Visualizing Data in Python

Tables, Histograms, Boxplots, and Slicing for Statistics

When working with a new dataset, one of the most useful things to do is to begin to visualize the data. By using tables, histograms, box plots, and other visual tools, we can get a better idea of what the data may be trying to tell us, and we can gain insights into the data that we may have not discovered otherwise.

Today, we will be going over how to perform some basic visualisations in Python, and, most importantly, we will learn how to begin exploring data from a graphical perspective.

In [1]:
```
# We first need to import the packages that we will be using
import seaborn as sns # For plotting
import matplotlib.pyplot as plt # For showing plots

# Load in the data set
tips_data = sns.load_dataset("tips")
```

Visualizing the Data - Tables

When you begin working with a new data set, it is often best to print out the first few rows before you begin other analysis. This will show you what kind of data is in the dataset, what data types you are working with, and will serve as a reference for the other plots that we are about to make.

In [2]:

```
# Print out the first few rows of the data
tips_data.head()
```

Out[2]:

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

Describing Data

Summary statistics, which include things like the mean, min, and max of the data, can be useful to get a feel for how large some of the variables are and what variables may be the most important.

In [3]:
```
# Print out the summary statistics for the quantitative variables
tips_data.describe()
```

Out[3]:

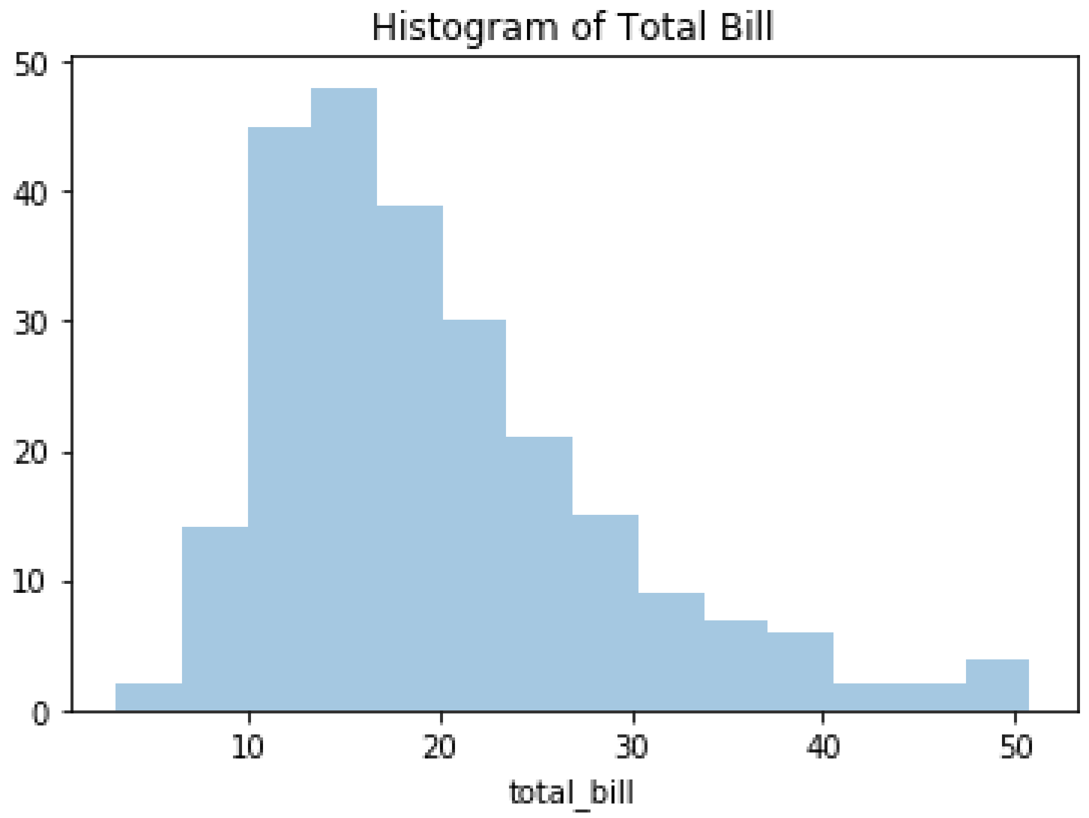
	total_bill	tip	size
count	244.000000	244.000000	244.000000
mean	19.785943	2.998279	2.569672
std	8.902412	1.383638	0.951100
min	3.070000	1.000000	1.000000
25%	13.347500	2.000000	2.000000
50%	17.795000	2.900000	2.000000
75%	24.127500	3.562500	3.000000
max	50.810000	10.000000	6.000000

Creating a Histogram

After we have a general 'feel' for the data, it is often good to get a feel for the shape of the distribution of the data.

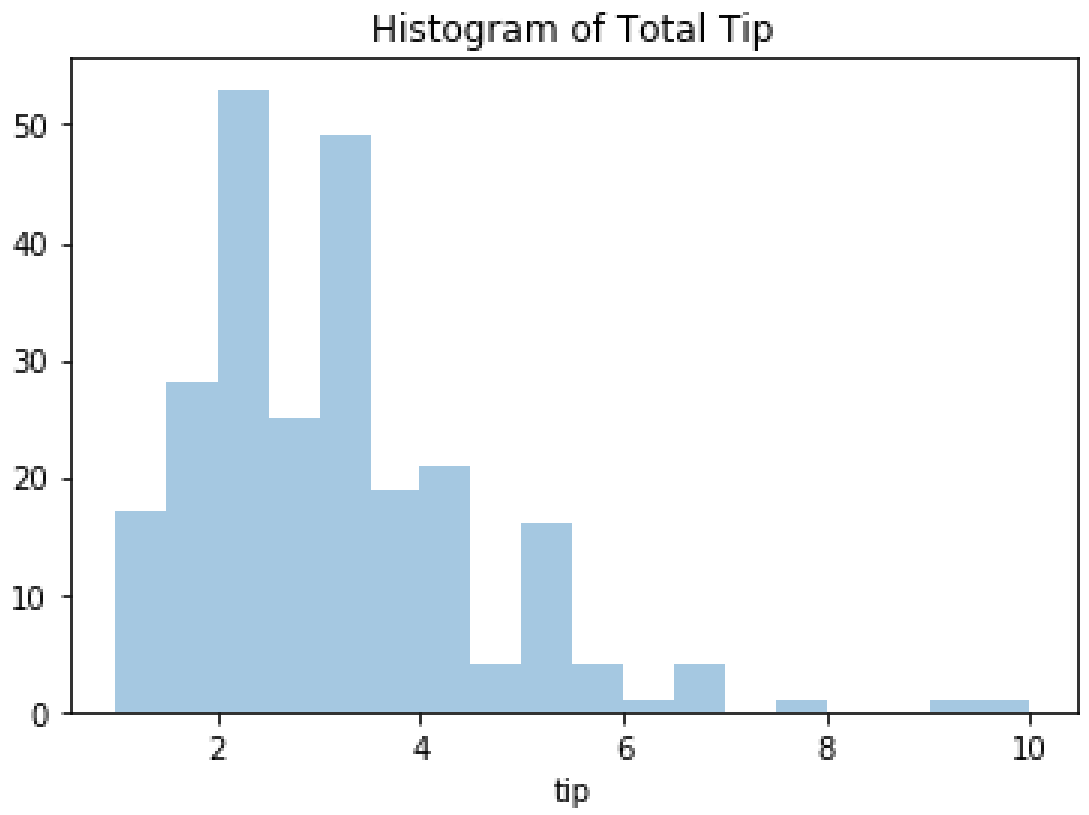
```
In [4]: # Plot a histogram of the total bill
        sns.distplot(tips_data["total_bill"], kde = False).set_title("Histogram of Total Bil
        l")
        plt.show()
```

```
/opt/conda/envs/python2/lib/python2.7/site-packages/matplotlib/axes/_axes.py:6571:
UserWarning: The 'normed' kwarg is deprecated, and has been replaced by the 'densit
y' kwarg.
  warnings.warn("The 'normed' kwarg is deprecated, and has been "
```



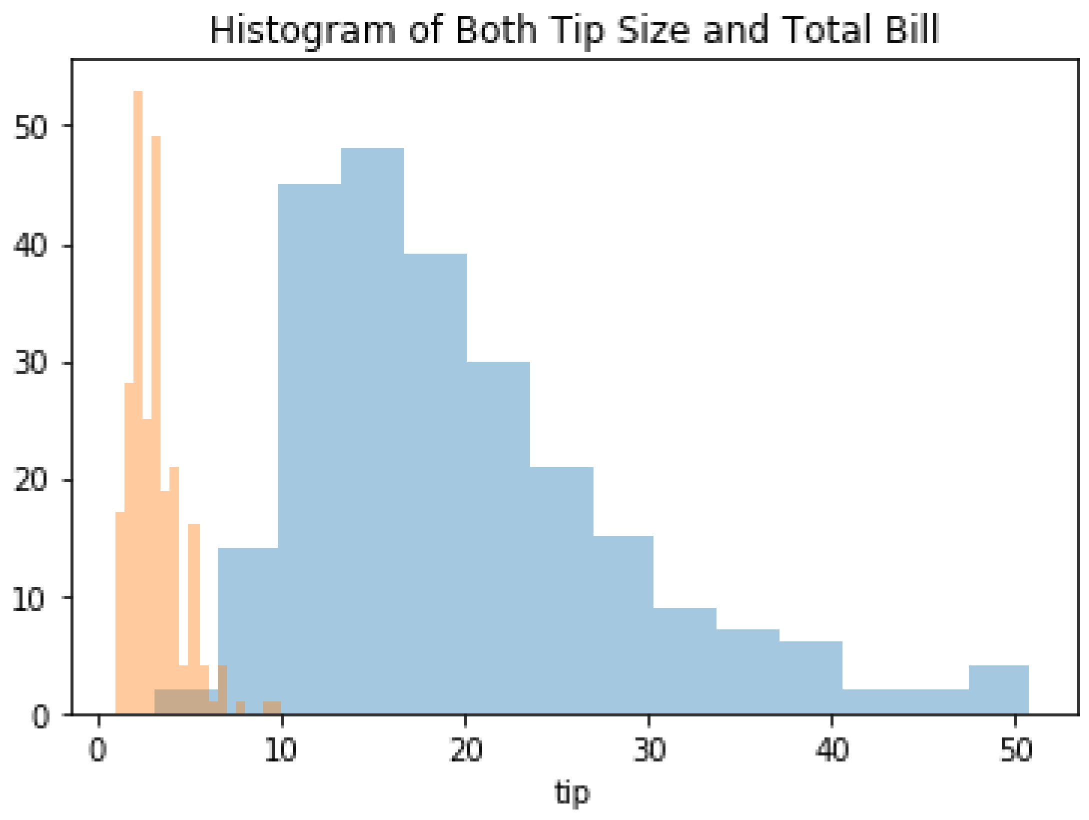
```
In [5]: # Plot a histogram of the Tips only
        sns.distplot(tips_data["tip"], kde = False).set_title("Histogram of Total Tip")
        plt.show()
```

```
/opt/conda/envs/python2/lib/python2.7/site-packages/matplotlib/axes/_axes.py:6571:
UserWarning: The 'normed' kwarg is deprecated, and has been replaced by the 'densit
y' kwarg.
  warnings.warn("The 'normed' kwarg is deprecated, and has been "
```



In [6]:
```
# Plot a histogram of both the total bill and the tips'
sns.distplot(tips_data["total_bill"], kde = False)
sns.distplot(tips_data["tip"], kde = False).set_title("Histogram of Both Tip Size and
Total Bill")
plt.show()
```

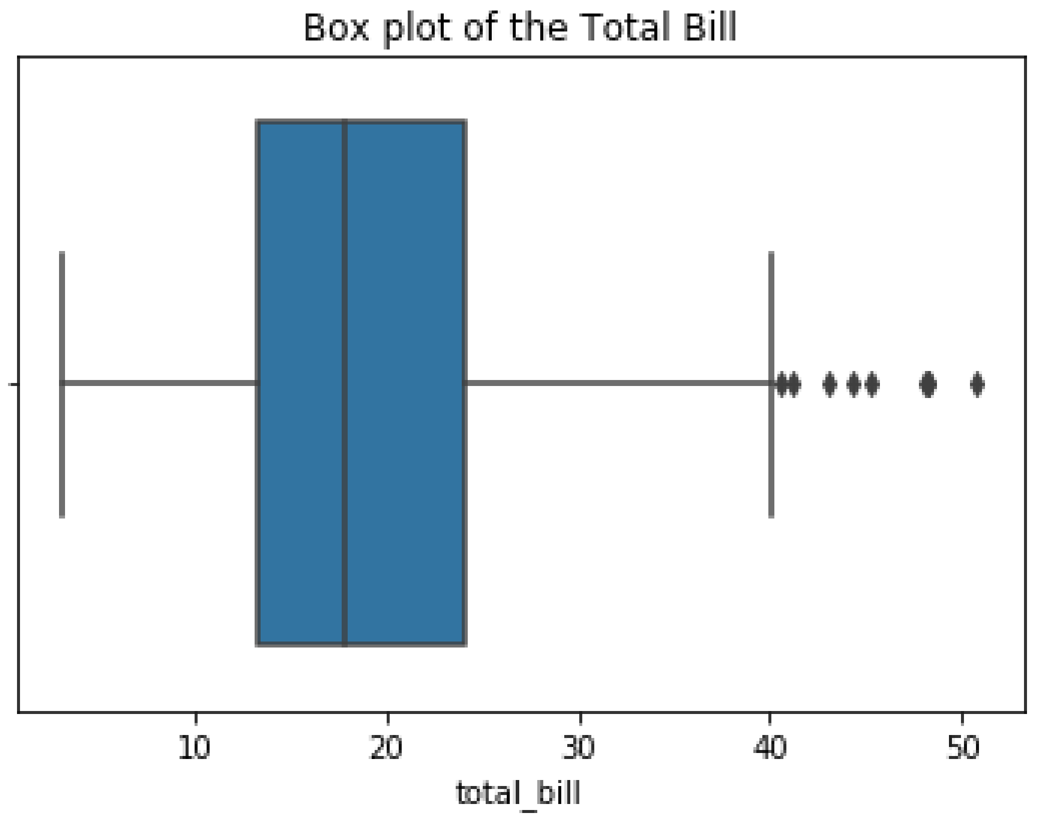
```
/opt/conda/envs/python2/lib/python2.7/site-packages/matplotlib/axes/_axes.py:6571:
UserWarning: The 'normed' kwarg is deprecated, and has been replaced by the 'densit
y' kwarg.
  warnings.warn("The 'normed' kwarg is deprecated, and has been "
/opt/conda/envs/python2/lib/python2.7/site-packages/matplotlib/axes/_axes.py:6571:
UserWarning: The 'normed' kwarg is deprecated, and has been replaced by the 'densit
y' kwarg.
  warnings.warn("The 'normed' kwarg is deprecated, and has been "
```



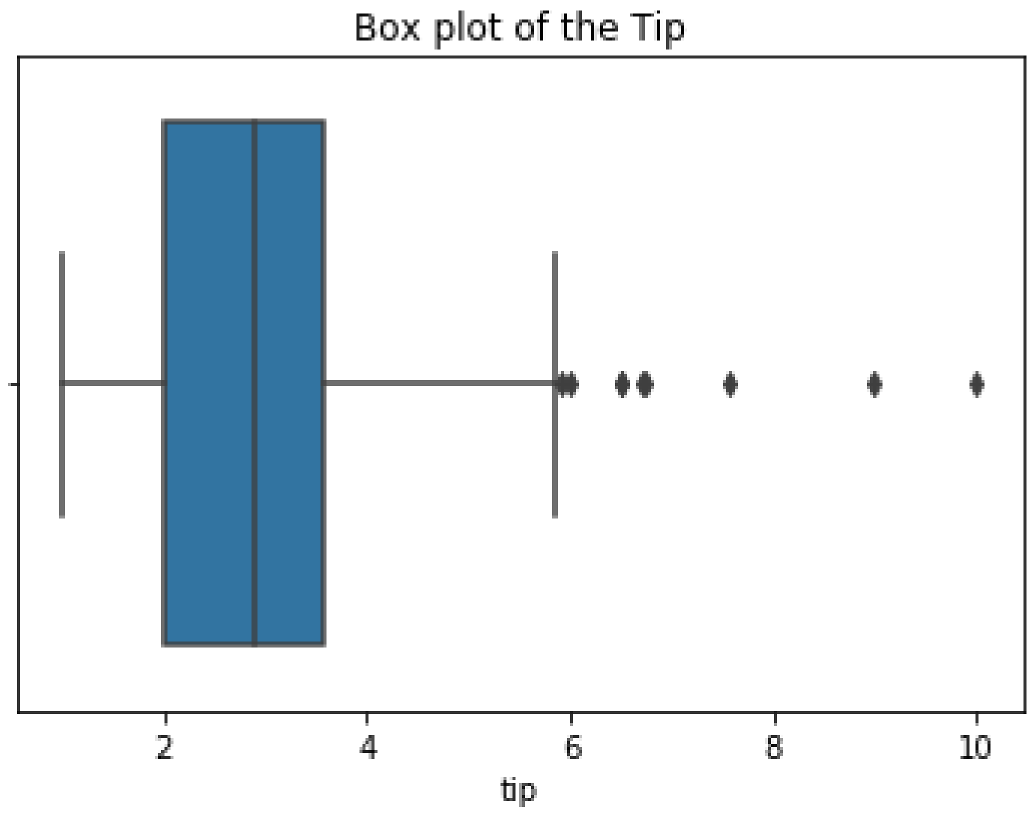
Creating a Boxplot

Boxplots do not show the shape of the distribution, but they can give us a better idea about the center and spread of the distribution as well as any potential outliers that may exist. Boxplots and Histograms often complement each other and help an analyst get more information about the data

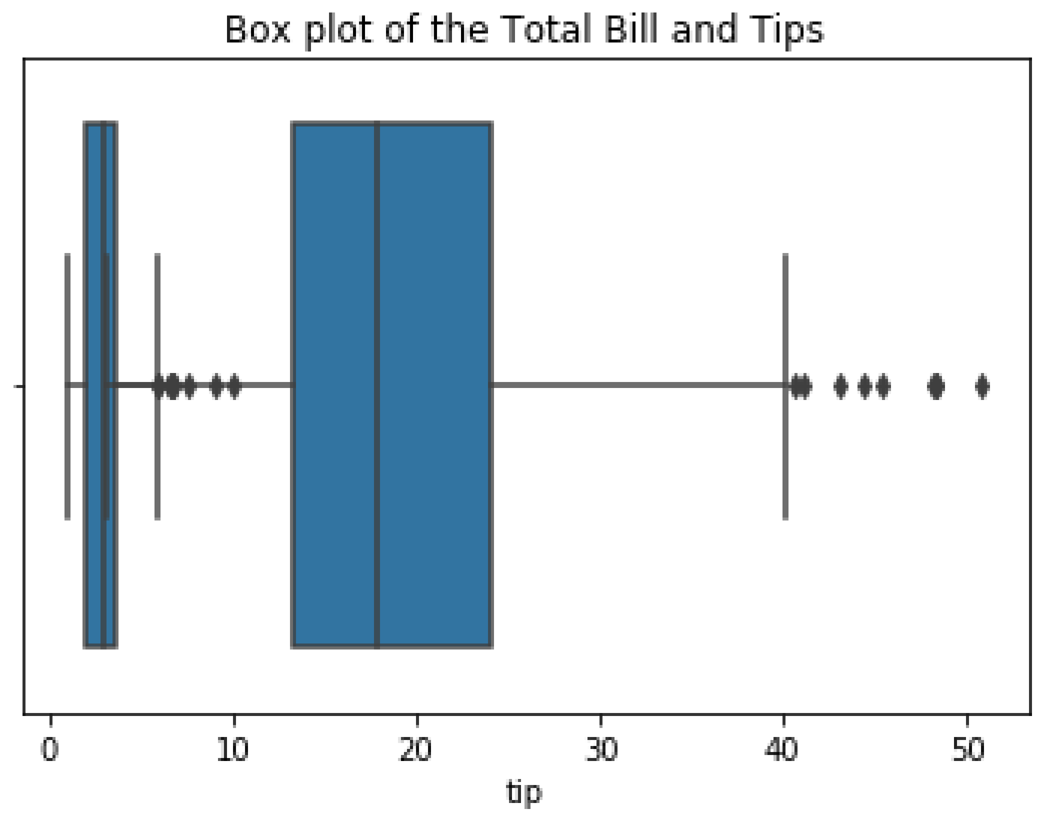
```
In [7]: # Create a boxplot of the total bill amounts
        sns.boxplot(tips_data["total_bill"]).set_title("Box plot of the Total Bill")
        plt.show()
```



```
In [8]: # Create a boxplot of the tips amounts
        sns.boxplot(tips_data["tip"]).set_title("Box plot of the Tip")
        plt.show()
```



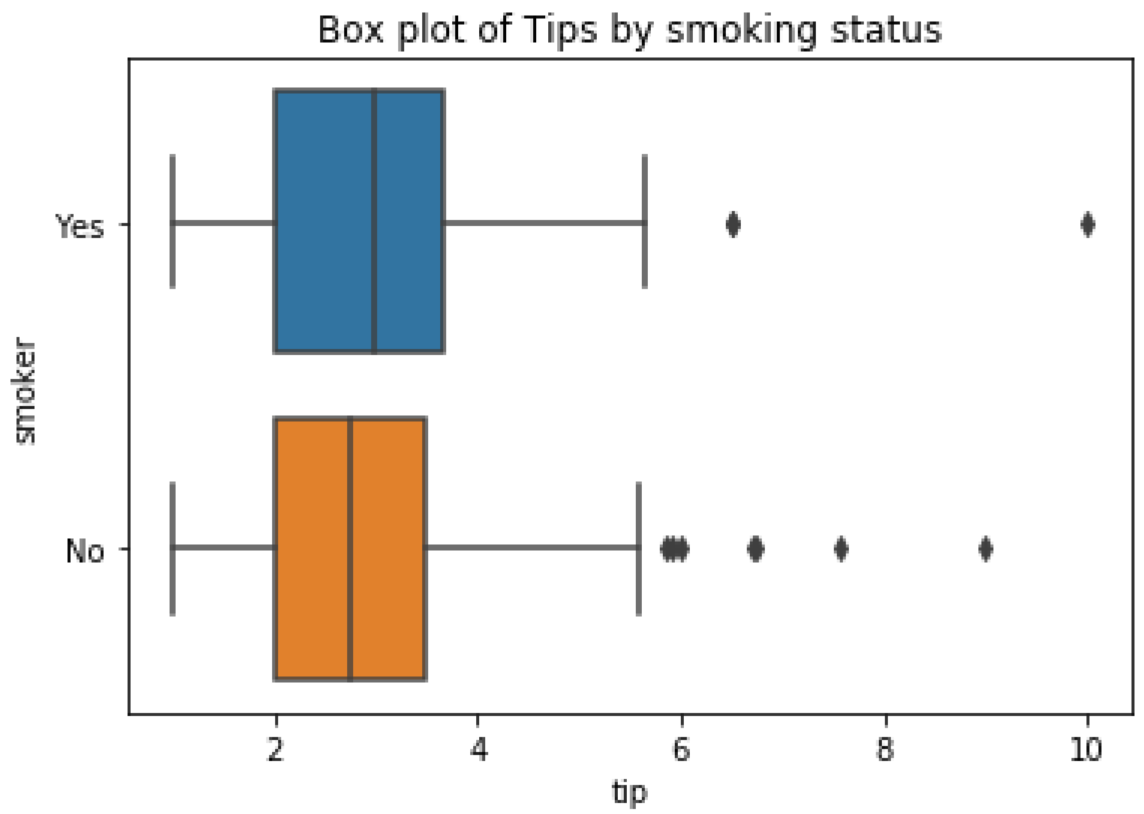
In [9]:
```
# Create a boxplot of the tips and total bill amounts - do not do it like this
sns.boxplot(tips_data["total_bill"])
sns.boxplot(tips_data["tip"]).set_title("Box plot of the Total Bill and Tips")
plt.show()
```



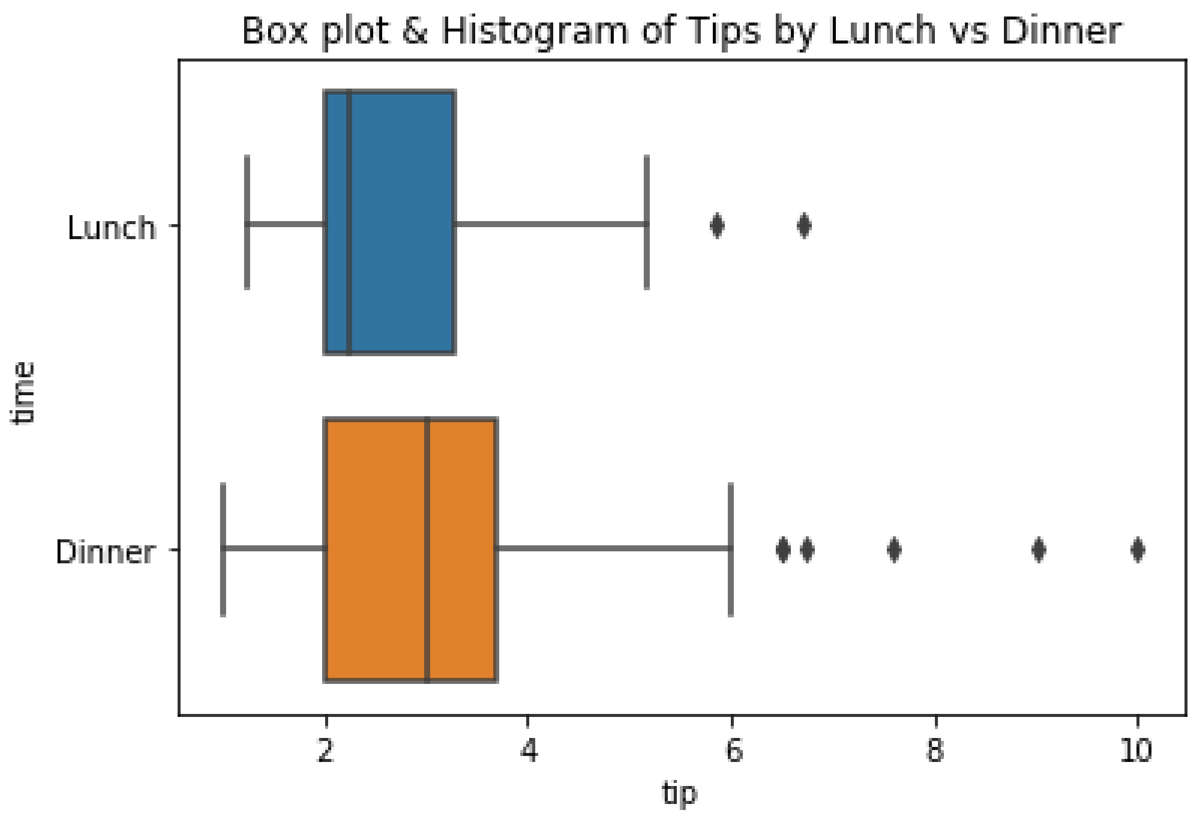
Creating Histograms and Boxplots Plotted by Groups

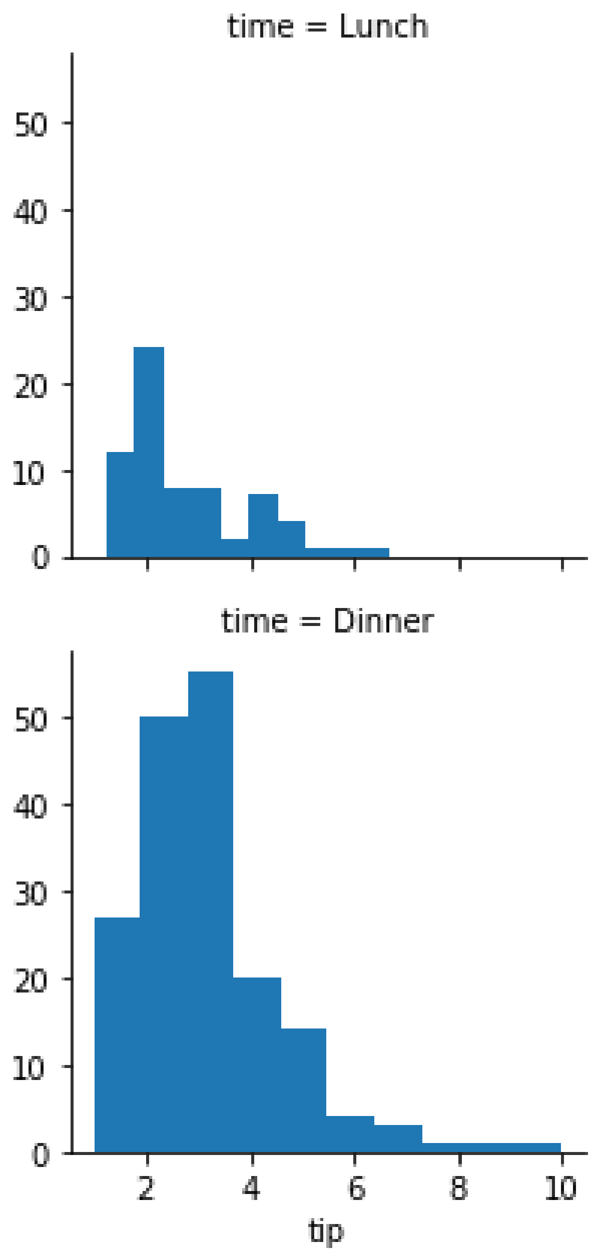
While looking at a single variable is interesting, it is often useful to see how a variable changes in response to another. Using graphs, we can see if there is a difference between the tipping amounts of smokers vs. non-smokers, if tipping varies according to the time of the day, or we can explore other trends in the data as well.

```
In [13]: # Create a boxplot and histogram of the tips grouped by smoking status
         sns.boxplot(x = tips_data["tip"], y = tips_data["smoker"]).set_title("Box plot of Tip
         s by smoking status")
         plt.show()
```

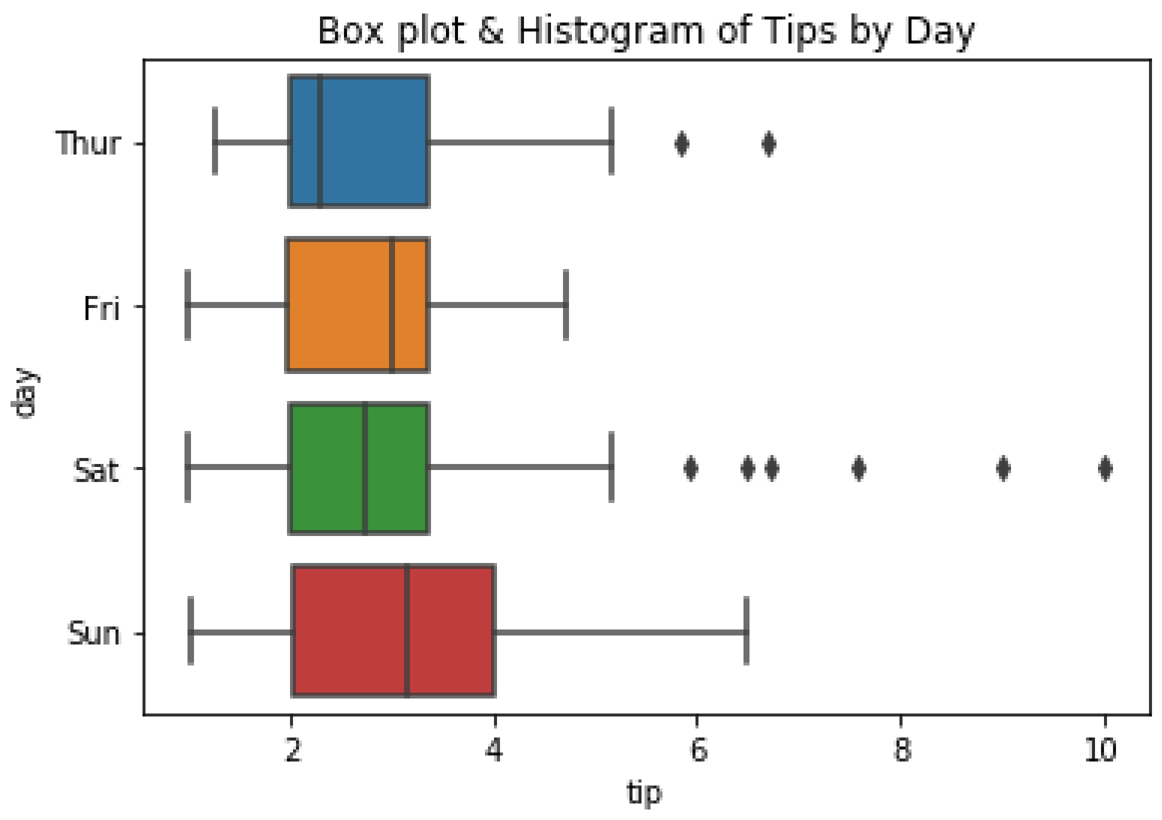


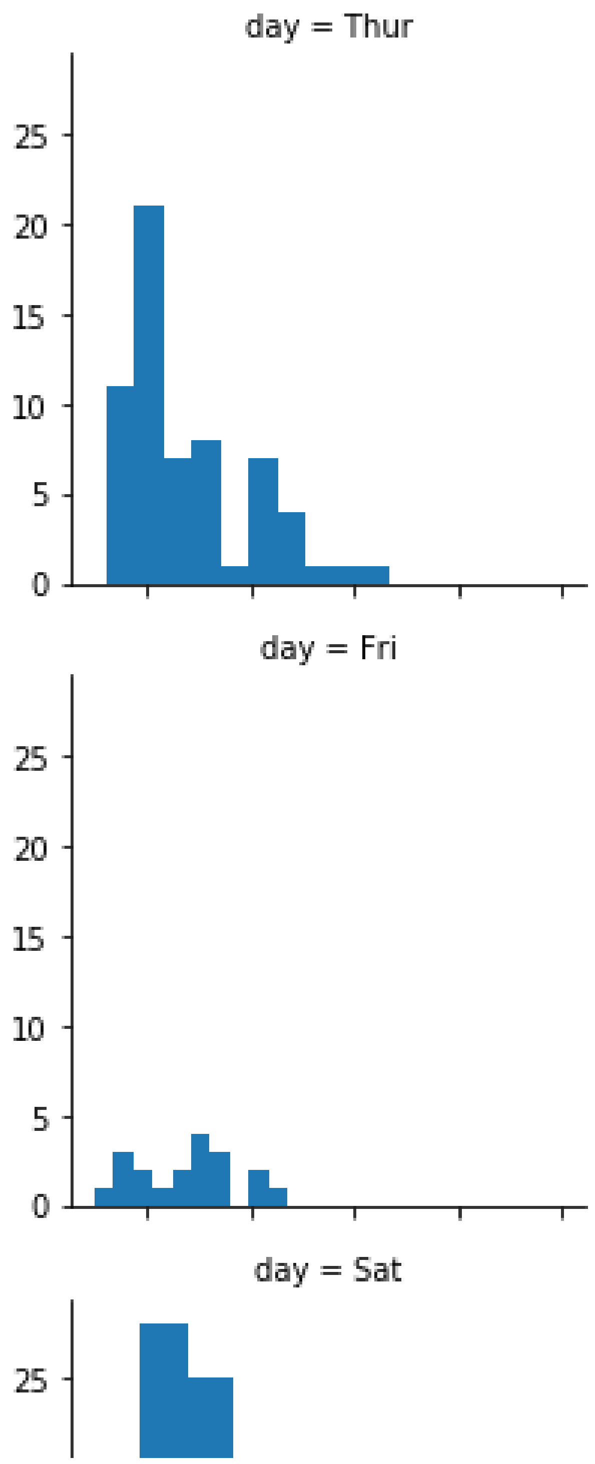
In [15]:
```
# Create a boxplot and histogram of the tips grouped by time of day
sns.boxplot(x = tips_data["tip"], y = tips_data["time"])\
            .set_title("Box plot & Histogram of Tips by Lunch vs Dinner")

g = sns.FacetGrid(tips_data, row = "time")
g = g.map(plt.hist, "tip")
plt.show()
```

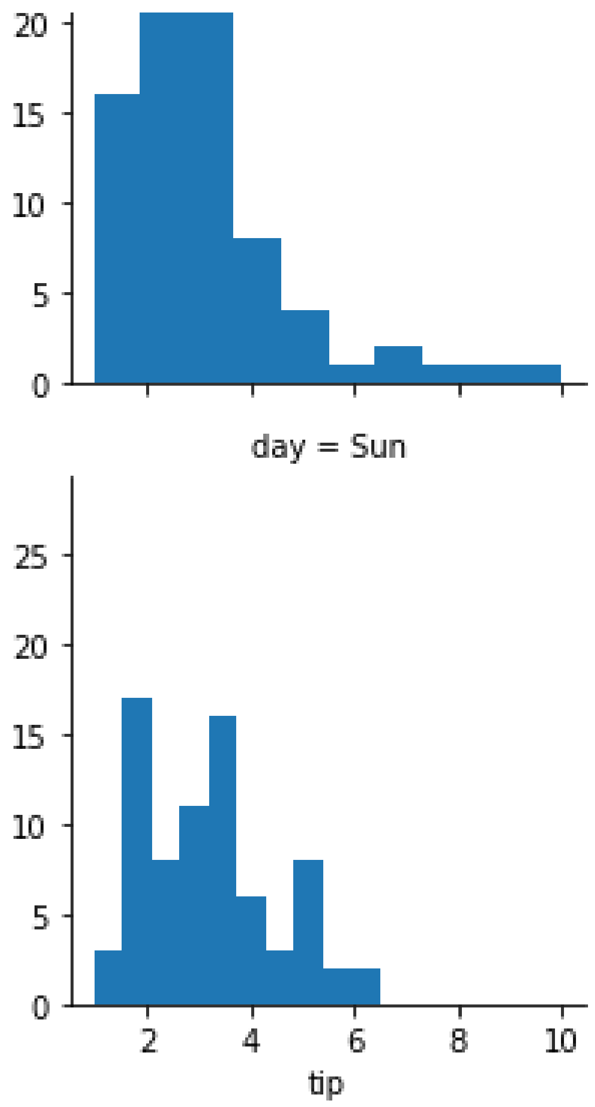

Box plot & Histogram of Tips by Lunch vs Dinner
Lunch
Dinner
time
2
4
6
8
10
tip


time = Lunch
time = Dinner
0
10
20
30
40
50
2
4
6
8
10
tip

In [16]:
```
# Create a boxplot and histogram of the tips grouped by the day
sns.boxplot(x = tips_data["tip"], y = tips_data["day"]).set_title("Box plot & Histogr
am of Tips by Day")

g = sns.FacetGrid(tips_data, row = "day")
g = g.map(plt.hist, "tip")
plt.show()
```


Box plot & Histogram of Tips by Day
Thur
Fri
Sat
Sun
day
2
4
6
8
10
tip


day = Thur
25
20
15
10
5
0
day = Fri
25
20
15
10
5
0
day = Sat
25



day = Sun
tip