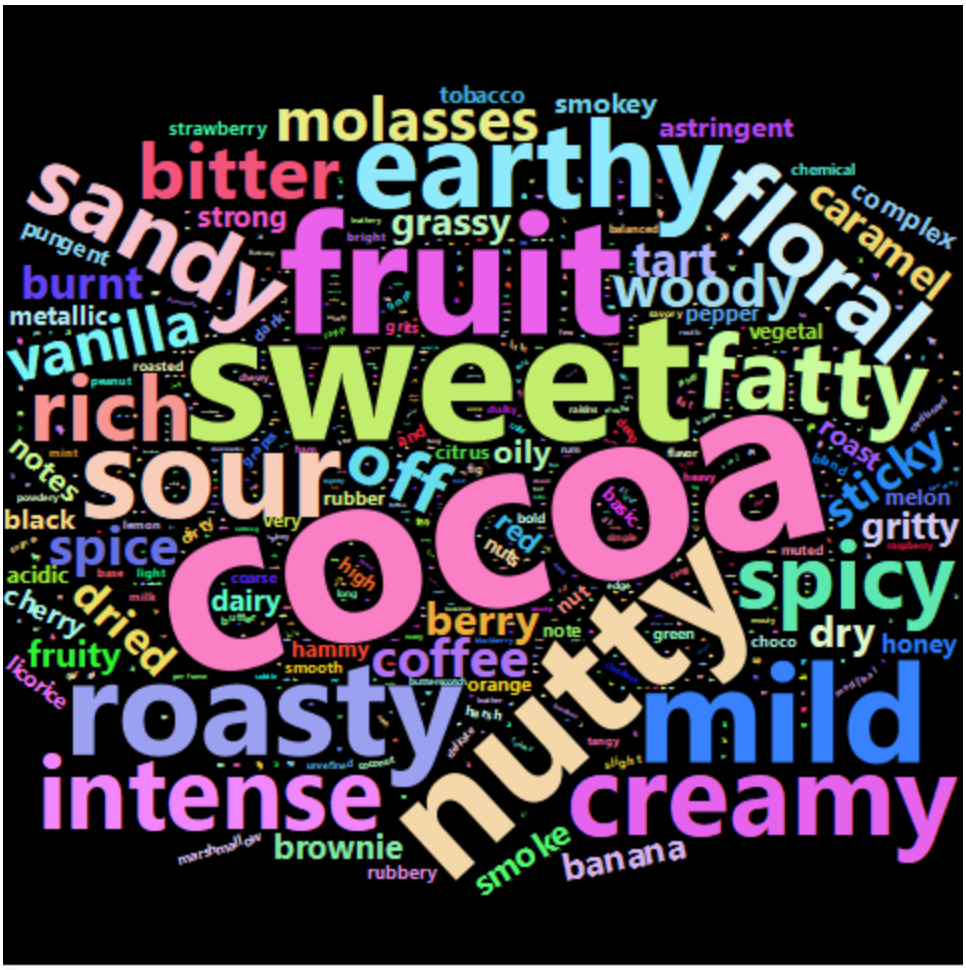

tobacco
smokey
strawberry
molasses
astringent
bitter
earthy
chemical
complex
floral
caramel
strong
grassy
sandy
fruit
tart
woody
pungent
burnt
pepper
metallic
vanilla
vegetal
sweet
fatty
rich
roasted
peanut
sour
off
citrus
oily
roast
sticky
notes
rubber
melon
black
cocoa
gritty
spice
spicy
acidic
coarse
dairy
dried
cherry
berry
note
green
dry
honey
fruity
hammy
coffee
smooth
licorice
orange
roasty
mild
intense
nutty
creamy
brownie
smoke
banana
rubbery

Tableau
(for code please see Weeks11_12_Tableau.twb)