DSC 640: Weeks 9 – 10
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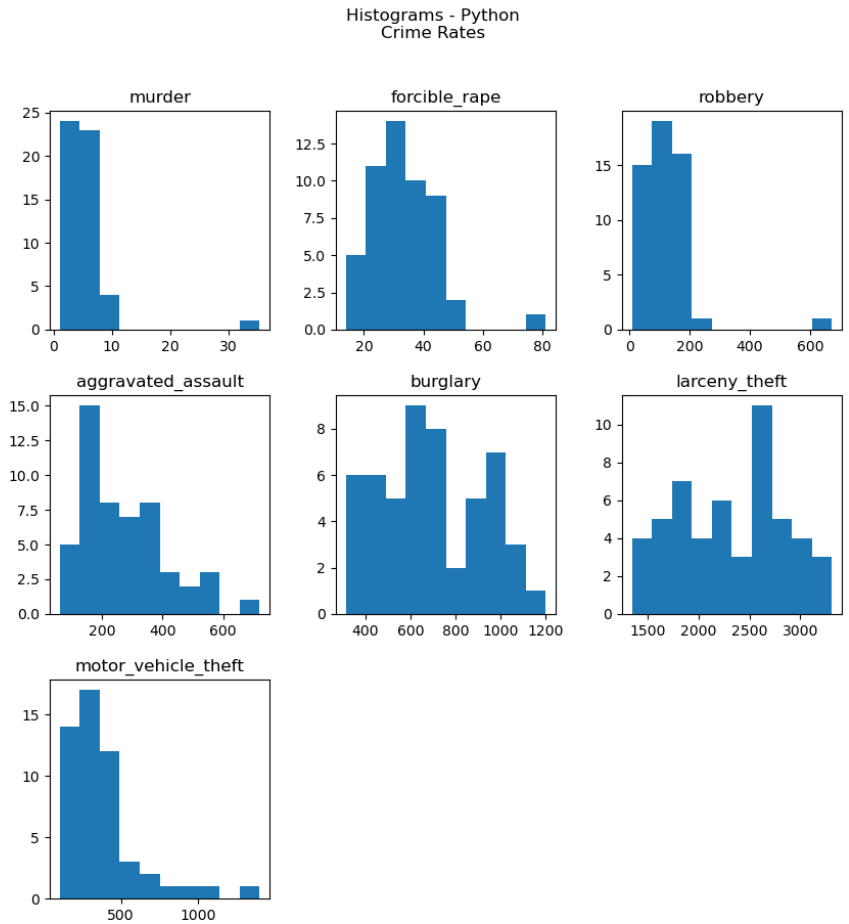
Exercise 6.2 Histograms, Box Plots & Bullet Charts

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")
```

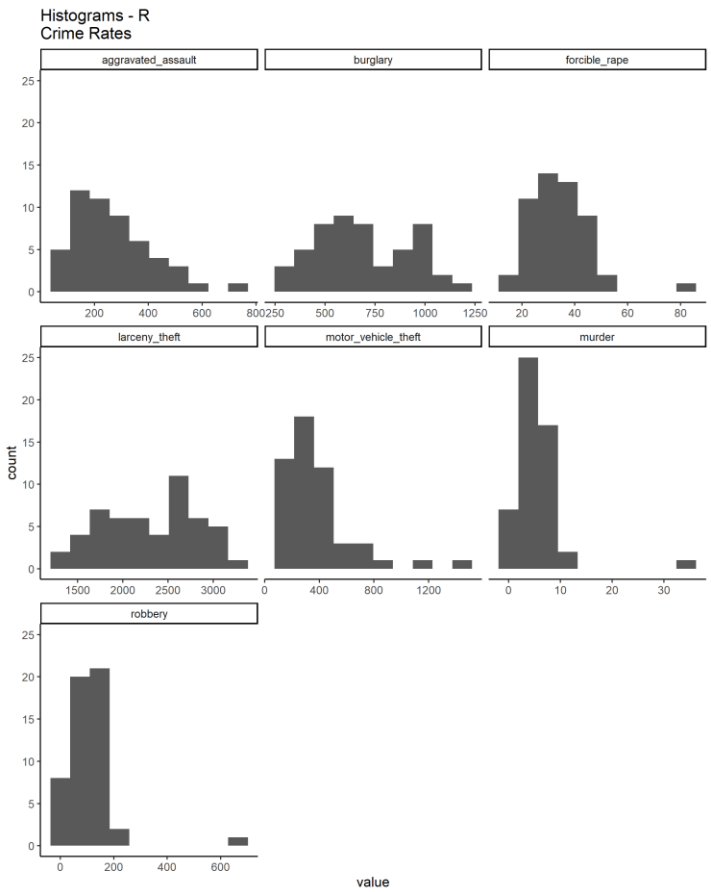
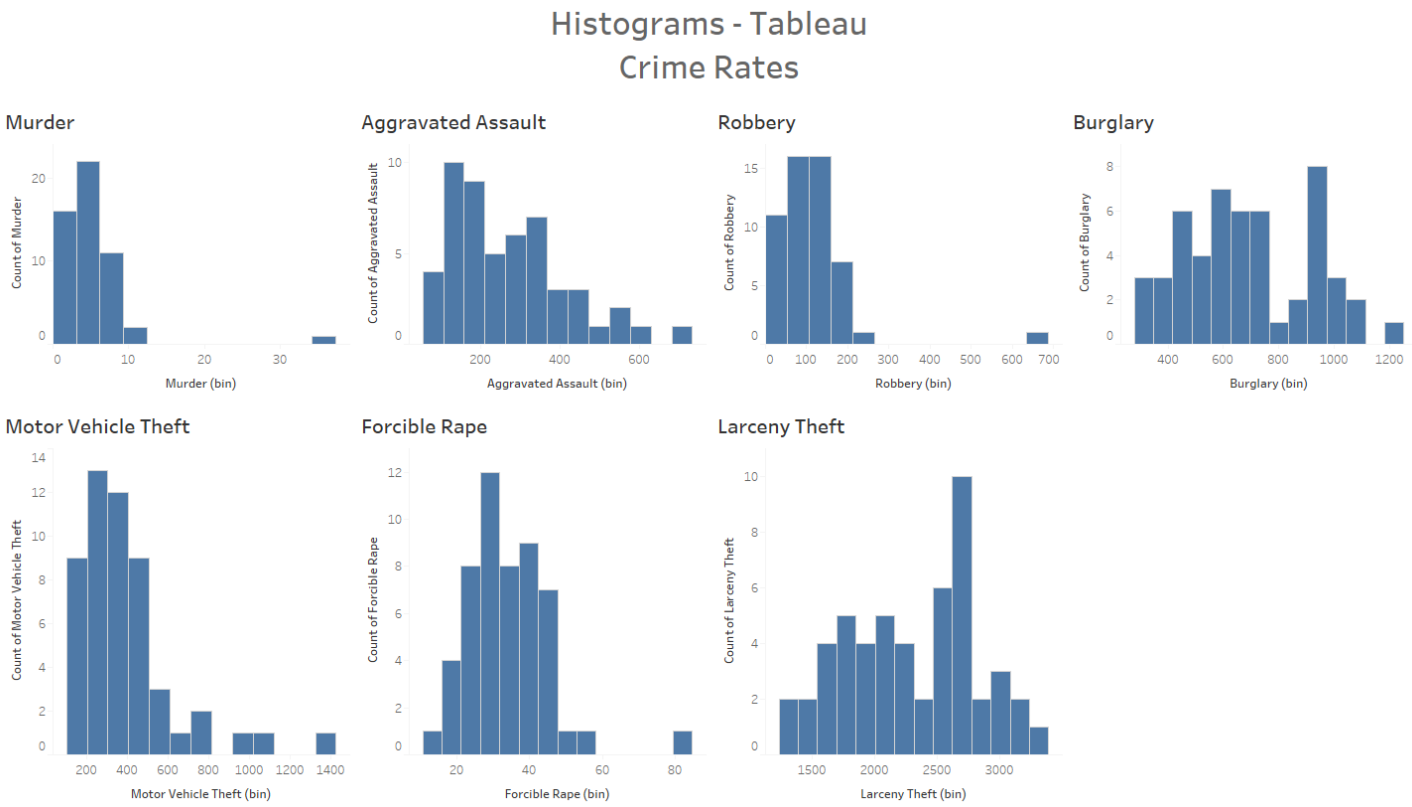


Tableau
(for code please see Weeks11_12_Tableau.twb)

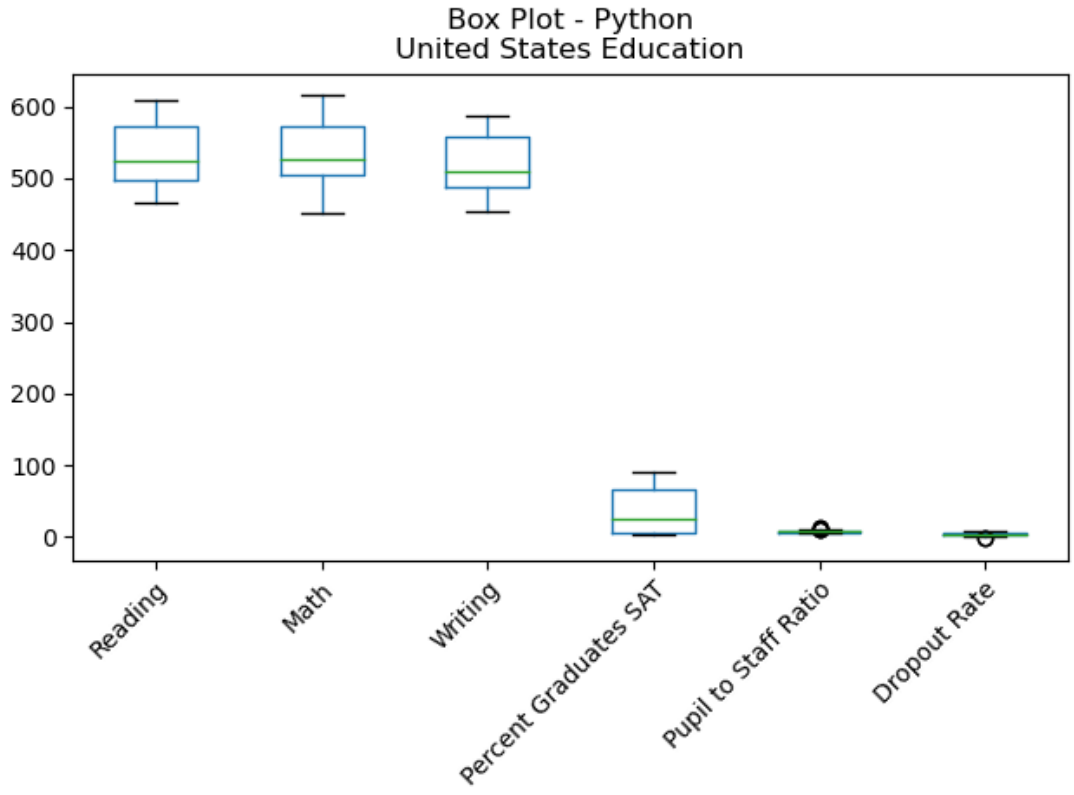


Box Plots

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")
```

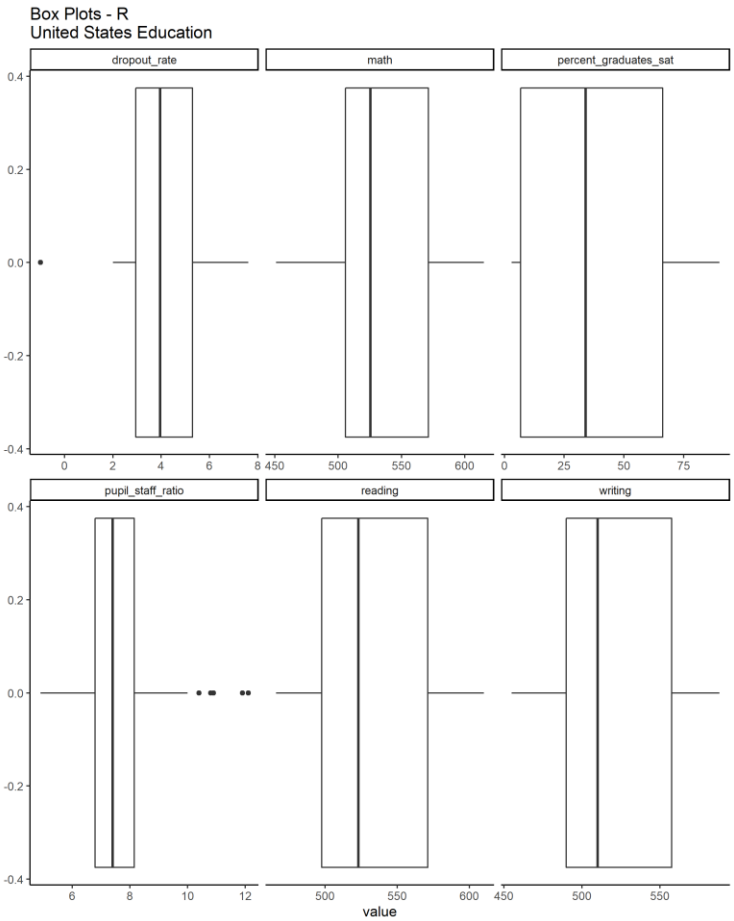
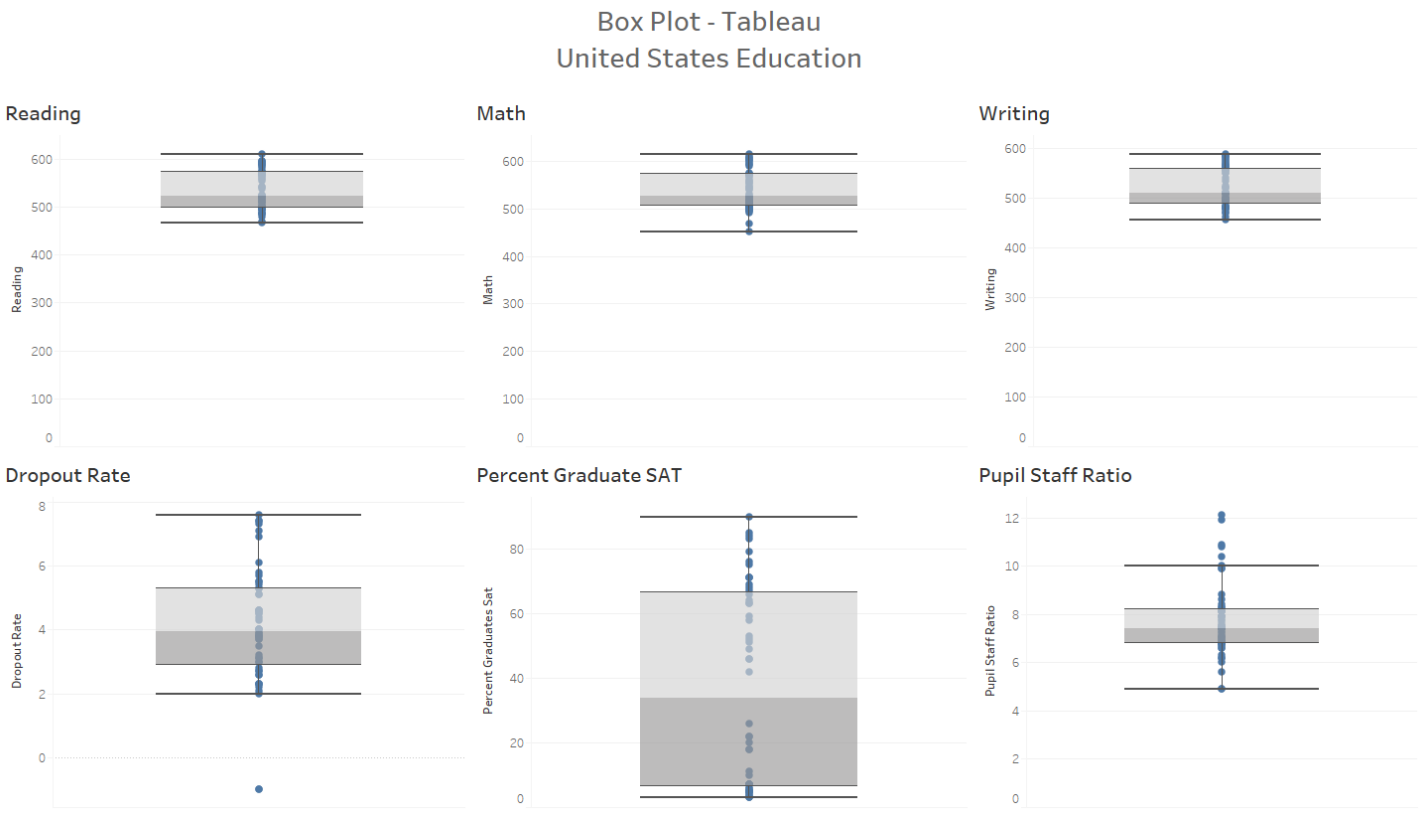


Tableau
(for code please see Weeks11_12_Tableau.twb)



Bullet Chart

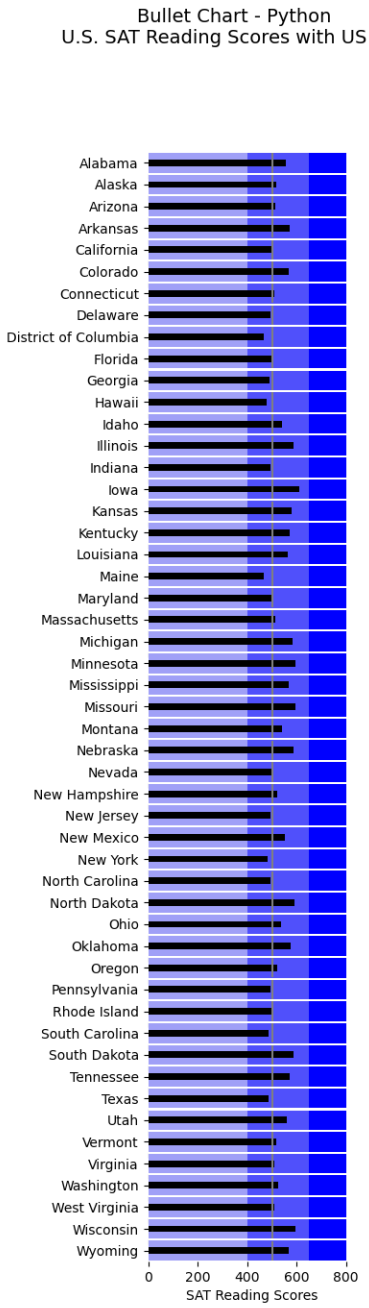
Python

```
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")
```

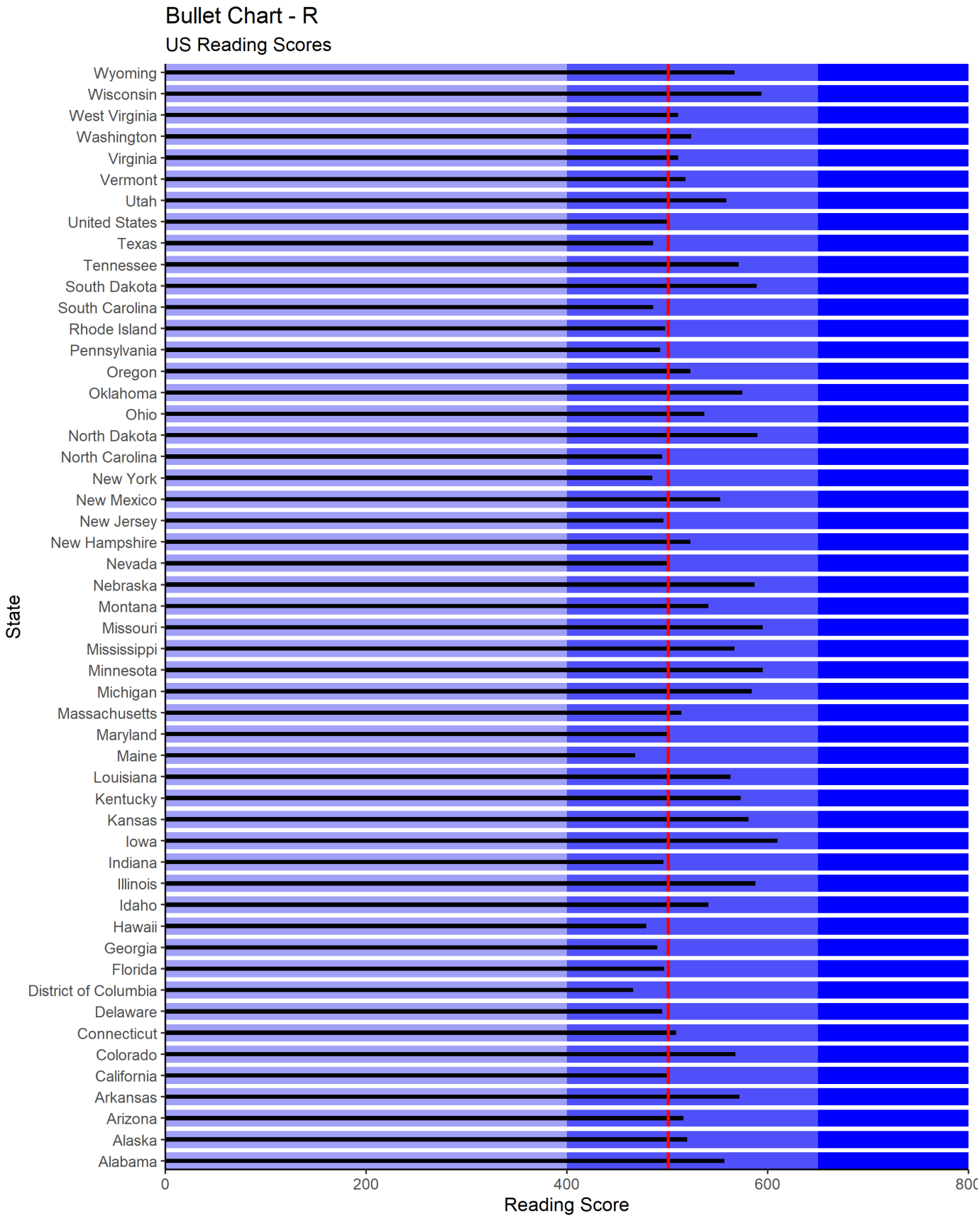
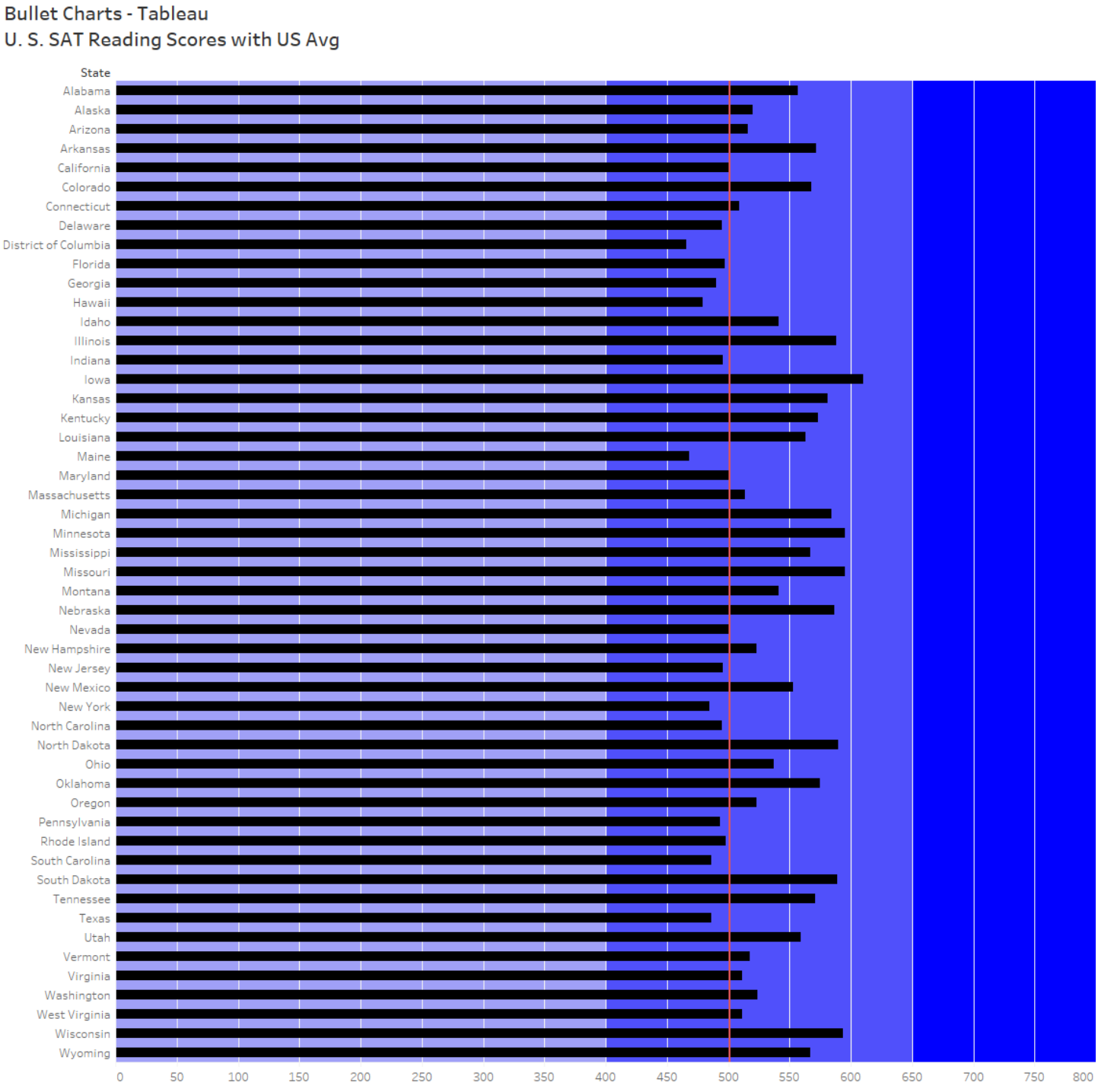

Bullet Chart - R
US Reading Scores
Wyoming
Wisconsin
West Virginia
Washington
Virginia
Vermont
Utah
United States
Texas
Tennessee
South Dakota
South Carolina
Rhode Island
Pennsylvania
Oregon
Oklahoma
Ohio
North Dakota
North Carolina
New York
New Mexico
New Jersey
New Hampshire
Nevada
Nebraska
Montana
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

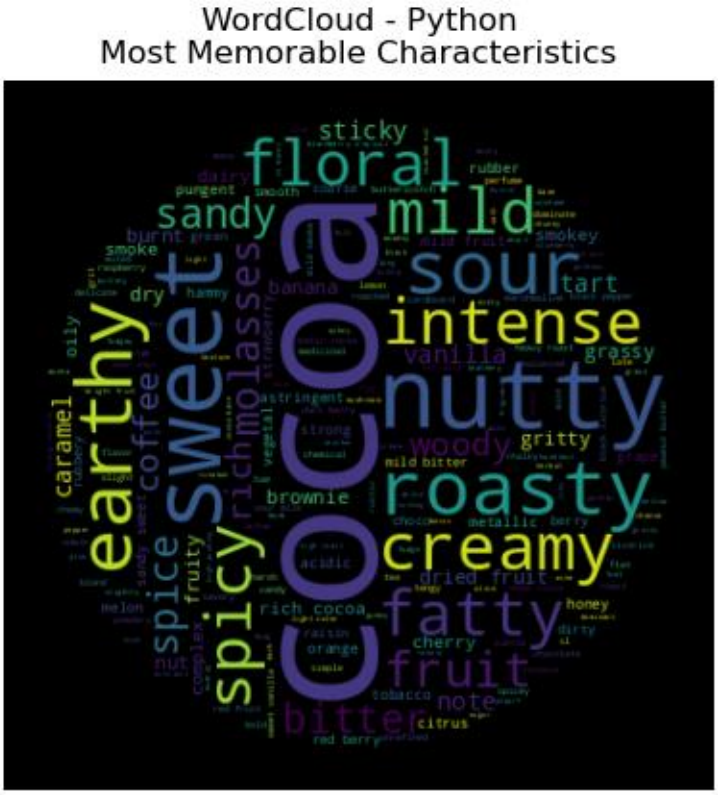
Tableau
(for code please see Weeks11_12_Tableau.twb)



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)
```

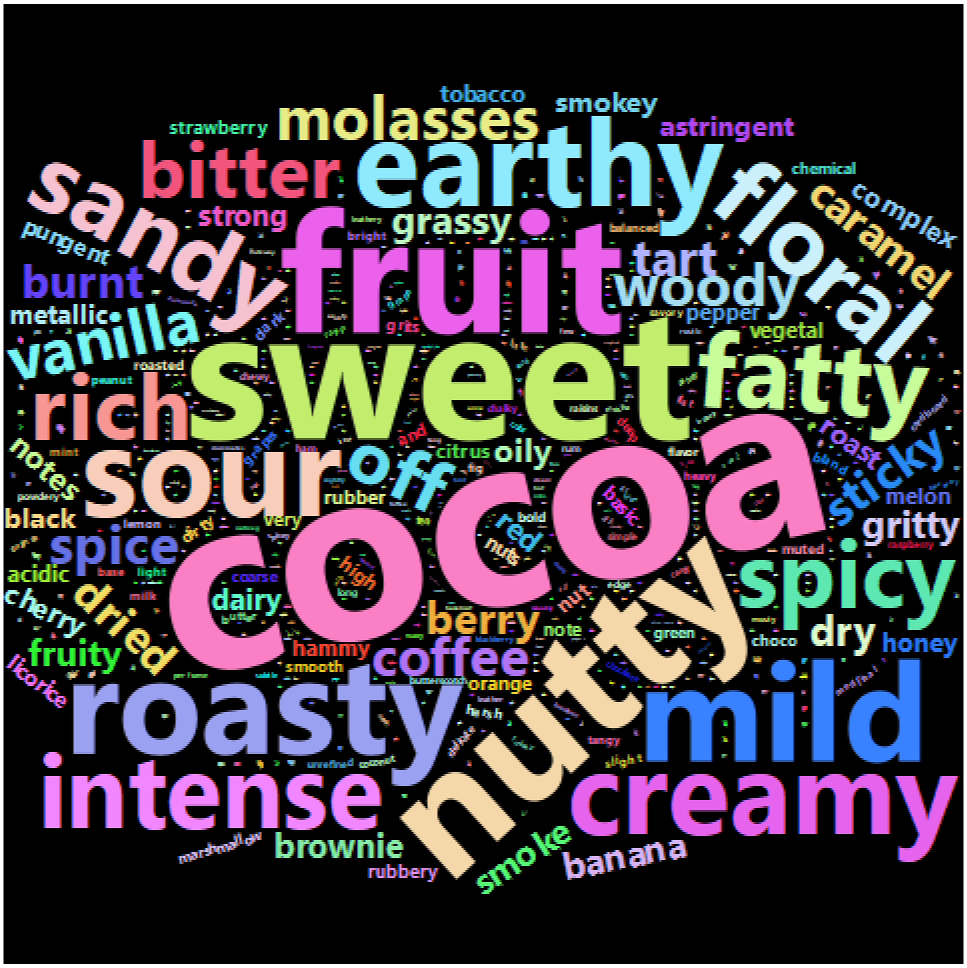

cocoa
sweet
fruit
nutty
earthy
roasty
mild
creamy
intense
sour
sandy
floral
fatty
rich
bitter
molasses
spicy
vanilla
woody
caramel
burnt
tart
sticky
spice
coffee
berry
dried
dairy
dry
gritty
grassy
oily
off
fruity
brownie
banana
smoke
complex
strong
metallic
black
notes
cherry
smokey
tobacco
astringent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

Tableau
(for code please see Weeks11_12_Tableau.twb)