python-cheat-sheet / matplotlib / visualization / visualization.ipynb

xkhanhnguyen Visualization 9e67651 · 3 years ago History

3.38 MB

In [136…

```
import pandas as pd
import numpy as np
import plotly.offline as py
import plotly.express as px
import plotly.graph_objs as go
from plotly.offline import download_plotlyjs, init_notebook_mode, plot, i
init_notebook_mode(connected=True)

import seaborn as sns
plt.style.use('seaborn-whitegrid') # Set the aesthetic style of the plots
sns.set(style="white", color_codes=True)

# import matplotlib and set inline for jupyter notebook
import matplotlib.pyplot as plt
```

Relationship

1. Scatter plot using Matplotlib
2. Marginal Histogram
3. Scatter plot using Seaborn
4. Pair Plot in Seaborn
5. Heat Map

In [129…

```
# Source: https://www.kaggle.com/benhamner/python-data-visualizations

# load the iris data
iris = datasets.load_iris()
type(iris.data)

# Build a DataFrame for iris dataset
iris_df = pd.DataFrame(iris.data, columns=iris.feature_names)
iris_df['target']=iris.target
iris_df['species'] = iris_df['target'].map({0:iris.target_names[0],
                                            1:iris.target_names[1],
                                            2:iris.target_names[2]})
iris_df.head(10)
```

Out[129…

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	species
0	5.1	3.5	1.4	0.2	0	setosa
1	4.9	3.0	1.4	0.2	0	setosa
2	4.7	3.2	1.3	0.2	0	setosa
3	4.6	3.1	1.5	0.2	0	setosa
4	5.0	3.6	1.4	0.2	0	setosa
5	5.4	3.9	1.7	0.4	0	setosa
6	4.6	3.4	1.4	0.3	0	setosa
7	5.0	3.4	1.5	0.2	0	setosa
8	4.4	2.9	1.4	0.2	0	setosa

9	4.9	3.1	1.5	0.1	0	setosa

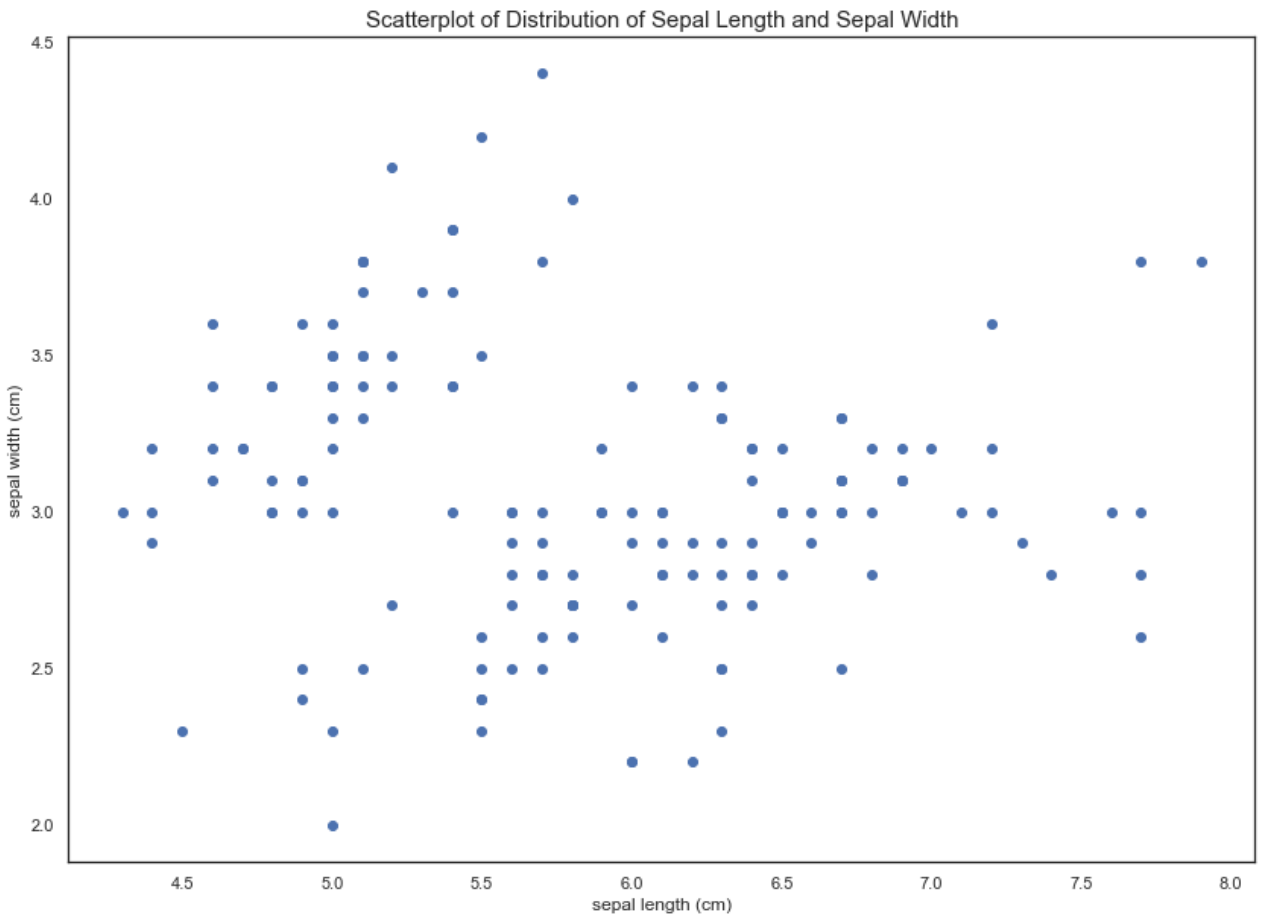
In [129…
```
# Let's see how many examples we have of each species
iris_df["species"].value_counts()
```

Out[129…
```
setosa        50
virginica     50
versicolor    50
Name: species, dtype: int64
```

1. Scatter Plot

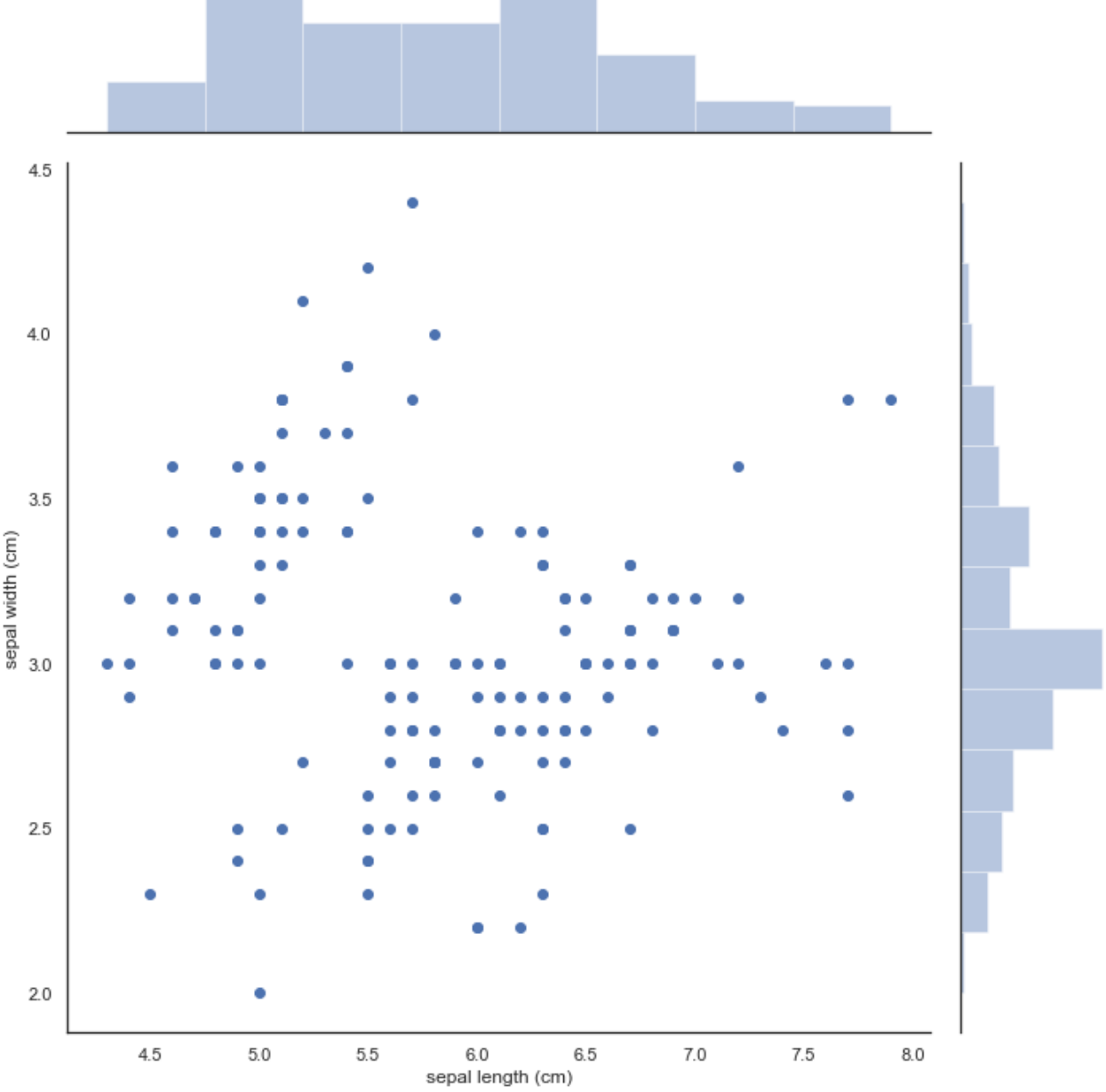
In [129…
```
#scatter plot of distribution of sepal length and sepal width

fig = plt.figure(figsize=(14,10))
plt.scatter(iris_df['sepal length (cm)'], iris_df['sepal width (cm)'])
plt.title('Scatterplot of Distribution of Sepal Length and Sepal Width',
plt.xlabel('sepal length (cm)')
plt.ylabel('sepal width (cm)')
```

Out[129…
```
Text(0, 0.5, 'sepal width (cm)')
```



2. Marginal Histogram

In [129…
```
# We can also use the seaborn library to make a similar plot
# A seaborn jointplot shows bivariate scatterplots and univariate histogr
p = sns.jointplot(iris_df['sepal length (cm)'], iris_df['sepal width (cm)
```



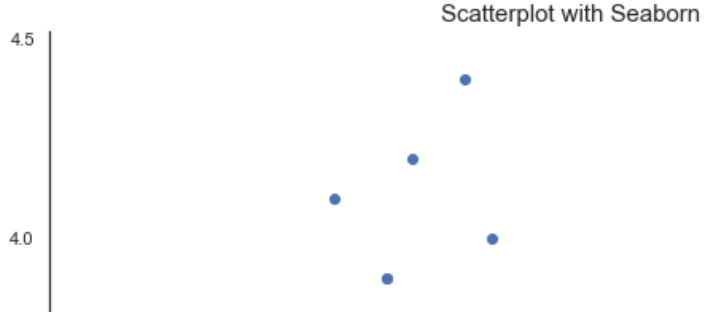
3. Scatter plot using Seaborn

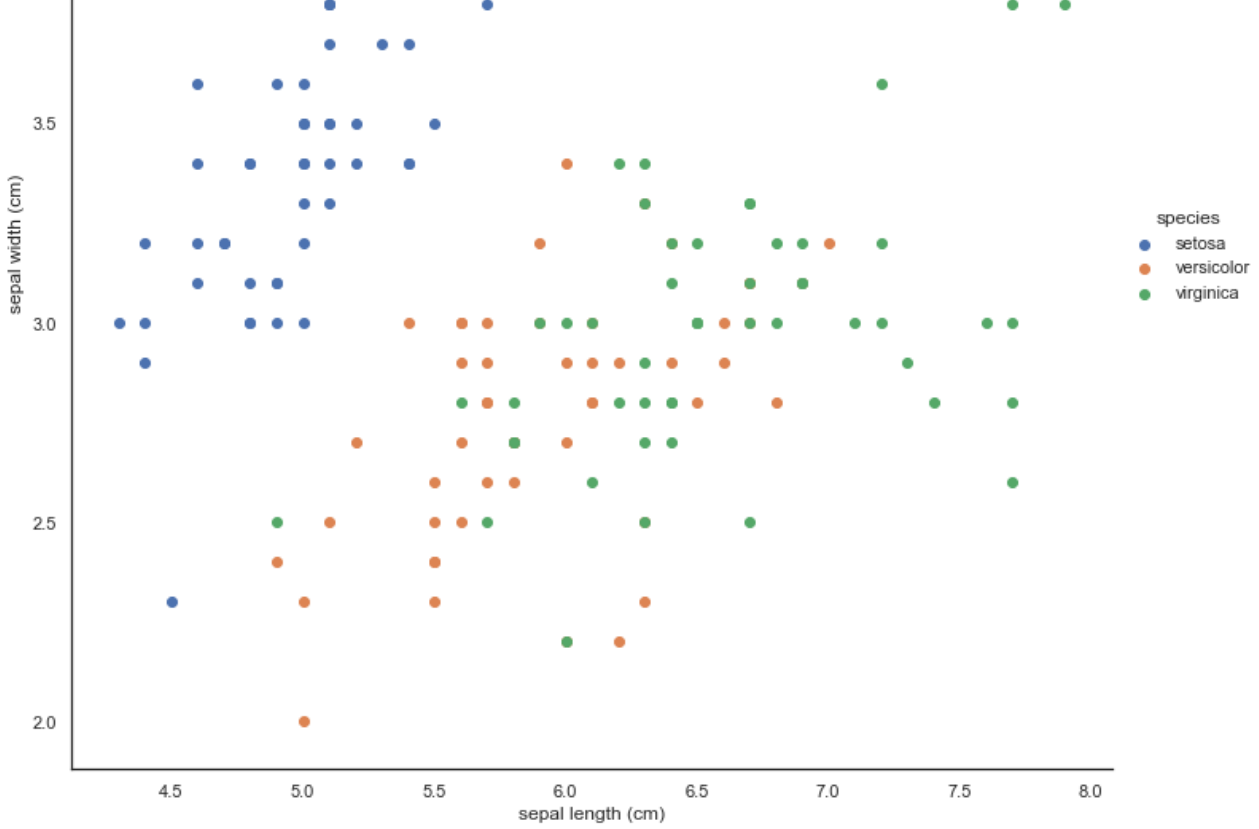
In [129…

```
# One piece of information missing in the plots above is what species eac
# We'll use seaborn's FacetGrid to color the scatterplot by species
sns.FacetGrid(iris_df, hue='species', size=10) \
   .map(plt.scatter, 'sepal length (cm)', 'sepal width (cm)') \
   .add_legend()
plt.title('Scatterplot with Seaborn', fontsize=15)
```

```
/Library/Frameworks/Python.framework/Versions/3.8/lib/python3.8/site-packag
es/seaborn/axisgrid.py:243: UserWarning:

The `size` parameter has been renamed to `height`; please update your code.
```

Out[129… `Text(0.5, 1.0, 'Scatterplot with Seaborn')`



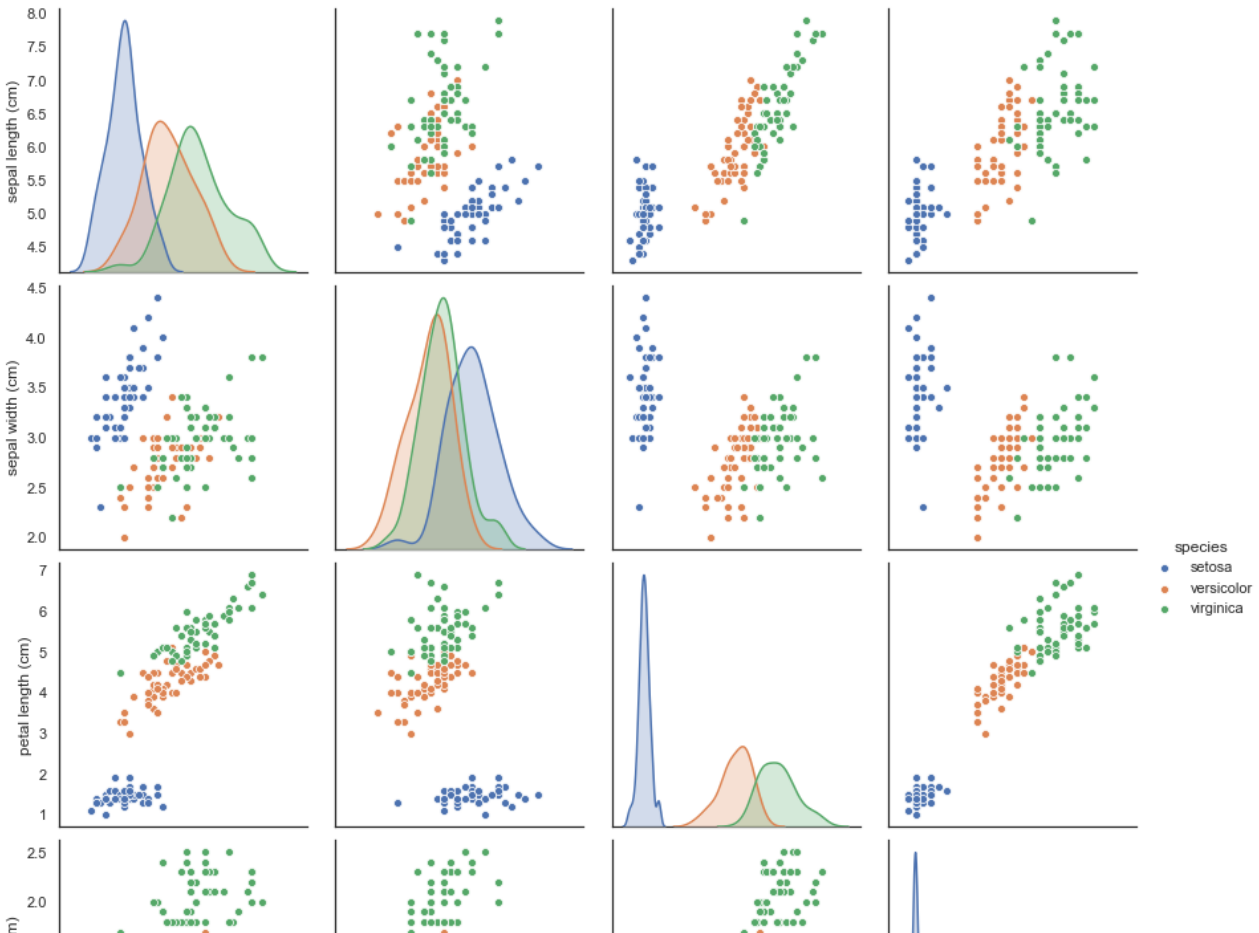


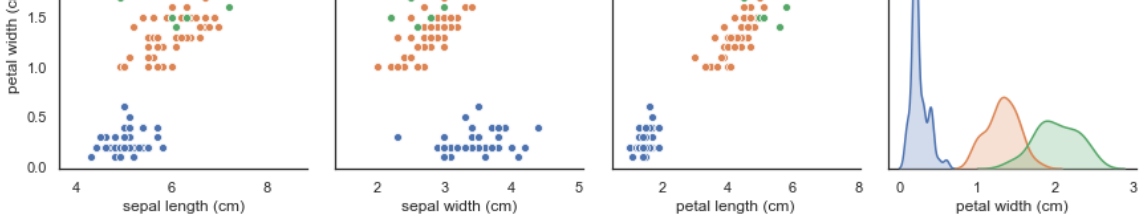
4. Pair plot

In [129…

```
# Another useful seaborn plot is the pair plot,
# which shows the bivariate relationship between each pair of features.
# From the pair plot, we'll see that the Iris-setosa species is separated
# from the other two across all feature combinations
sns.pairplot(iris_df.drop("target", axis=1), hue="species", height=3)
```

Out[129… <seaborn.axisgrid.PairGrid at 0x7f9bbcd5d8b0>



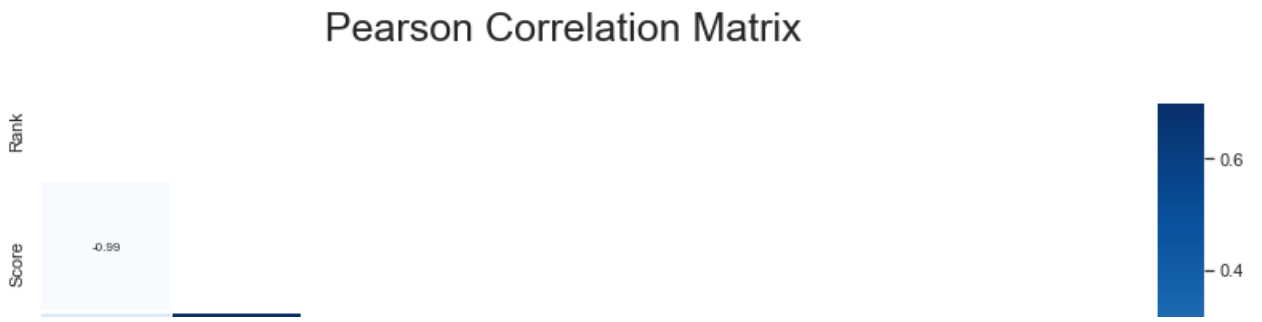


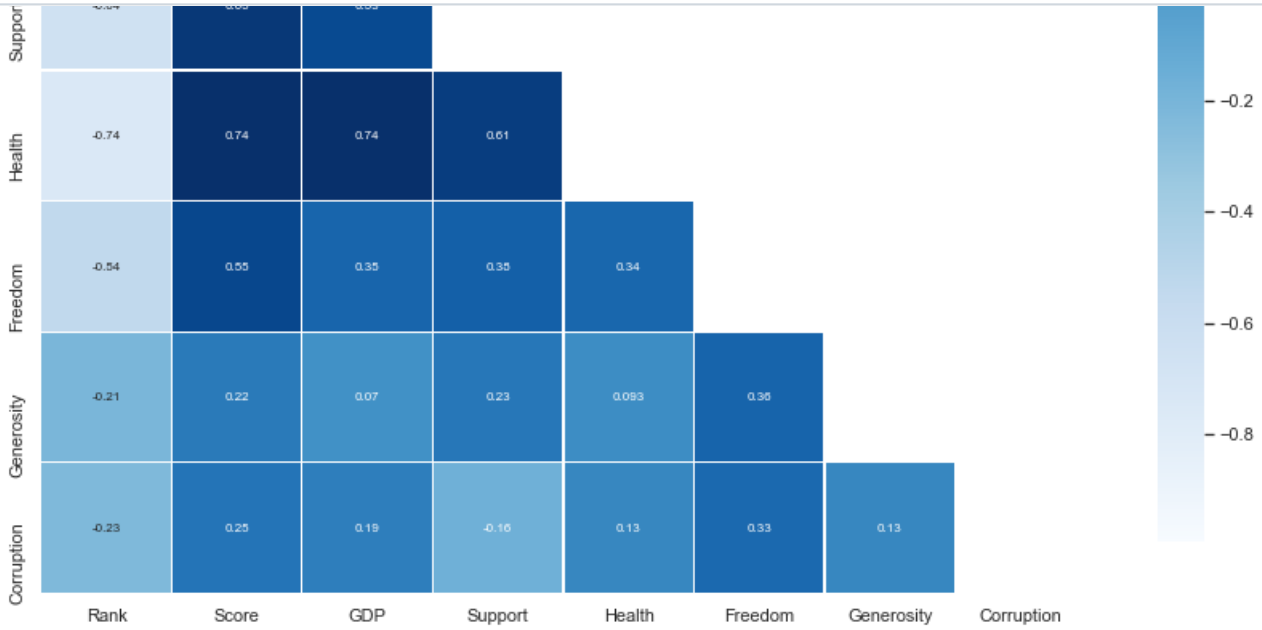
5. Heat map

In [129…

```
happy = pd.read_csv('happiness_rank.csv')
# Correlation Among variables
usecols = ['Rank','Country','Score','GDP','Support',
                'Health','Freedom','Generosity','Corruption']
mask = np.zeros_like(happy[usecols].corr(), dtype=np.bool)
mask[np.triu_indices_from(mask)] = True

f, ax = plt.subplots(figsize=(16, 12))
plt.title('Pearson Correlation Matrix',fontsize=25)

sns.heatmap(happy[usecols].corr(),
                        linewidths=0.25,vmax=0.7,square=True,cmap="Blues"
            linecolor='w',annot=True,annot_kws={"size":8},mask=mask,cbar_
```

Out[129… <AxesSubplot:title={'center':'Pearson Correlation Matrix'}>





Deviation plots

6. Line Chart

7. Area Chart

8. Stack Area Chart

9. Area Chart Unstacked

In [132…

```
# Build data frame from inputted data
data = pd.DataFrame(data = {'Month': ['Jan', 'Feb', 'March', 'April','May
                                      'July', 'Aug', 'Sept', 'Oct','Nov',
 'All Views': [728820, 862775, 1001285,817075,973996,877365,
               539134, 978768, 1792495, 569553, 989850, 1012303],
 'Internal Views': [374872, 466159, 578368,530037,608158,543964,
                    345293, 485921, 843923, 284741, 494991, 472819],
 'External Views': [260911, 301914,310423,197089,237425,226267,
                    193841, 492847, 948572, 284712, 494859, 539484]})
data.to_csv('Views.csv')
data
```

Out[132…

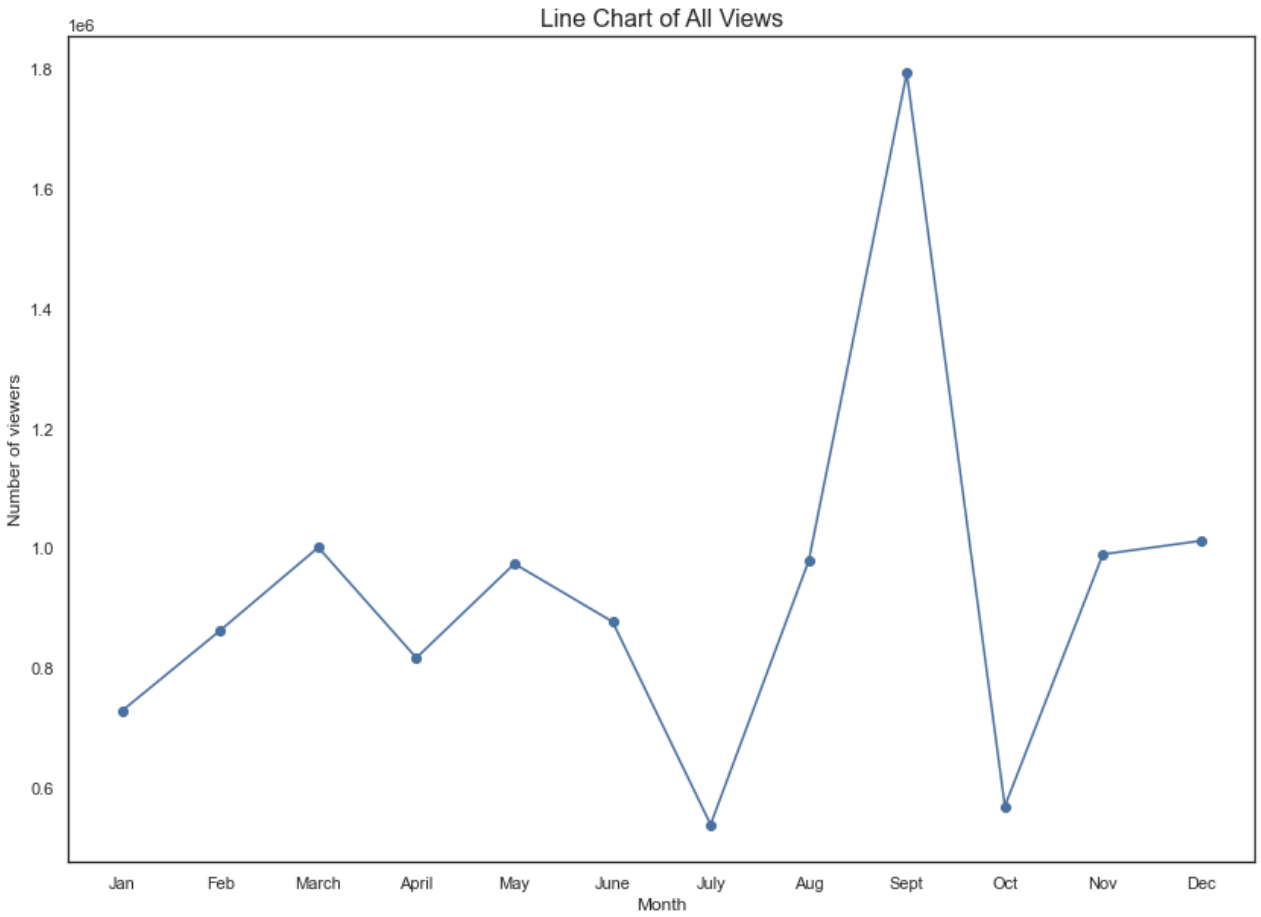
	Month	All Views	Internal Views	External Views
0	Jan	728820	374872	260911
1	Feb	862775	466159	301914
2	March	1001285	578368	310423
3	April	817075	530037	197089
4	May	973996	608158	237425
5	June	877365	543964	226267
6	July	539134	345293	193841
7	Aug	978768	485921	492847
8	Sept	1792495	843923	948572
9	Oct	569553	284741	284712
10	Nov	989850	494991	494859
11	Dec	1012303	472819	539484

6. Line Chart

In [133…

```
# instanciate the figure
fig = plt.figure(figsize = (14, 10))


# plot the data
plt.plot(data['Month'], data['All Views'], color='#4870a0', marker='o')

# set label and title for the plot
plt.xlabel('Month')
plt.ylabel('Number of viewers')
plt.title('Line Chart of All Views', fontsize = 16)
```

Out[133… Text(0.5, 1.0, 'Line Chart of All Views')

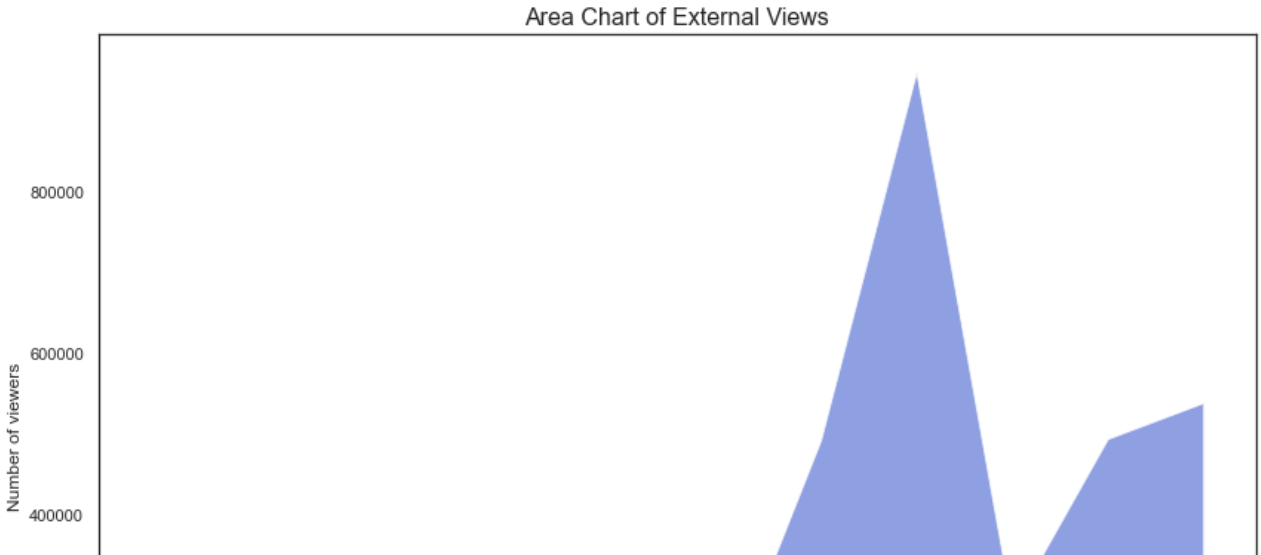


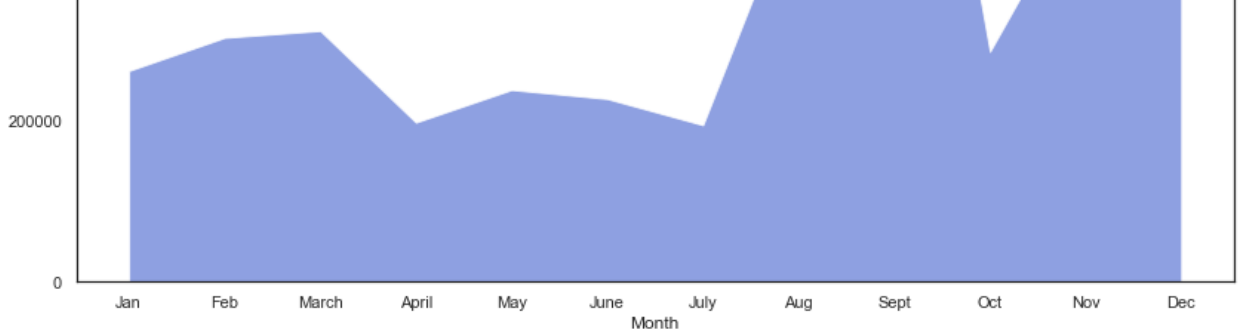
7. Area Chart

In [133…

```
# instanciate the figure
fig = plt.figure(figsize = (14, 10))


# plot the data
plt.stackplot(data['Month'], data['External Views'], colors='#7289da', al

# set label and title for the plot
plt.xlabel('Month')
plt.ylabel('Number of viewers')
plt.title('Area Chart of External Views', fontsize = 16)
```

Out[133… Text(0.5, 1.0, 'Area Chart of External Views')



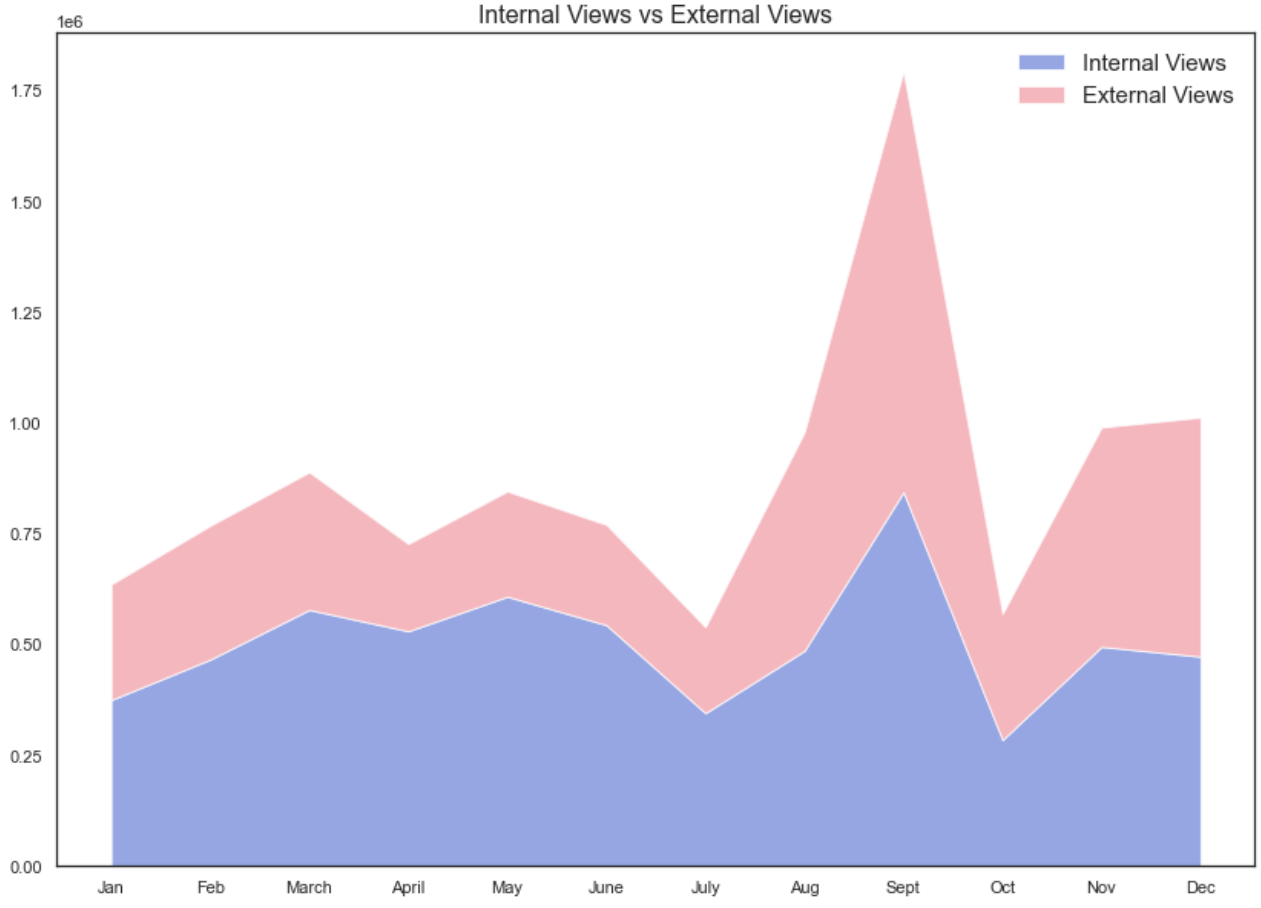


8. Stack Area Chart

In [134…

```
# instanciate the figure
fig = plt.figure(figsize = (14, 10))


# plot the data
plt.stackplot(data['Month'], data['Internal Views'], data['External Views
              alpha=0.75,
              colors=['#7289da','#f29fa9'],
             labels=['Internal Views', 'External Views'])


# set a title and a legend
plt.title('Internal Views vs External Views', fontsize=16)
plt.legend(fontsize=15)
```

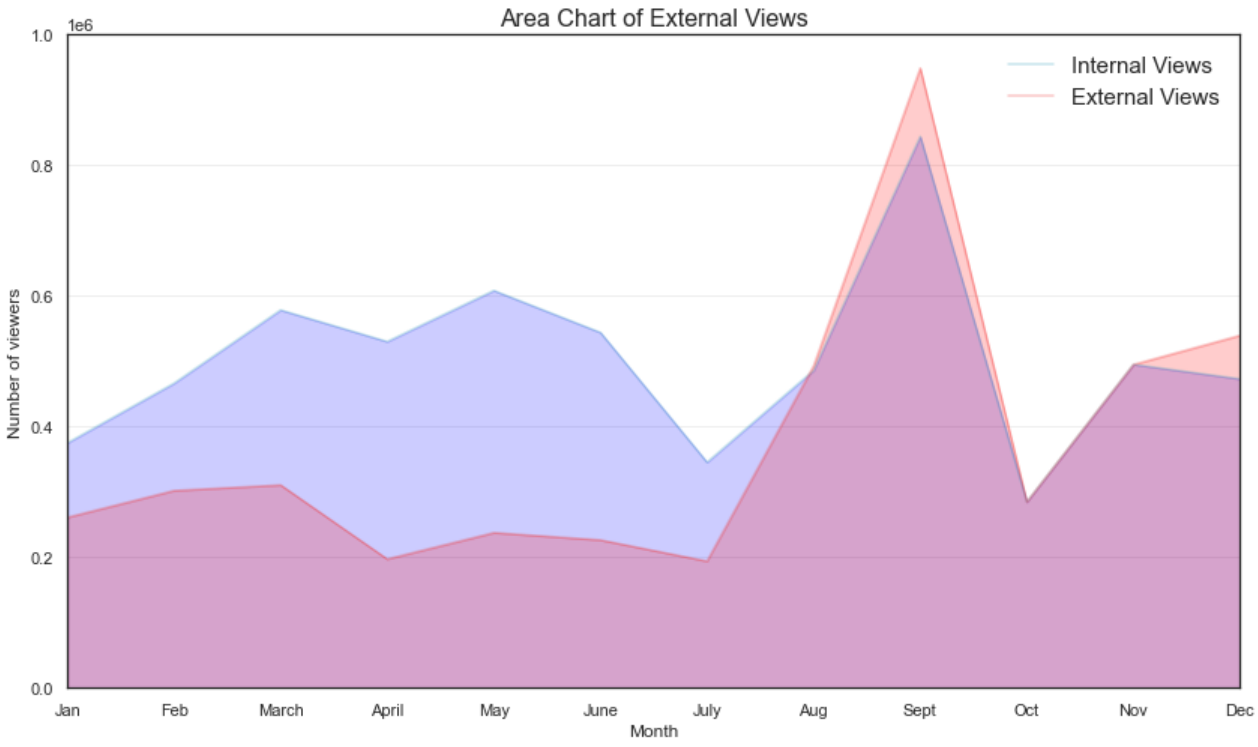
Out[134… <matplotlib.legend.Legend at 0x7f9ba5892490>



9. Area Chart Unstacked

In [136…

```
# instanciate the figure
fig = plt.figure(figsize=(14, 8))
ax = fig.add_subplot()

# plot the data
ax.plot(x, color='#49a7c3', alpha=0.3, label='Internal Views')
ax.plot(y, color='#f04747', alpha=0.3, label='External Views')

# fill the areas between the plots and the x axis
# this can create overlapping areas between lines
ax.fill_between(x.index, 0, x, color='blue', alpha=0.2)
ax.fill_between(x.index, 0, y, color='red', alpha=0.2)

# set ticks, label and title for the plot
plt.xticks(np.arange(12), data['Month'])
plt.xlabel('Month')
plt.ylabel('Number of viewers')
plt.title('Area Chart of External Views', fontsize = 16)


# change the x-ylim
ax.set_xlim(0, data.index[-1])
ax.set_ylim(0, 1e6)


# set a legend and the y grid for the plot
ax.legend(fontsize=15)
ax.grid(axis='y', alpha=0.3)
```



Ranking Plot

11. Vertical Bar Chart
12. Horizontal Bar Chart
13. Multi-set Bar Chart
14. Stack Bar Chart
15. Lollipop Chart

11. Vertical Bar Chart

In [123…

```
car = pd.read_csv('mpg_ggplot2.csv')
car
```

Out[123…

	manufacturer	model	displ	year	cyl	trans	drv	cty	hwy	fl	clas
0	audi	a4	1.8	1999	4	auto(l5)	f	18	29	p	compac
1	audi	a4	1.8	1999	4	manual(m5)	f	21	29	p	compac
2	audi	a4	2.0	2008	4	manual(m6)	f	20	31	p	compac
3	audi	a4	2.0	2008	4	auto(av)	f	21	30	p	compac
4	audi	a4	2.8	1999	6	auto(l5)	f	16	26	p	compac
...	...	...	...	...	...	...	...	...	...	...	.
229	volkswagen	passat	2.0	2008	4	auto(s6)	f	19	28	p	midsiz
230	volkswagen	passat	2.0	2008	4	manual(m6)	f	21	29	p	midsiz
231	volkswagen	passat	2.8	1999	6	auto(l5)	f	16	26	p	midsiz
232	volkswagen	passat	2.8	1999	6	manual(m5)	f	18	26	p	midsiz
233	volkswagen	passat	3.6	2008	6	auto(s6)	f	17	26	p	midsiz

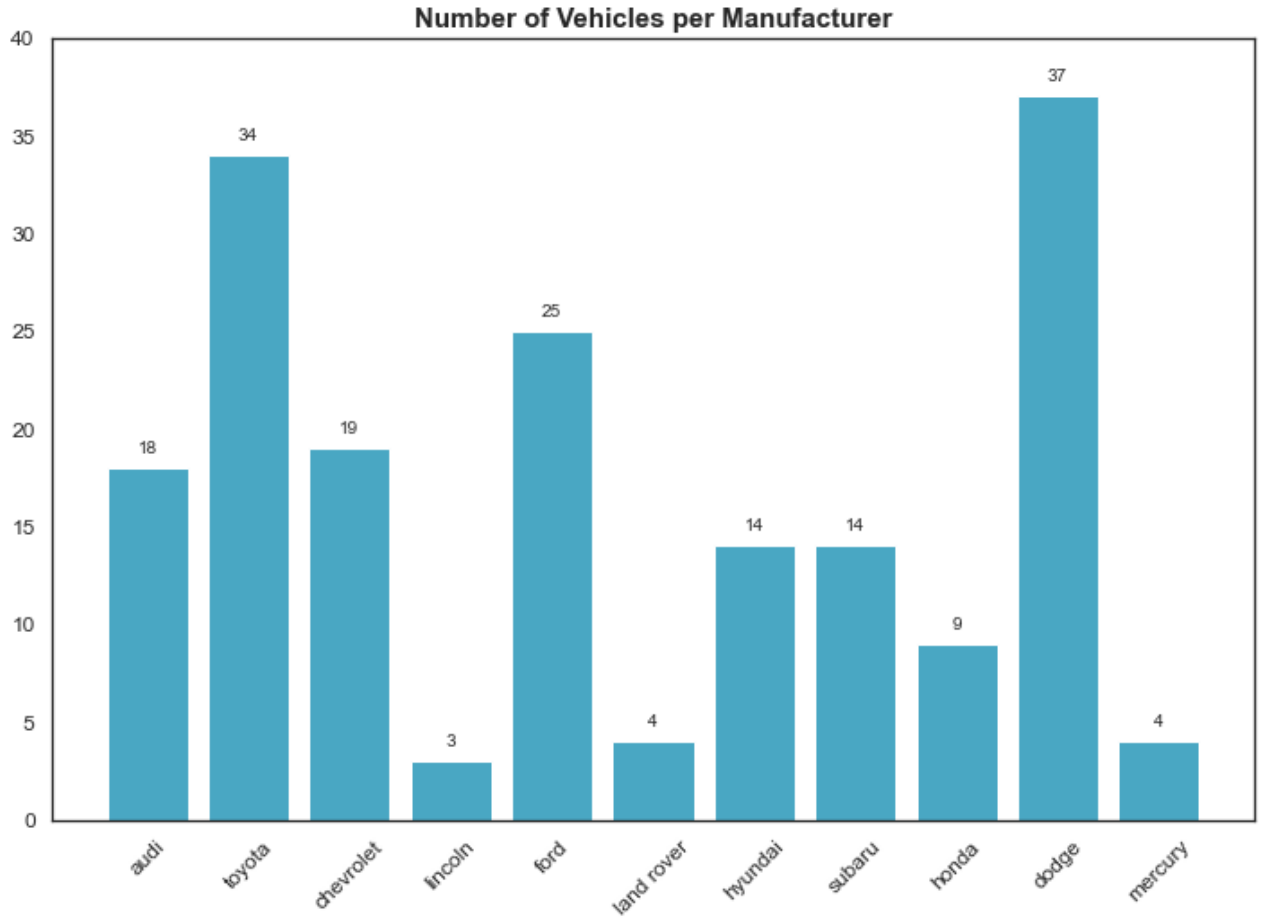
234 rows × 11 columns

In [127…

```
# Vertical bar chart
# prepare data
value_count =  car["manufacturer"].value_counts(sort=False)
value_count = value_count[:11,]


# instanciate the figure
fig = plt.figure(figsize=(12, 8))
ax = fig.add_subplot()

# plot the data using matplotlib
ax.bar(value_count.index, value_count.values, color='#49a7c3') # color=co

# iterate over every x and y and annotate the value on the top of the bar
for i, (k, v) in enumerate(value_count.items()):
    ax.text(k, # where to put the text on the x coordinates
            v + 1, # where to put the text on the y coordinates
            v, # value to text
            #color=colors[i], # color corresponding to the bar
            fontsize=10, # fontsize
            horizontalalignment='center', # center the text to be more pl
            verticalalignment='center'
           )


# size of the x and y ticks
ax.tick_params(axis='x', labelrotation=45, labelsize=12)
ax.tick_params(axis='y', labelsize=12)

# change the ylim
ax.set_ylim(0, 40)
```

```
# set a title for the plot
ax.set_title('Number of Vehicles per Manufacturer', fontsize=15, fontweigl
```

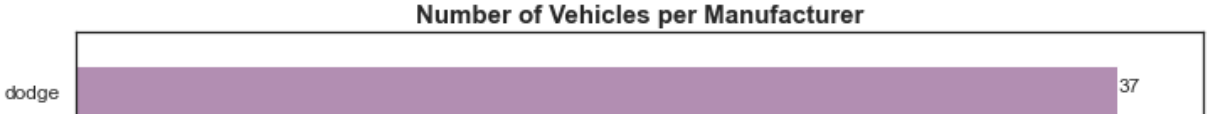
Out[127… `Text(0.5, 1.0, 'Number of Vehicles per Manufacturer')`

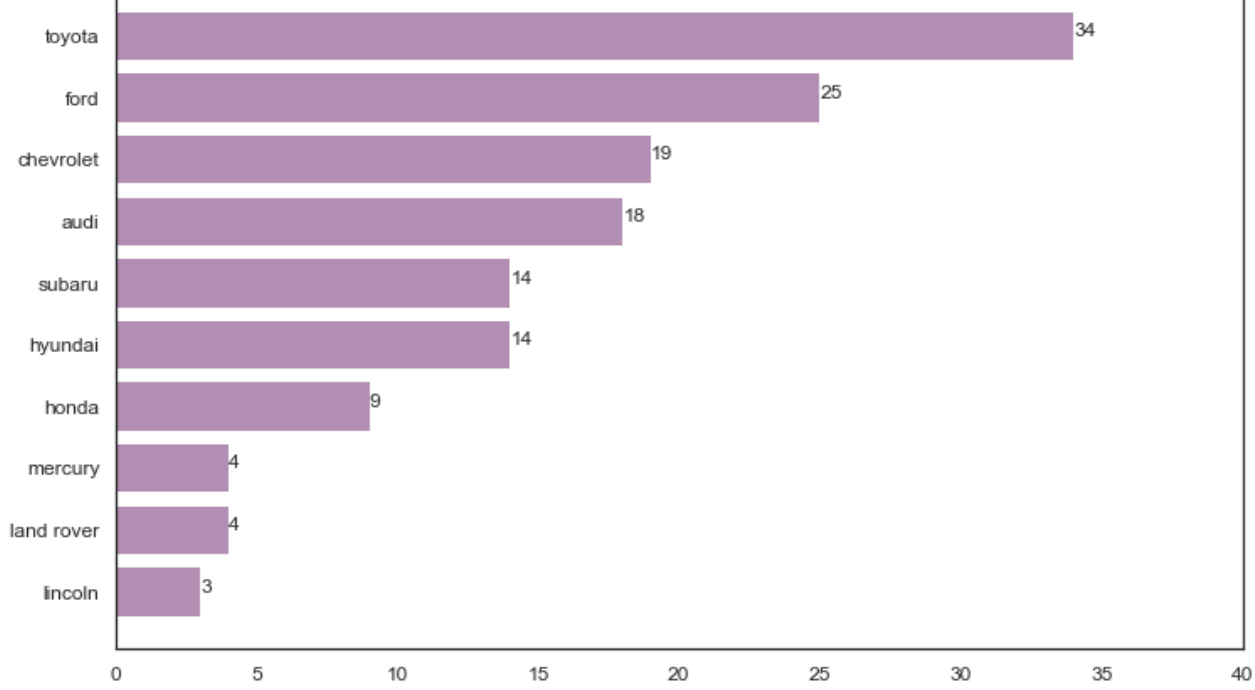


12. Horizontal bar chart

In [123…

```
value_count = value_count.sort_values()
# Vertical bar chart
fig = plt.figure(figsize=(12, 8))
ax = fig.add_subplot()


# plot the data using matplotlib
plt.barh(value_count.index, value_count.values, color='#b28eb2')

for index, value in enumerate(value_count.values):
    plt.text(value, index, str(value))


# size of the x and y ticks
ax.tick_params(axis='x', labelsize=12)
ax.tick_params(axis='y', labelsize=12)

# change the ylim
ax.set_xlim(0, 40)

# set a title for the plot
ax.set_title('Number of Vehicles per Manufacturer', fontsize=15, fontweigl
```

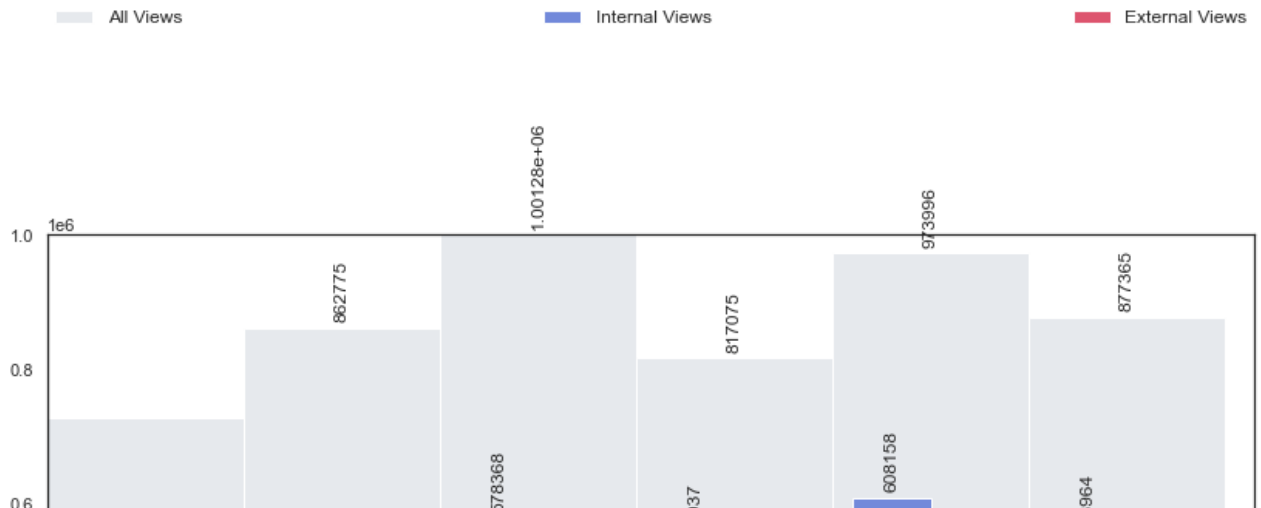


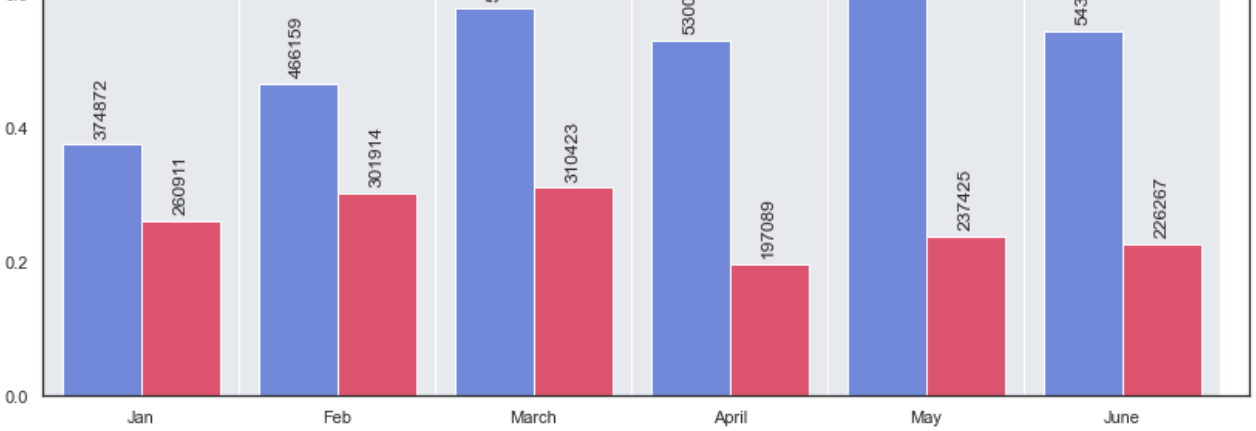


13. Multi-set Bar Chart

In [127…

```
views = pd.DataFrame(data, columns=['Month', 'All Views'])
df = pd.DataFrame(data,
                  columns=['Month', 'Internal Views', 'External Views'])

# Plotting the bars
ax = views.plot.bar(rot=0,color='#E6E9ED',width=1, figsize=(14,8))
ax = df.plot.bar(rot=0, ax=ax, color=['#7289da', '#dd546e', '#99aab5', '#
                 width=0.8, figsize=(14,8))


for p in ax.patches[1:]:
    h = p.get_height()
    x = p.get_x()+p.get_width()/2.
    if h != 0:
        ax.annotate("%g" % p.get_height(), xy=(x,h), xytext=(0,4), rotati
                    textcoords="offset points", ha="center", va="bottom")

ax.set_xlim(-0.5, None)
ax.margins(y=0)
ax.legend(ncol=len(df.columns), loc="lower left", bbox_to_anchor=(0,1.3,1
          borderaxespad=0, mode="expand", fontsize=12)
ax.set_xticklabels(df["Month"])
plt.show()
```

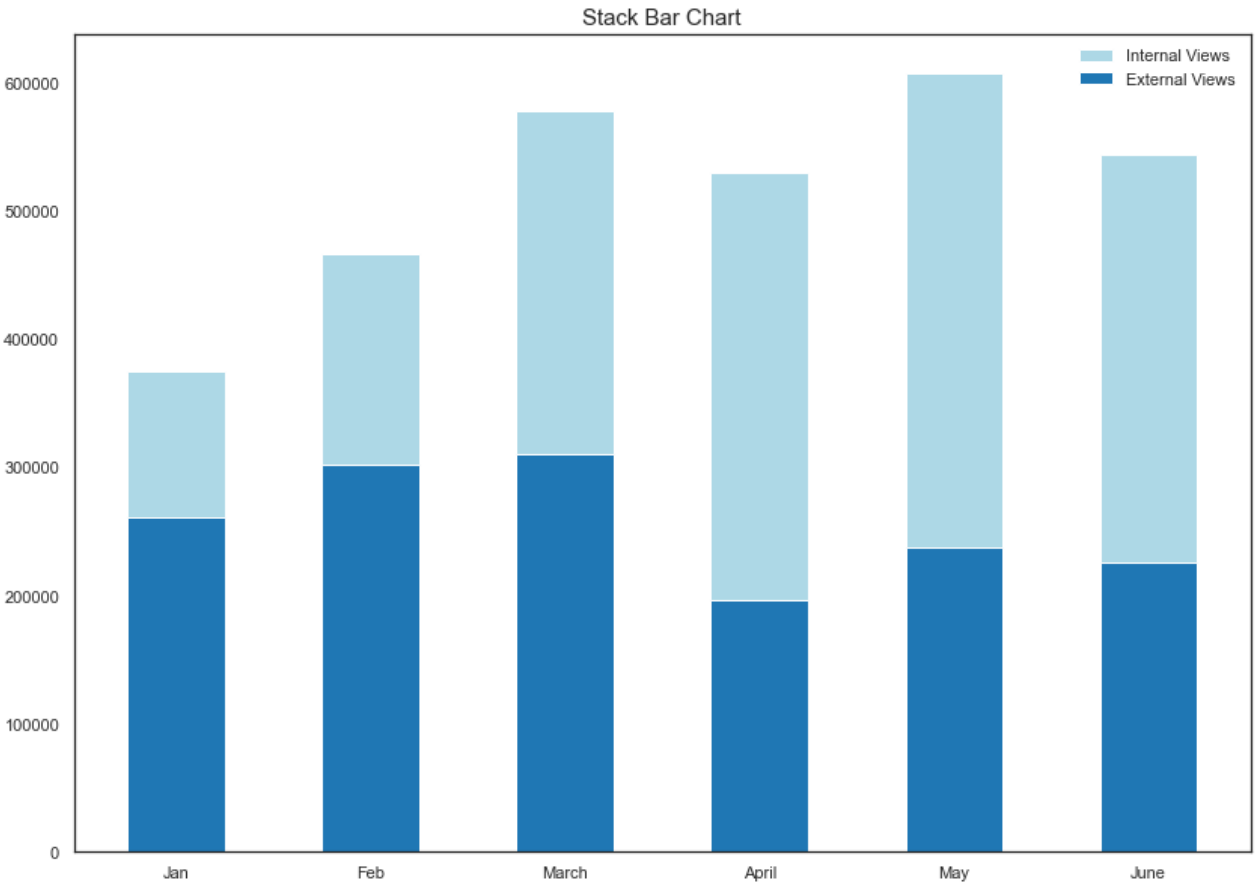




14. Stacked bar chart

In [123…

```
fig = plt.figure(figsize=(14,10))
rect1 = plt.bar(data['Month'] ,data['Internal Views'],
                width=0.5, color='lightblue')
rect2 = plt.bar(data['Month'], data['External Views'],
                width=0.5, color='#1f77b4')

plt.legend((rect1[0], rect2[0]), ('Internal Views', 'External Views'))
plt.title('Stack Bar Chart', fontsize=15)
plt.show()
```



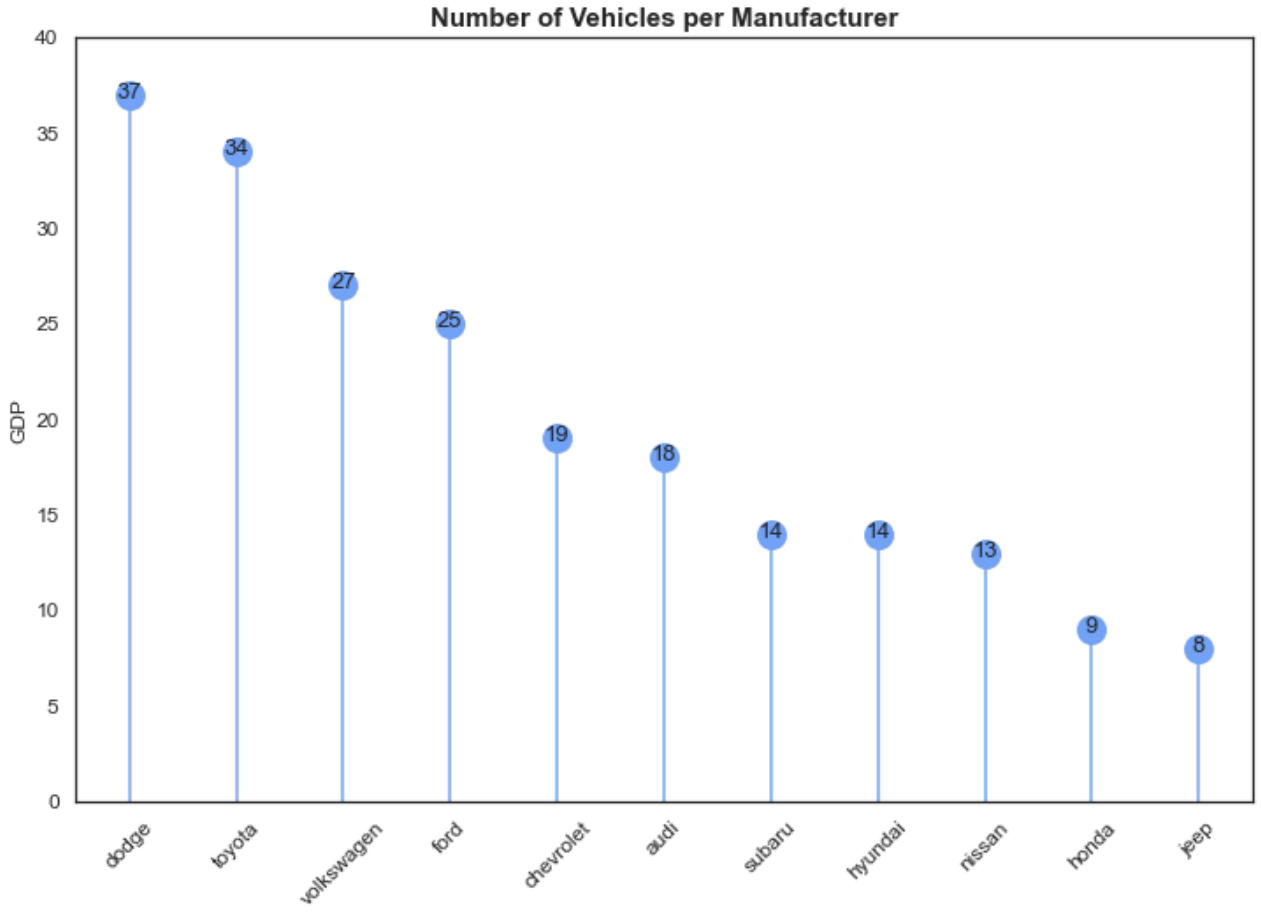
15. Lollipop Chart

In [123…

```
# Horizontal bar chart
# prepare data
value_count =  car["manufacturer"].value_counts(sort=True)
value_count = value_count[:11,]
# create n colors based on the number of labels we have
```

```
# colors = [plt.cm.Spectral(i/float(len(d.keys()))) for i in range(len(d.

# instanciate the figure
fig = plt.figure(figsize=(12, 8))
ax = fig.add_subplot()

(markerline, stemlines, baseline) = plt.stem(value_count.index, value_cou

# iterate over every x and y and annotate the value on the top of the bar
for i, (k, v) in enumerate(value_count.items()):
    ax.text(k, # where to put the text on the x coordinates
            v + 0.1, # where to put the text on the y coordinates
            v, # value to text
            #color=colors[i], # color corresponding to the bar
            fontsize=13, # fontsize
            horizontalalignment='center', # center the text to be more pl
            verticalalignment='center'
           )

plt.setp(markerline, marker='o', markersize=15,
         markeredgewidth=2, color='#71a2f6')
plt.setp(stemlines, color='#71a2f6')
plt.setp(baseline, visible=False)
plt.tick_params(labelsize=12)
plt.ylabel('GDP', size=12)
plt.ylim(0, 40)
# size of the x and y ticks
plt.tick_params(axis='x', labelrotation=45, labelsize=12)
plt.tick_params(axis='y', labelsize=12)

# set a title for the plot
plt.title('Number of Vehicles per Manufacturer', fontsize=15, fontweight=
```

Out[123… Text(0.5, 1.0, 'Number of Vehicles per Manufacturer')



Distribution Plot

Distribution Plot

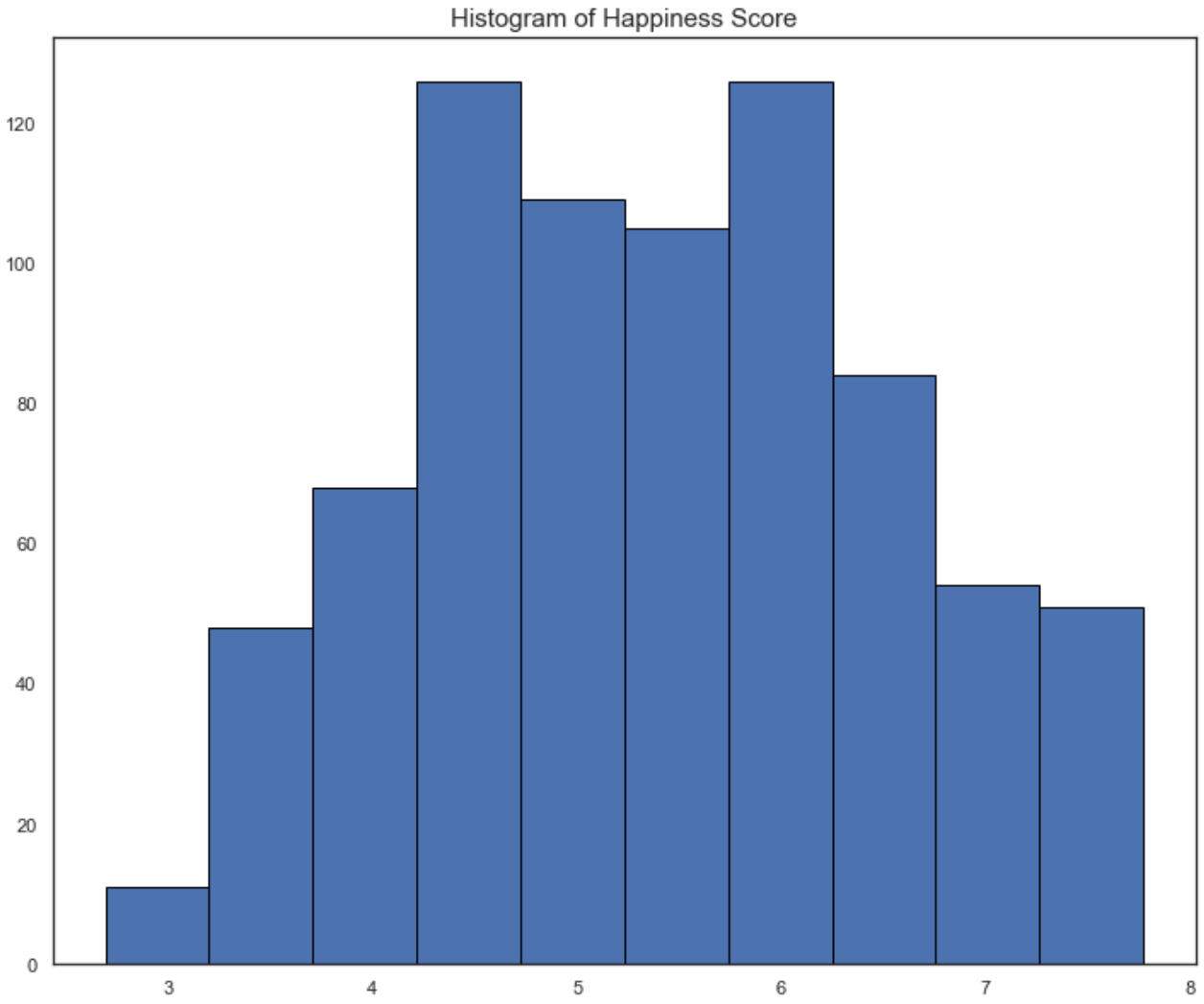
15. Histogram
16. Density Curve with Histogram
17. Density Plot
18. Box Plot
19. Strip Plot
20. Violin Plot
21. Population Pyramid

15. Histogram

In [128…

```
fig = plt.figure(figsize=(12,10))
plt.hist(happy['Score'], edgecolor = 'black')
plt.title('Histogram of Happiness Score', fontsize=15)
```

Out[128… `Text(0.5, 1.0, 'Histogram of Happiness Score')`

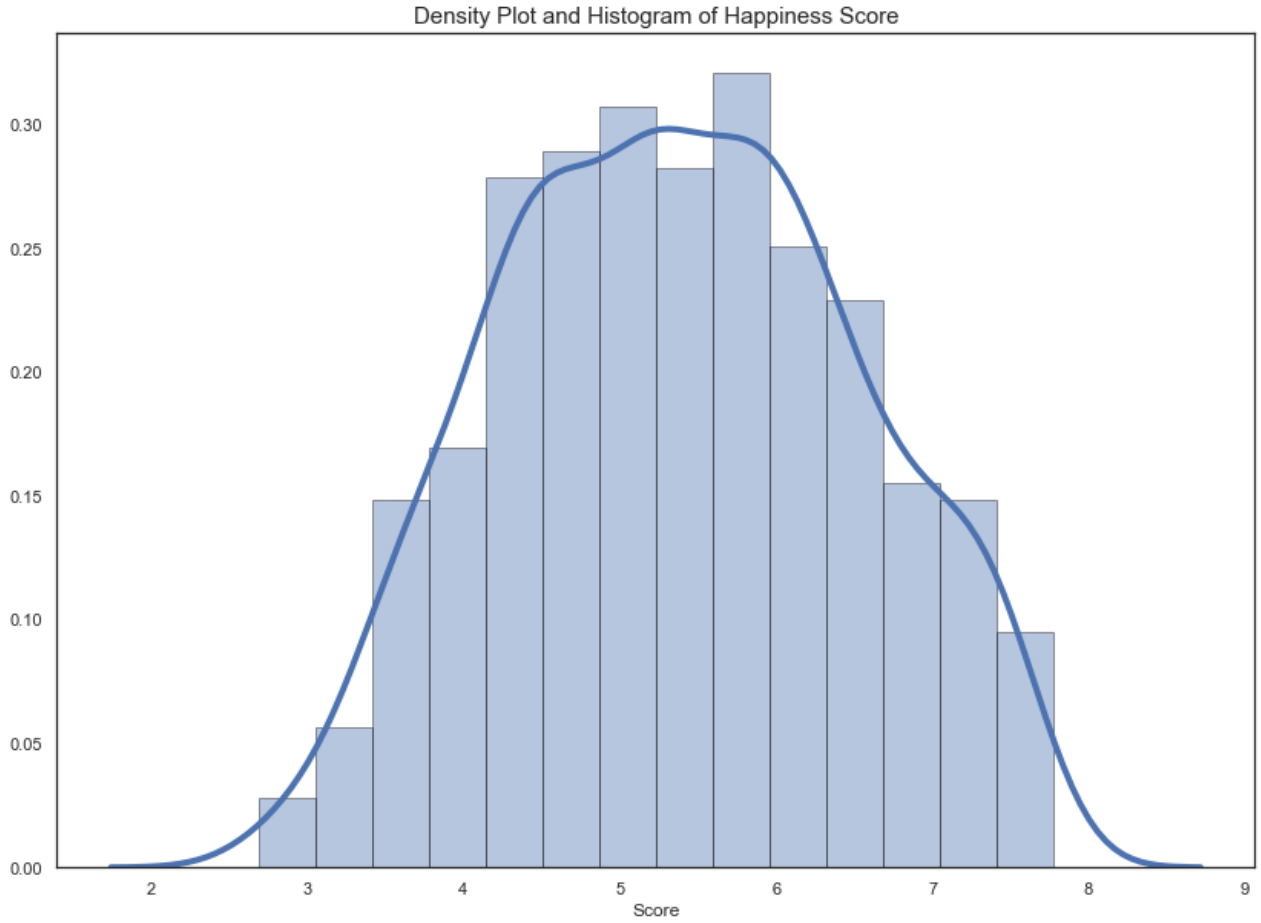


16. Density Curve with Histogram

In [123…

```
fig = plt.figure(figsize=(14,10))
sns.distplot(happy['Score'], hist=True, kde=True,
             hist_kws={'edgecolor':'black'},
             kde_kws={'linewidth': 4})
plt.title('Density Plot and Histogram of Happiness Score', fontsize=15)
```

Out[123… Text(0.5, 1.0, 'Density Plot and Histogram of Happiness Score')



17. Density Plot

In [128…

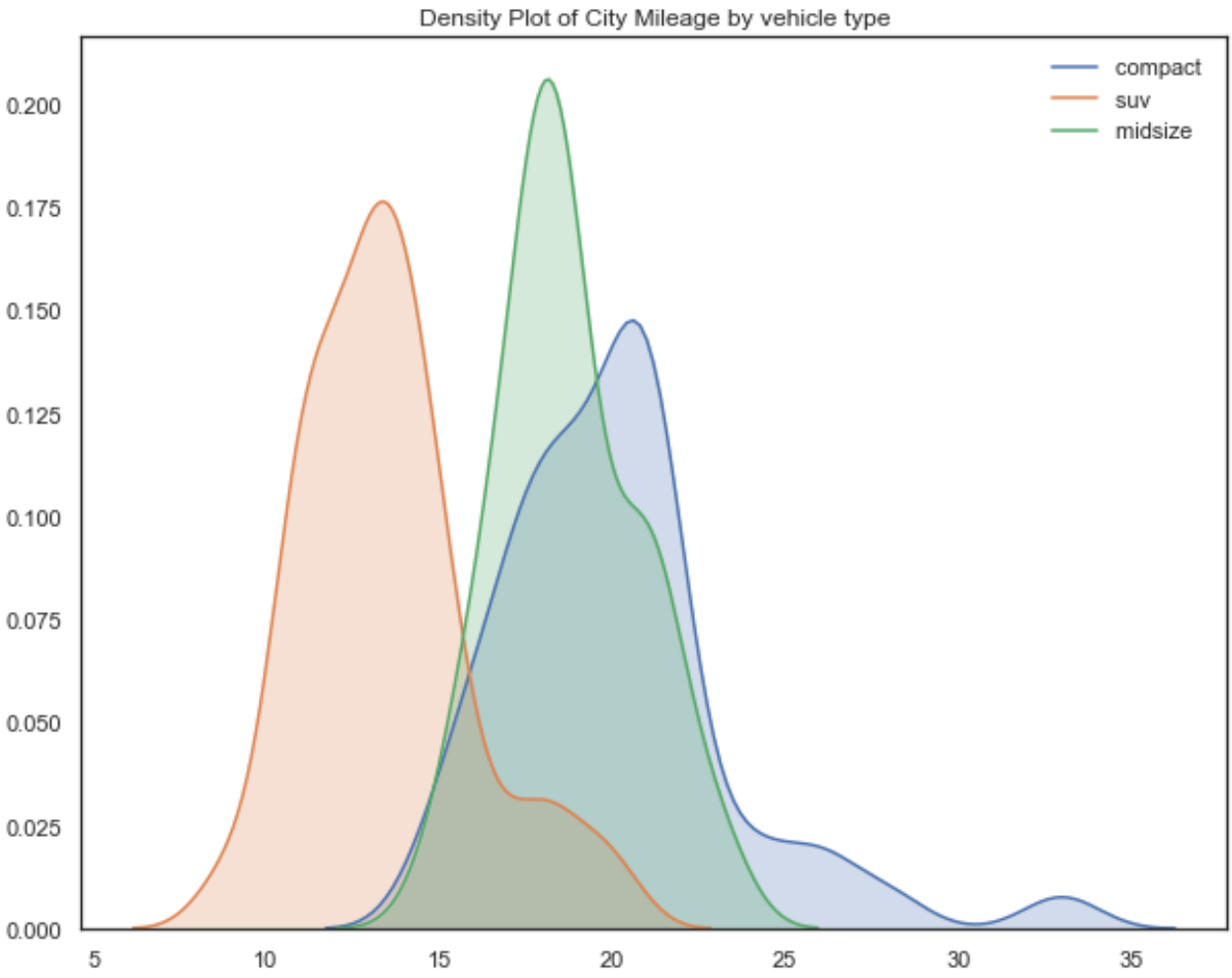
```
# simple density plot
# instanciate the figure
fig = plt.figure(figsize = (10, 8))
sns.kdeplot(car['displ'], shade=True)
```

Out[128… <AxesSubplot:>

In [124…

```
# instanciate the figure
fig = plt.figure(figsize = (10, 8))

# plot the data
# the idea is to iterate over each class
# extract their data ad plot a sepate density plot
for class_ in ['compact', 'suv', 'midsize']:
    # extract the data
    x = car[car['class'] == class_]['cty']
    # plot the data using seaborn
    sns.kdeplot(x, shade=True, label = '{} '.format(class_))

# set the title of the plot
plt.title('Density Plot of City Mileage by vehicle type')
```

Out[124… `Text(0.5, 1.0, 'Density Plot of City Mileage by vehicle type')`



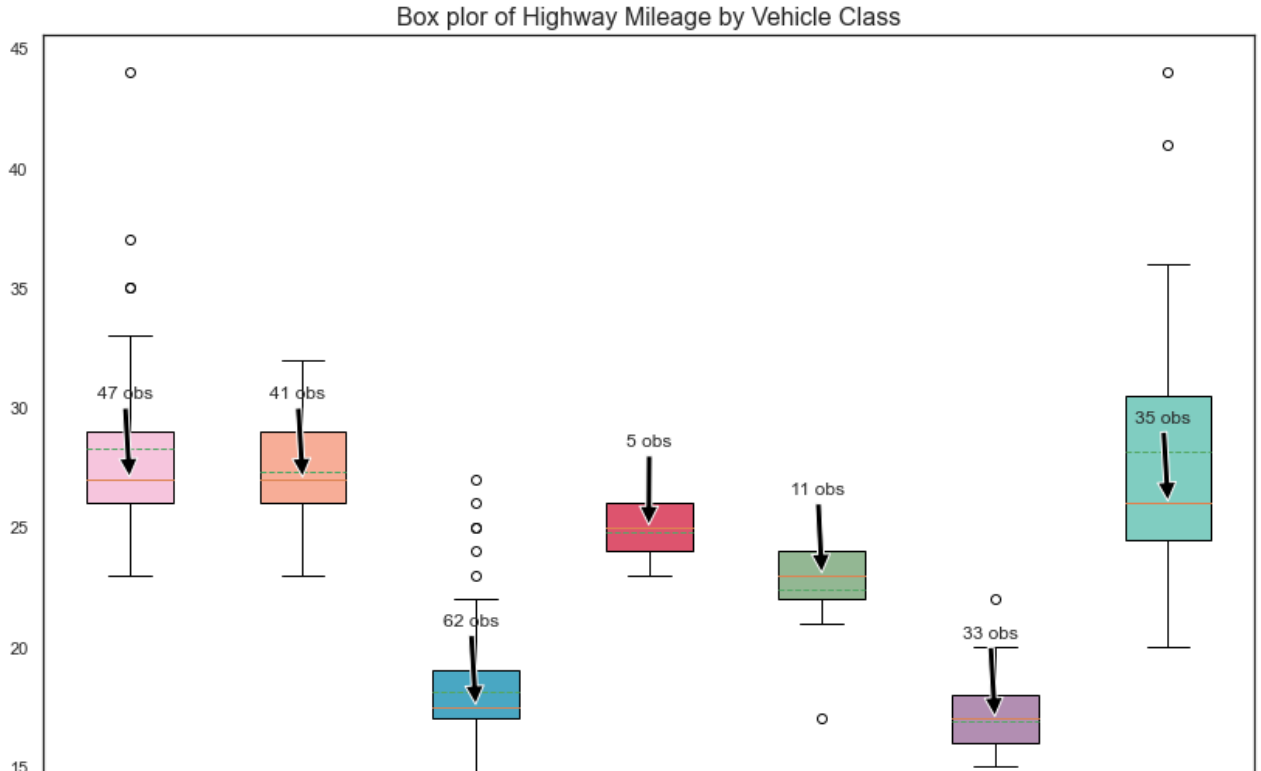
18. Box Plot

In [124…

```
# vectors to plot
vects = [car[car["class"]==cars]["hwy"] for cars in car["class"].unique()]

# labels for the x axis
labels = [class_ for class_ in car["class"].unique()]
```

```
# handpicked colors
colors = ['#f6c5dd', '#f7ad97', '#49a7c3', '#dd546e', '#93b793', '#b28eb2



# instanciate the figure
fig = plt.figure(figsize=(14, 10))
ax = fig.add_subplot()

# plot the data using matplotlib
plot1 = ax.boxplot(vects,
    notch=False, vert=True,
    meanline=True,showmeans=True,
    patch_artist=True
)

# iterate over every box and add some annotations
for box, color, vect, label, tick in zip(plot1['boxes'], # this line to i
                                         colors, vects, labels, ax.get_xt
    # change the color of the box
    box.set(facecolor=color)
    # add text
    ax.annotate("{} obs".format(len(vect)),
                xy=(tick, np.median(vect)),
               xytext=(15, 60), textcoords='offset points',
                 arrowprops=dict(facecolor='black', shrink=0.03),
            horizontalalignment='right', verticalalignment='top',
            )


# prettify the plot
# change the x labels
ax.set_xticklabels(labels=labels)

# change the rotation and the size of the x ticks (numbers of x axis)
ax.tick_params(axis='x',labelsize=12)

# set the title for the plot
ax.set_title('Box plor of Highway Mileage by Vehicle Class', fontsize=16)
```

Out[124… `Text(0.5, 1.0, 'Box plor of Highway Mileage by Vehicle Class')`

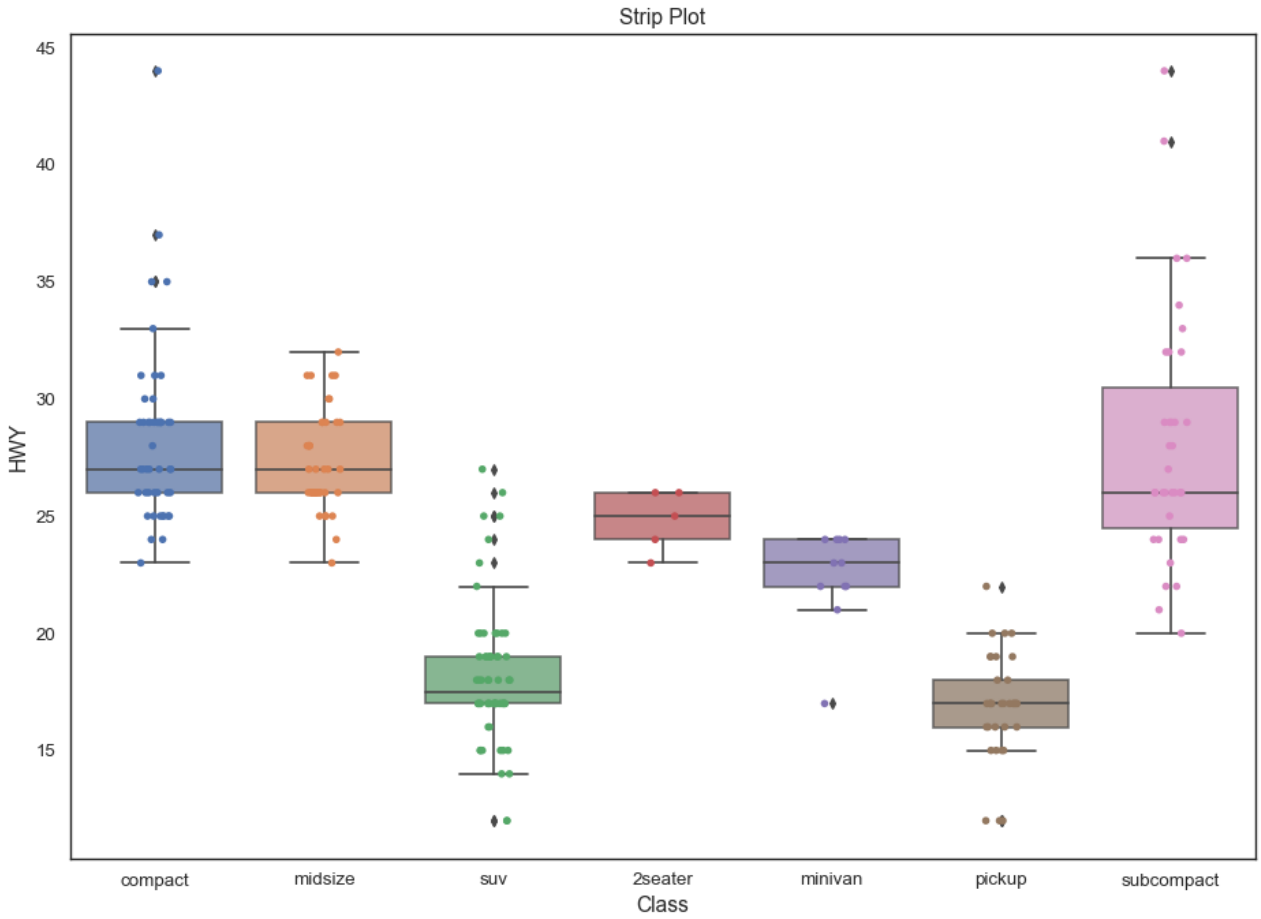


19. Strip Plot

In [124…

```
plt.figure(figsize=(14, 10), dpi=80)

ax = sns.boxplot(car['class'], car['hwy'], boxprops=dict(alpha=0.75))
ax = sns.stripplot(car['class'], car['hwy'], jitter=True, edgecolor="gray"
# change the font of the x and y ticks (numbers on the axis)
ax.tick_params(axis='x', labelsize=12)
ax.tick_params(axis='y', labelsize=12)

# set and x and y label
ax.set_xlabel("Class", fontsize=14)
ax.set_ylabel("HWY", fontsize=14)

# set a title
ax.set_title("Strip Plot", fontsize=14)
```

Out[124… `Text(0.5, 1.0, 'Strip Plot')`



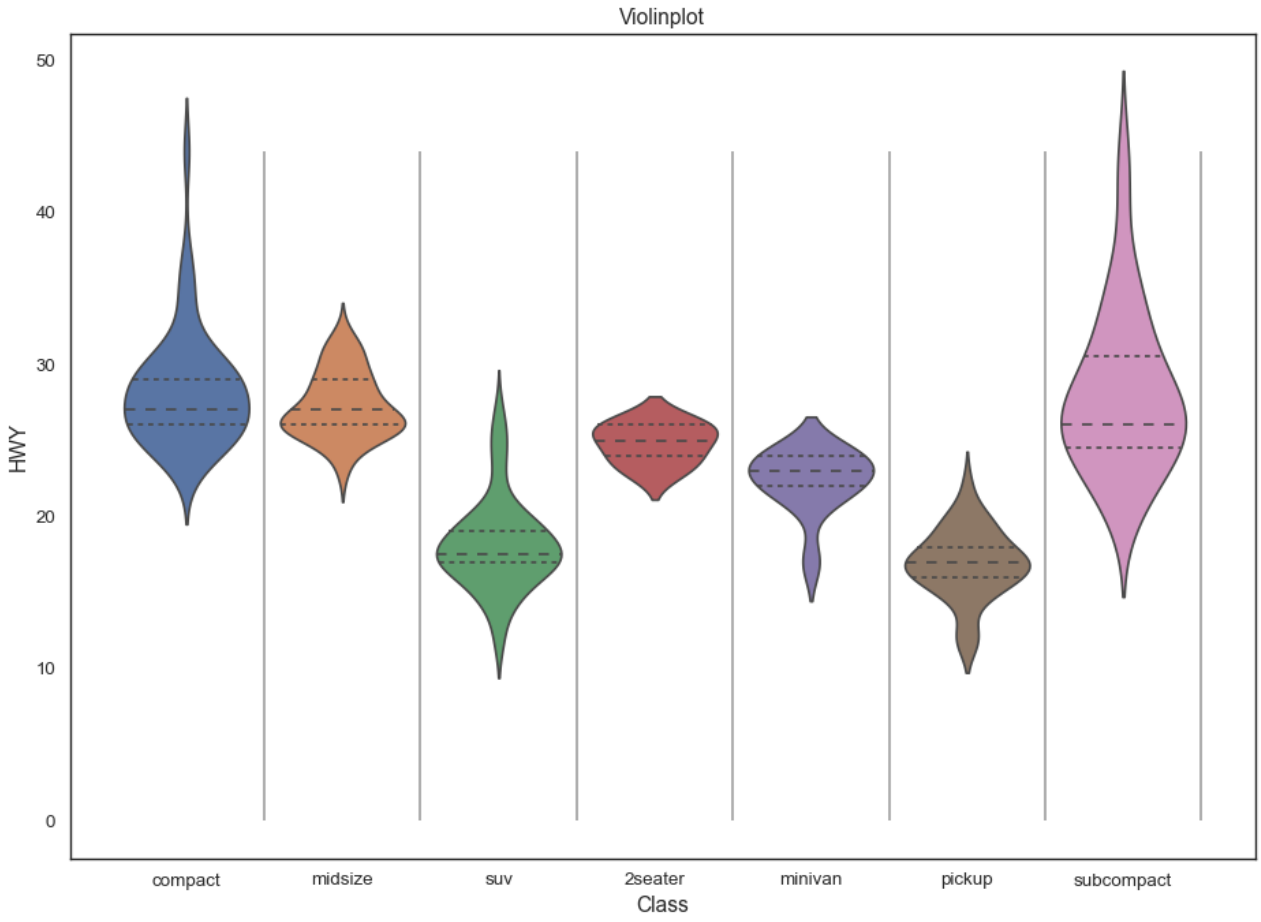
20. Violin Plot

In [124…

```
plt.figure(figsize=(14, 10), dpi=80)
sns.violinplot(car['class'], car['hwy'],
               scale='width', inner='quartile')

# prettify the plot
```

```
# get the current figure
ax = plt.gca()
# get the xticks to iterate over
xticks = ax.get_xticks()

# iterate over every xtick and add a vertical line
# to separate different classes
for tick in xticks:
    ax.vlines(tick+0.5, 0, np.max(car["hwy"]), color="grey", alpha=0.75)

# rotate the x and y ticks
ax.tick_params(axis='x', labelsize=12)
ax.tick_params(axis='y', labelsize=12)

# add x and y label
ax.set_xlabel("Class", fontsize=14)
ax.set_ylabel("HWY", fontsize=14)

# set title
ax.set_title("Violinplot", fontsize=14)
```

Out[124… `Text(0.5, 1.0, 'Violinplot')`

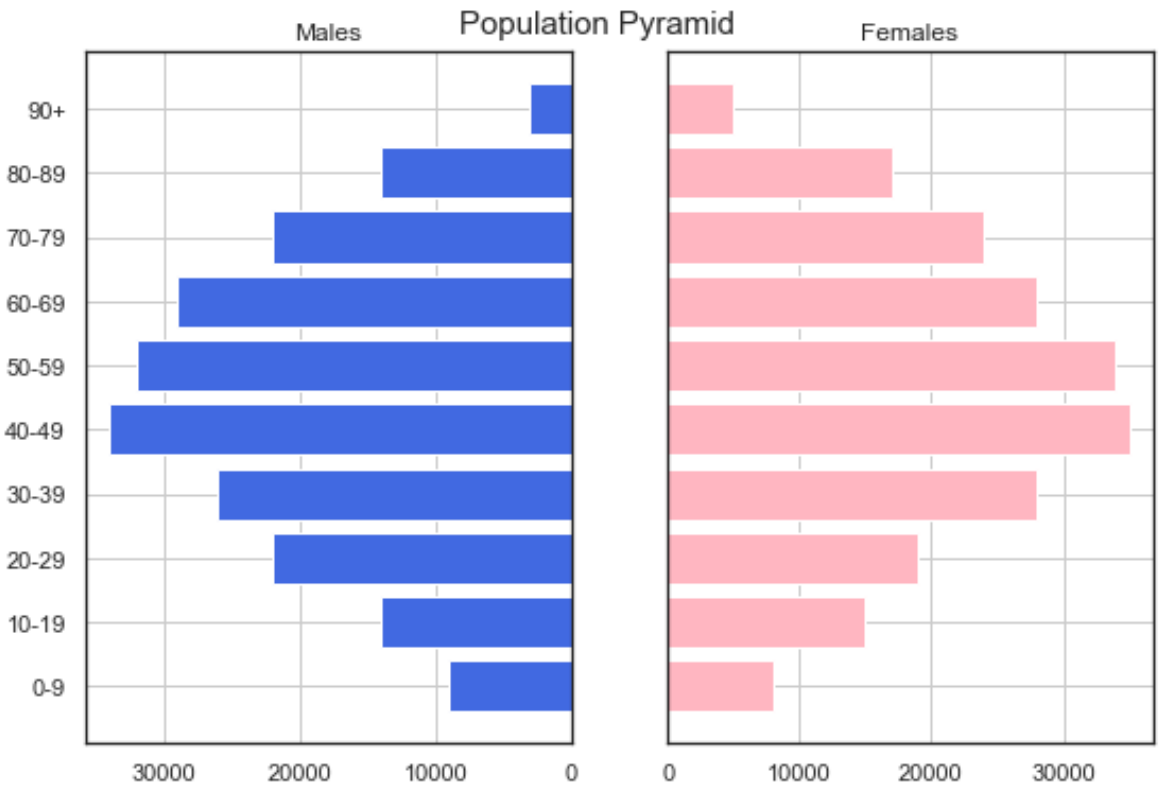


21. Population Pyramid

In [124…

```
#create dataframe
df = pd.DataFrame({'Age': ['0-9','10-19','20-29','30-39','40-49','50-59',
                   'Male': [9000, 14000, 22000, 26000, 34000, 32000, 290
                   'Female': [8000, 15000, 19000, 28000, 35000, 34000, 2


#define x and y limits
y = range(0, len(df))
x_male = df['Male']
```

```
x_female = df['Female']

#define plot parameters
fig, axes = plt.subplots(ncols=2, sharey=True, figsize=(9, 6))

#specify background color and plot title
fig.patch.set_facecolor('white')
plt.figtext(.5,.9,"Population Pyramid ", fontsize=15, ha='center')

#define male and female bars
axes[0].barh(y, x_male, align='center', color='royalblue')
axes[0].set(title='Males')
axes[1].barh(y, x_female, align='center', color='lightpink')
axes[1].set(title='Females')

#adjust grid parameters and specify labels for y-axis
axes[1].grid()
axes[0].set(yticks=y, yticklabels=df['Age'])
axes[0].invert_xaxis()
axes[0].grid()

#display plot
plt.show()
```



Comparision Plot

22. Bubble Chart
23. Bullet Chart
24. Pie Chart
25. Net Pie Chart
26. Donut Chart
27. TreeMap
28. Diverging Bar
29. Choropleth Map
30. Bubble Map

22. Bubble Chart

In [128…

```
happy = pd.read_csv('happiness_rank.csv')
'''Happiness score vs gdp per capital'''
px.scatter(happy, x="GDP", y="Score", animation_frame="Year",
           animation_group="Country",
           size="Rank", color="Country", hover_name="Country",
           trendline= "ols")
```

23. Bullet Chart

In [125…

```
# Bullet Chart
import plotly.figure_factory as ff

data = (
  {"label": "Happiness", "sublabel":"score",
   "range": [5, 6, 8], "performance": [5.5, 6.5], "point": [7]},
  {"label": "Economy", "sublabel": "score", "range": [0, 1, 2],
   "performance": [1, 1.5], "sublabel":"score","point": [1.5]},
  {"label": "Family","sublabel":"score", "range": [0, 1, 2],
   "performance": [1, 1.5],"sublabel":"score", "point": [1.3]},
  {"label": "Freedom","sublabel":"score", "range": [0, 0.3, 0.6],
   "performance": [0.3, 0.4],"sublabel":"score", "point": [0.5]},
  {"label": "Trust", "sublabel":"score","range": [0, 0.2, 0.5],
   "performance": [0.3, 0.4], "point": [0.4]}
)


fig = ff.create_bullet(
    data, titles='label', subtitles='sublabel', markers='point',
    measures='performance', ranges='range', orientation='h',
    measure_colors=['#1e747c', '#7ac7bf'],
    range_colors=['#F5E1DA', '#F1F1F1']
   )
py.iplot(fig, filename='bullet chart from dict')
```

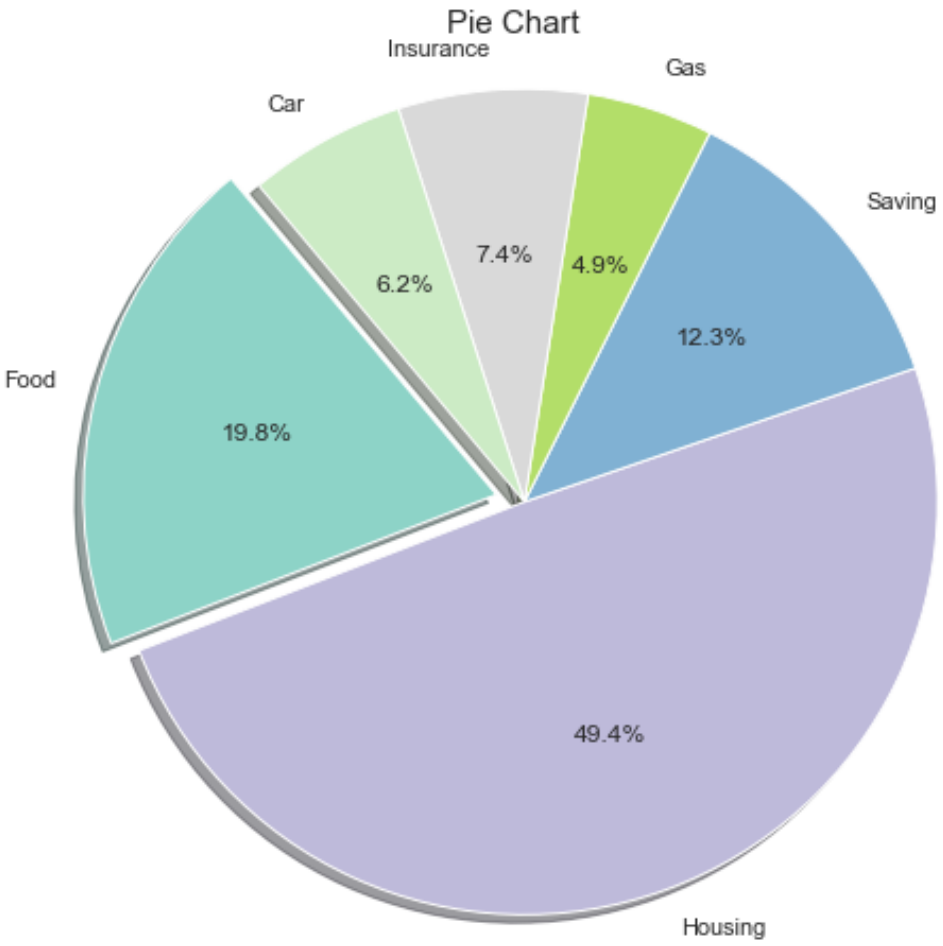
24. Pie Chart

In [125…

```
fig = plt.figure(figsize=(8,8))
labels = 'Food', 'Housing', 'Saving', 'Gas', 'Insurance', 'Car'
spend = [800, 2000, 500, 200, 300, 250]

# create n colors based on the number of labels we have
colors = [plt.cm.Set3(i/float(len(labels))) for i in range(len(labels))]

p = plt.pie(spend, # Value
            labels=labels, # Labels for each sections
            explode=(0.07, 0, 0, 0, 0, 0), # To slice the perticuler sect
            colors=colors, # Color of each section
            autopct='%1.1f%%', # Show data in persentage for with 1 decim
            startangle=130, # Start angle of first section
```

```
            shadow=True # Showing shadow of pie chart
           )


plt.axis('equal')

plt.title('Pie Chart', fontsize=15)
```

Out[125… Text(0.5, 1.0, 'Pie Chart')



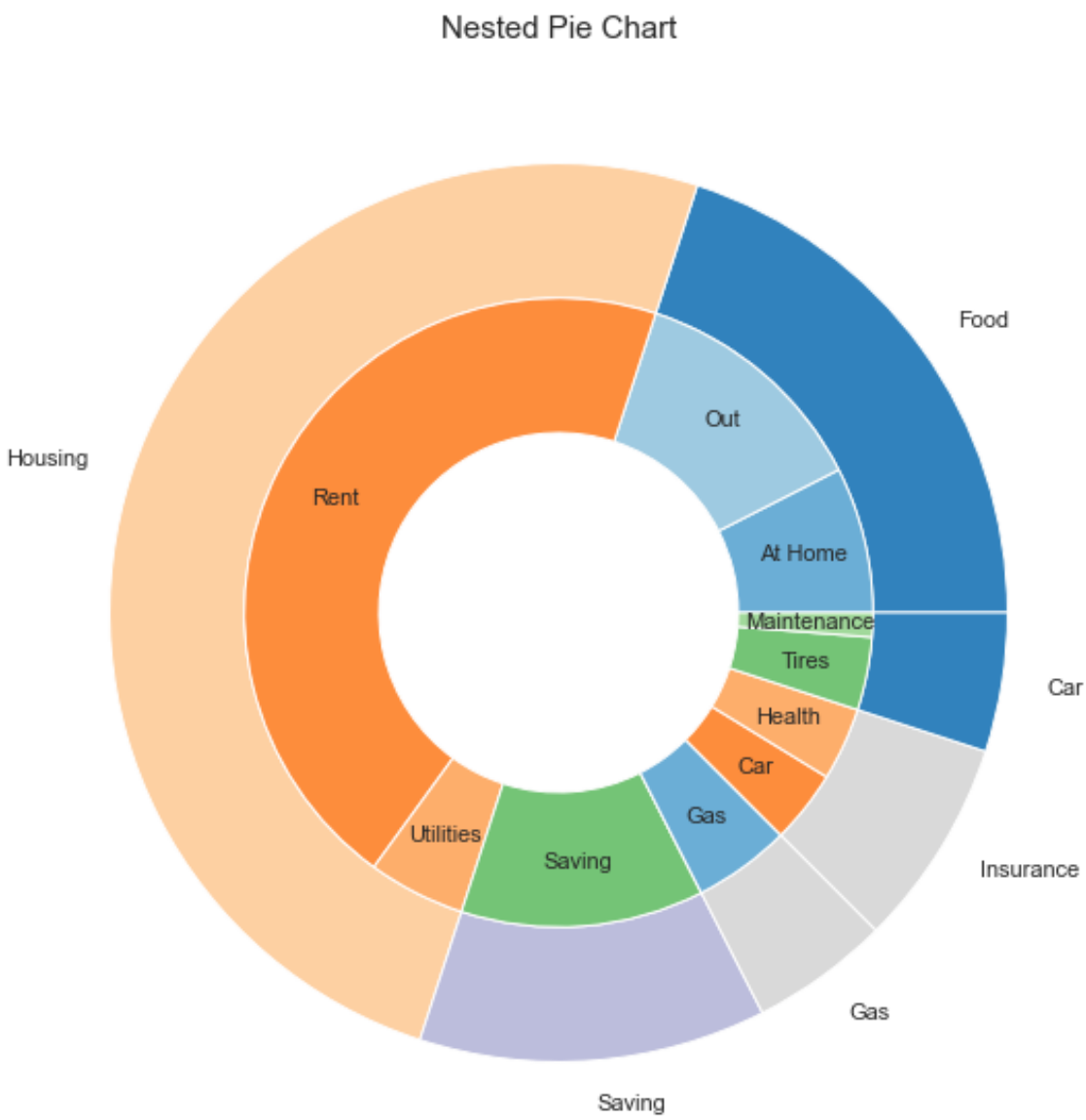
25. Net Pie Chart

In [125…

```
# get the data
size = 0.3
labels = 'Food', 'Housing', 'Saving', 'Gas', 'Insurance', 'Car'
spend = [800, 2000, 500, 200, 300, 250]
vals = np.array([[300., 500.], [1800., 200.], [500., 0.],[200., 0.], [150
in_labels = 'At Home','Out', 'Rent','Utilities','Saving','', 'Gas','','Ca
# create the outer and inner colors
cmap = plt.get_cmap("tab20c")
outer_colors = cmap(np.arange(5)*7)
inner_colors = cmap(np.array([1, 2, 5, 6, 9, 10]))

# instanciate the figure
fig = plt.figure(figsize=(14, 10))
ax = fig.add_subplot()

# plot the data
# outer level
ax.pie(vals.sum(axis=1), # plot the total [60., 32.] = 92
       radius=1, # Radius to increase or decrease the size of pie chart
       labels=labels, # Labels for each sections
       colors=outer_colors, # Color of each section
```

```
        wedgeprops=dict(width=size, edgecolor='w') # Add edges to each por
       )

# inner level
patches, texts = ax.pie(vals.flatten(), # using flatten we plot 60, 32 se
       radius=1-size,
       labels=in_labels,
       labeldistance=0.8,
       colors=inner_colors,
       wedgeprops=dict(width=size, edgecolor='w'))

for t in texts:
    t.set_horizontalalignment('center')


# set the title for the plot
plt.title('Nested Pie Chart', fontsize=15)
```

Out[125… Text(0.5, 1.0, 'Nested Pie Chart')



26. Donut Chart

In [125…

```
df15 = pd.read_csv('2015.csv')
d2015 = df15['Region'].value_counts()

label_d2015 = d2015.index
```

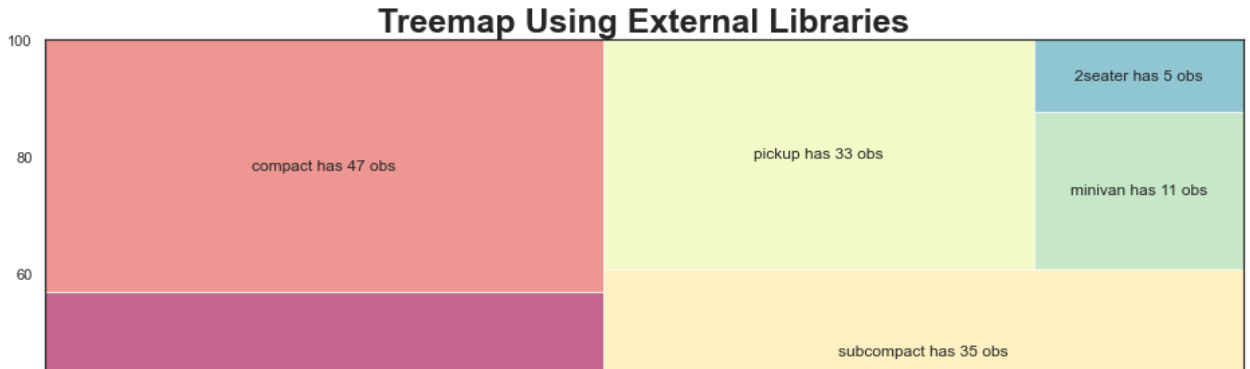
```
size_d2015 = d2015.values


colors = ['#4870a0', '#eb96aa', '#7ac7bf', '#b28eb2', '#d9a3d8',
          '#f3c366','#a1cdec', '#38b6ff','#92406e','#f5907b']

trace = go.Pie( labels=label_d2015,
                values=size_d2015,
                marker=dict(colors = colors),
                name='2015',
                hole=0.3)

data = [trace]

layout1 = go.Layout(
           title='Regions')

fig = go.Figure(data=data, layout=layout1)

py.iplot(fig)
```

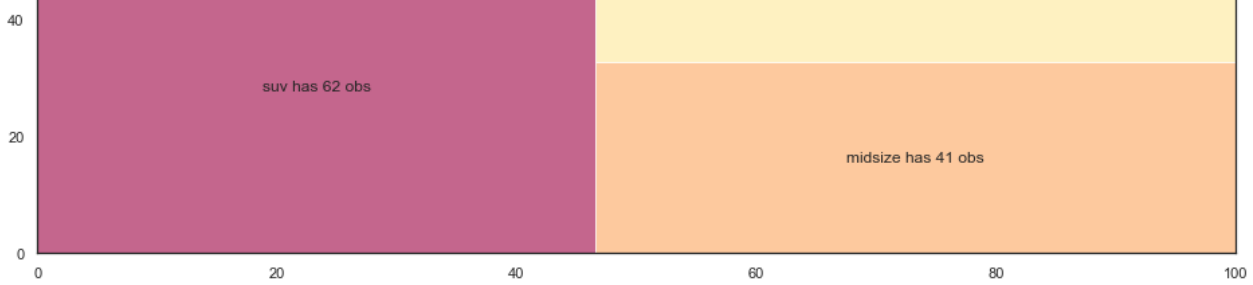
27. Tree Map

In [120…

```
import squarify

# prepare the data for plotting
# get the values
label_value = car['class'].value_counts().to_dict()

# create the labels using a list comprehesion
labels = ['{} has {} obs'.format(class_, obs) for class_, obs in label_va

# create n colors based on the number of labels we have
colors = [plt.cm.Spectral(i/float(len(labels))) for i in range(len(labels


# instanciate the figure
fig = plt.gcf()
fig.set_size_inches(16,8)

# plot the data using squarify
squarify.plot(sizes=label_value.values(), label=labels, color=colors, alp

# prettify the plot
# add a title to the plot
plt.title('Treemap Using External Libraries', fontsize=25, fontweight='bo
```

Out[120… Text(0.5, 1.0, 'Treemap Using External Libraries')





28. Diverging Bar Chart

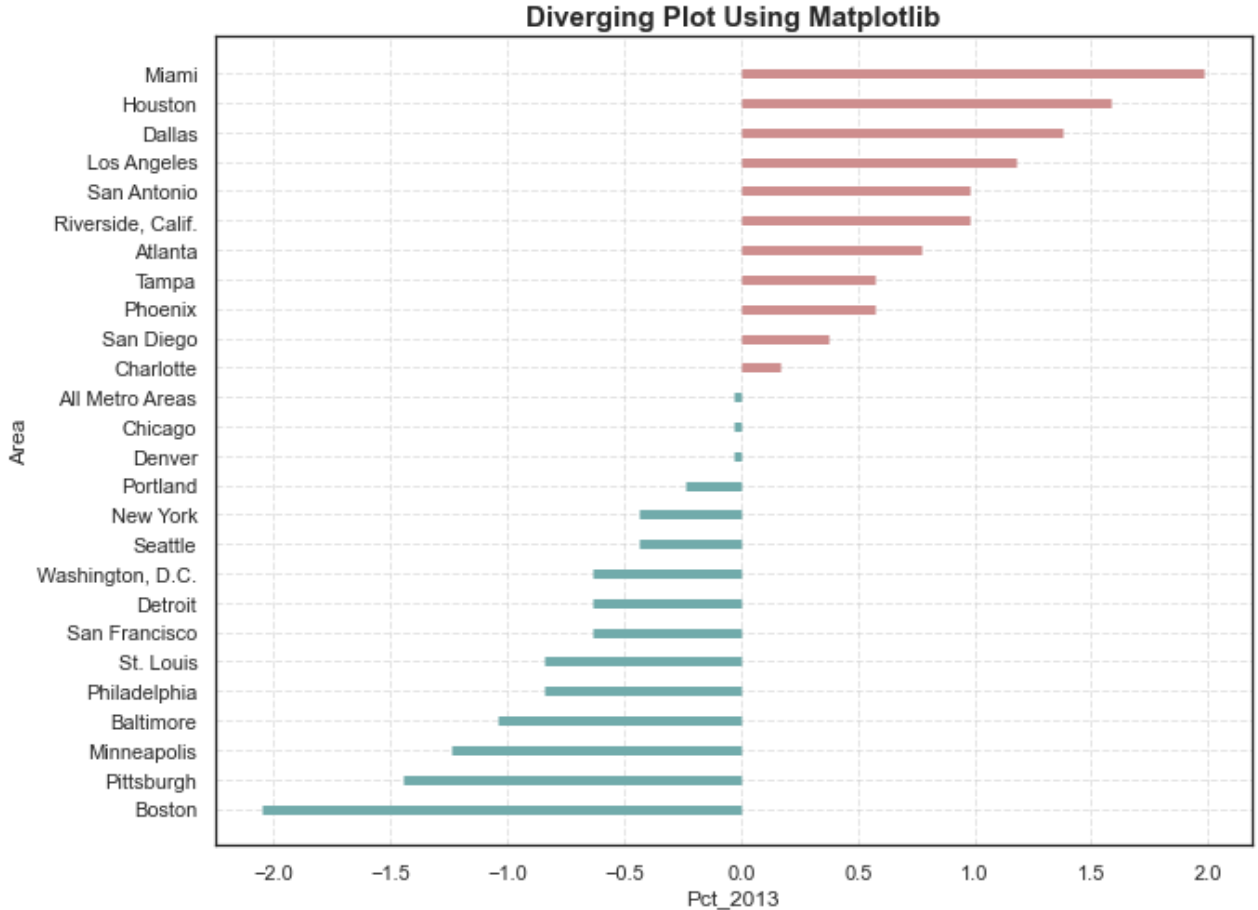
In [121…

```
health = pd.read_csv('health.csv')
# prepare the data for plotting
# here we standarize the data
# More info:
# https://statisticsbyjim.com/glossary/standardization/
health['x_plot'] = (health['pct_2013'] - health['pct_2013'].mean())/healt

# sort value and reset the index
health.sort_values('x_plot', inplace = True)
health.reset_index(inplace = True)

# create a color list, where if value is above > 0 it's green otherwise r
colors = ['#71abab' if x < 0 else '#ce8e8e' for x in health['x_plot']]

# instanciate the figure
fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot()
# plot using horizontal lines and make it look like a column by changing
ax.hlines(y=health.index, xmin=0 , xmax=health['x_plot'],  color=colors,

# prettify the plot
# set x and y axis
ax.set_xlabel('Pct_2013')
ax.set_ylabel('Area')

# set a title
ax.set_title('Diverging Plot Using Matplotlib', fontsize=15, fontweight='

# make a grid to help separate the lines
ax.grid(linestyle='--', alpha=0.5)

# change the y ticks
# first you set the yticks
# then you change them using the area names

plt.yticks(health.index, health.Area)
```

Out[121…

```
([<matplotlib.axis.YTick at 0x7f9bb0aee730>,
  <matplotlib.axis.YTick at 0x7f9bb0b108e0>,
  <matplotlib.axis.YTick at 0x7f9bb0b10970>,
  <matplotlib.axis.YTick at 0x7f9bad384a90>,
  <matplotlib.axis.YTick at 0x7f9bad384fa0>,
  <matplotlib.axis.YTick at 0x7f9bad3904f0>,
  <matplotlib.axis.YTick at 0x7f9bad390a00>,
  <matplotlib.axis.YTick at 0x7f9bad390f10>,
  <matplotlib.axis.YTick at 0x7f9bad395460>,
  <matplotlib.axis.YTick at 0x7f9bad395970>,
  <matplotlib.axis.YTick at 0x7f9bad390610>,
  <matplotlib.axis.YTick at 0x7f9bad3846a0>,
  <matplotlib.axis.YTick at 0x7f9bad395190>,
```

```
 <matplotlib.axis.YTick at 0x7f9bad39c220>,
 <matplotlib.axis.YTick at 0x7f9bad39c6d0>,
 <matplotlib.axis.YTick at 0x7f9bad39cbe0>,
 <matplotlib.axis.YTick at 0x7f9bb0a51130>,
 <matplotlib.axis.YTick at 0x7f9bb0a51640>,
 <matplotlib.axis.YTick at 0x7f9bb0a51b50>,
 <matplotlib.axis.YTick at 0x7f9bb0a51880>,
 <matplotlib.axis.YTick at 0x7f9bad39c910>,
 <matplotlib.axis.YTick at 0x7f9bad395c40>,
 <matplotlib.axis.YTick at 0x7f9bb0a5a250>,
 <matplotlib.axis.YTick at 0x7f9bb0a5a760>,
 <matplotlib.axis.YTick at 0x7f9bb0a5ac70>,
 <matplotlib.axis.YTick at 0x7f9bb0a5f1c0>],
[Text(0, 0, 'Boston'),
 Text(0, 1, 'Pittsburgh'),
 Text(0, 2, 'Minneapolis'),
 Text(0, 3, 'Baltimore'),
 Text(0, 4, 'Philadelphia'),
 Text(0, 5, 'St. Louis'),
 Text(0, 6, 'San Francisco'),
 Text(0, 7, 'Detroit'),
 Text(0, 8, 'Washington, D.C.'),
 Text(0, 9, 'Seattle'),
 Text(0, 10, 'New York'),
 Text(0, 11, 'Portland'),
 Text(0, 12, 'Denver'),
 Text(0, 13, 'Chicago'),
 Text(0, 14, 'All Metro Areas'),
 Text(0, 15, 'Charlotte'),
 Text(0, 16, 'San Diego'),
 Text(0, 17, 'Phoenix'),
 Text(0, 18, 'Tampa'),
 Text(0, 19, 'Atlanta'),
 Text(0, 20, 'Riverside, Calif.'),
 Text(0, 21, 'San Antonio'),
 Text(0, 22, 'Los Angeles'),
 Text(0, 23, 'Dallas'),
 Text(0, 24, 'Houston'),
 Text(0, 25, 'Miami')])
```



29. World Map

In [125…

```
'''World Map
Happiness Rank Accross the World'''

happiness_rank = dict(type='choropleth',
           locations=happy['Country'],
           locationmode='country names',
           z=happy['Rank'],
           text=happy['Country'],
           colorscale='bluyl',
           autocolorscale=False,
           reversescale=True,
           marker_line_color='darkgray',
           marker_line_width=0.5)
layout = dict(title='Happiness Rank Across the World',
             geo=dict(showframe=False,
                      projection={'type': 'equirectangular'}))
world_map_1 = go.Figure(data=[happiness_rank], layout=layout)
iplot(world_map_1)
```

30. Bubble Map

In [128…

```
# to use unverified ssl
import ssl
ssl._create_default_https_context = ssl._create_unverified_context
covid = pd.read_csv('https://opendata.ecdc.europa.eu/covid19/casedistribu
covid.head(10)
```

Out[128…

	dateRep	day	month	year	cases	deaths	countriesAndTerritories	geoId	c
0	03/09/2020	3	9	2020	38	3	Afghanistan	AF	
1	02/09/2020	2	9	2020	9	0	Afghanistan	AF	
2	01/09/2020	1	9	2020	34	4	Afghanistan	AF	
3	31/08/2020	31	8	2020	19	0	Afghanistan	AF	
4	30/08/2020	30	8	2020	3	0	Afghanistan	AF	
5	29/08/2020	29	8	2020	11	1	Afghanistan	AF	
6	28/08/2020	28	8	2020	3	0	Afghanistan	AF	
7	27/08/2020	27	8	2020	55	4	Afghanistan	AF	
8	26/08/2020	26	8	2020	1	0	Afghanistan	AF	
9	25/08/2020	25	8	2020	71	10	Afghanistan	AF	

In [128…

```
# Remove unuseful columns
covid = covid[['dateRep', 'cases', 'deaths', 'countriesAndTerritories', '
# Rename columns
```

```
covid = covid.rename(columns={
    'dateRep': 'date',
    'countriesAndTerritories': 'country',
    'countryterritoryCode': 'countryCode',
    'continentExp': 'continent'
})
# Convert string to datetime
covid['date'] = pd.to_datetime(covid['date'], format='%d/%m/%Y')
# Preview the data frame
covid.sample(10)
```

Out[128…

	date	cases	deaths	country	countryCode	continent
26975	2020-06-25	0	0	Nicaragua	NIC	America
34080	2020-08-07	20	1	South_Korea	KOR	Asia
37725	2020-04-18	0	0	Uganda	UGA	Africa
317	2020-06-16	69	0	Albania	ALB	Europe
16775	2020-06-06	0	0	Holy_See	VAT	Europe
11121	2020-04-29	1018	208	Ecuador	ECU	America
13375	2020-07-16	927	91	France	FRA	Europe
4614	2020-07-27	1148	48	Bolivia	BOL	America
15013	2020-06-04	0	0	Greece	GRC	Europe
35626	2020-05-28	0	0	Switzerland	CHE	Europe

In [129…

```
from datetime import datetime
# Get today as string
today = datetime.now().strftime('%Y-%m-%d')
# Get a data frame only for today
df_today = covid[covid.date == today]
# Preview the data frame
df_today.head()
```

Out[129…

	date	cases	deaths	country	countryCode	continent
0	2020-09-03	38	3	Afghanistan	AFG	Asia
238	2020-09-03	122	6	Albania	ALB	Europe
417	2020-09-03	325	7	Algeria	DZA	Africa
660	2020-09-03	15	0	Andorra	AND	Europe
834	2020-09-03	75	1	Angola	AGO	Africa

In [129…

```
import plotly.express as px
fig = px.scatter_geo(
    df_today, # provide the Pandas data frame
    locations='countryCode', # indicate locations
    color='continent',
    hover_name='country', # what to display when the mouse hovering on th
    size='cases', # how large the bubble is
    projection='equirectangular',
    title=f'World COVID-19 Cases for {today}'
)
fig.show()
```