

```
In [ ]: import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import seaborn as sns
```

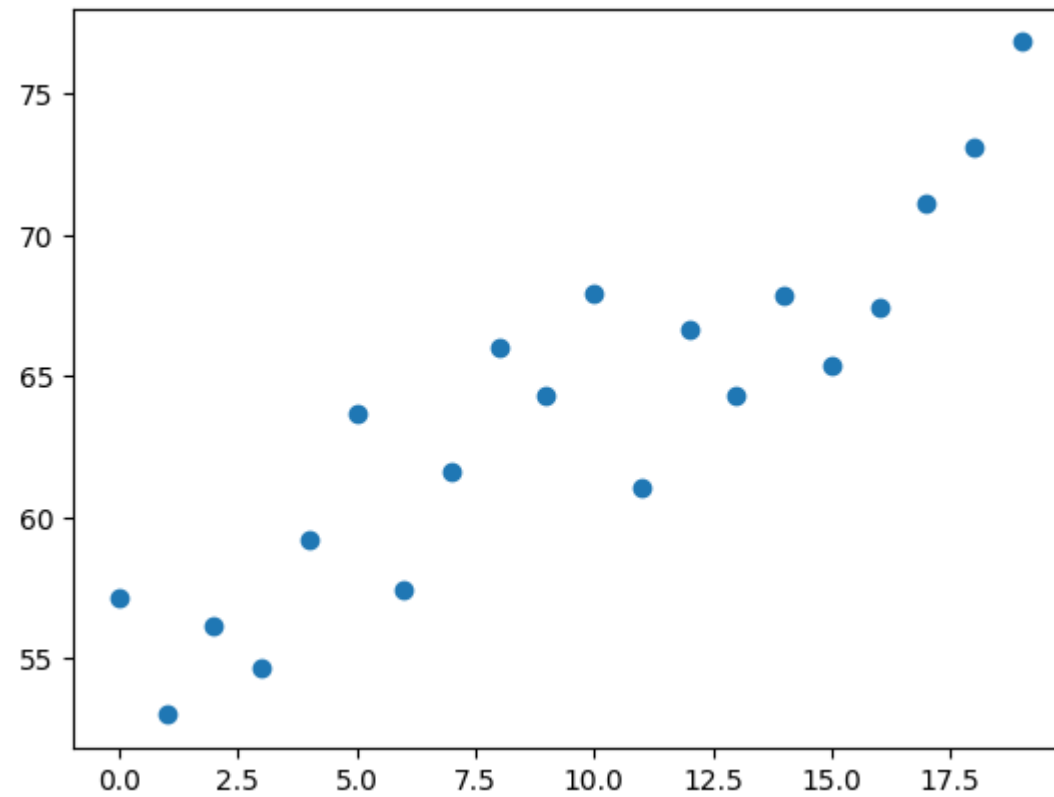
```
In [ ]: data = pd.read_csv('tips.csv')
data.head()
```

```
Out[ ]:
```

	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

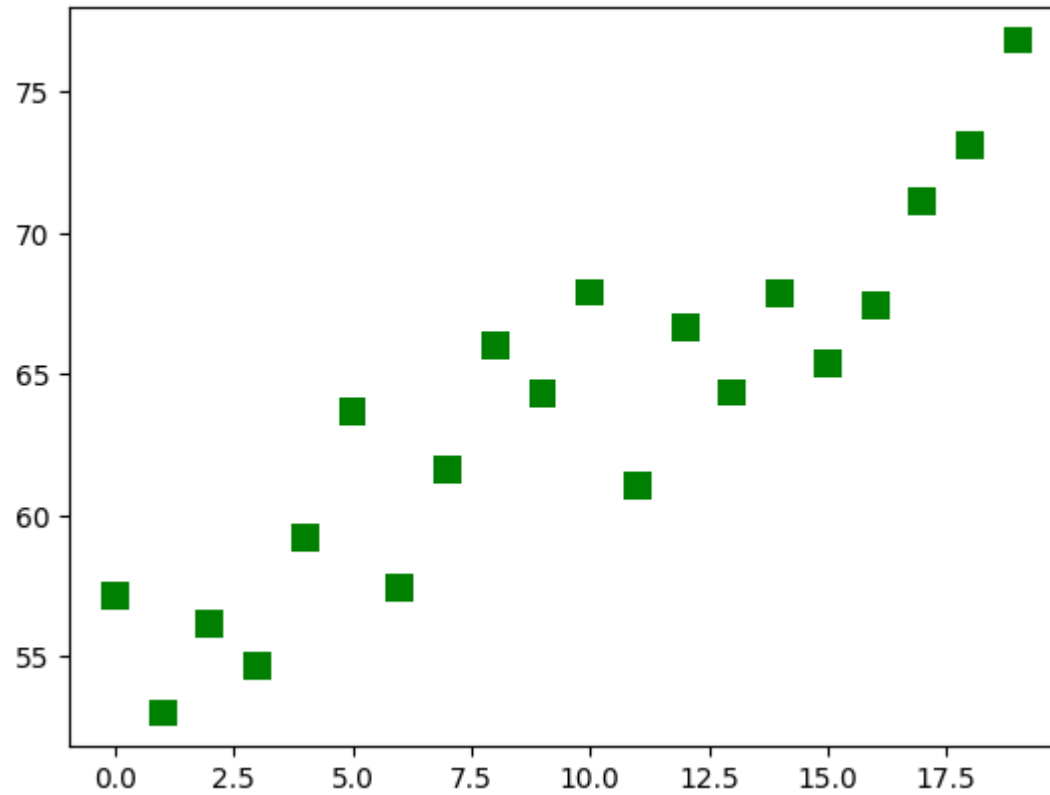
```
In [ ]: x = range(20)
y = np.arange(50, 70) + (np.random.random(20) * 10)

plt.figure()
plt.scatter(x, y)
plt.show()
```



```
In [ ]: plt.scatter(x,y,c='green',s=100,marker='s',edgecolor='none')
```

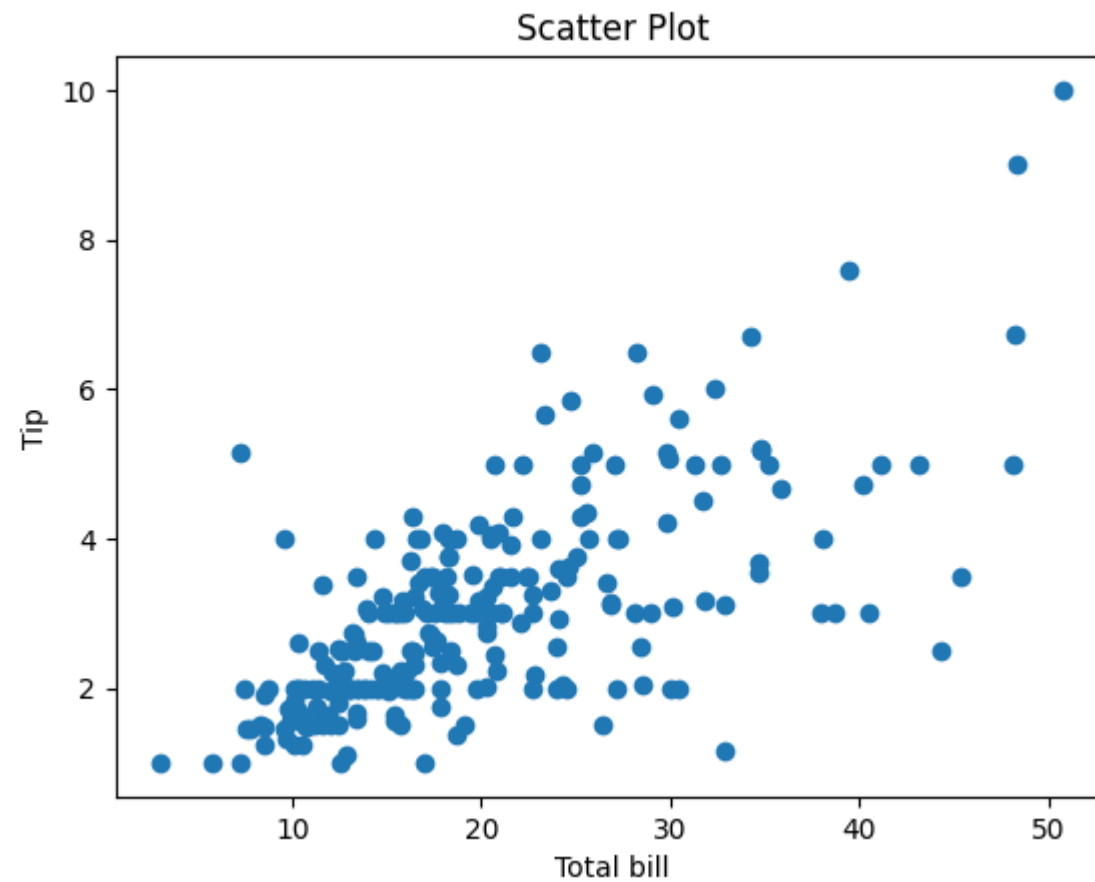
```
Out[ ]: <matplotlib.collections.PathCollection at 0x19e3d436b10>
```



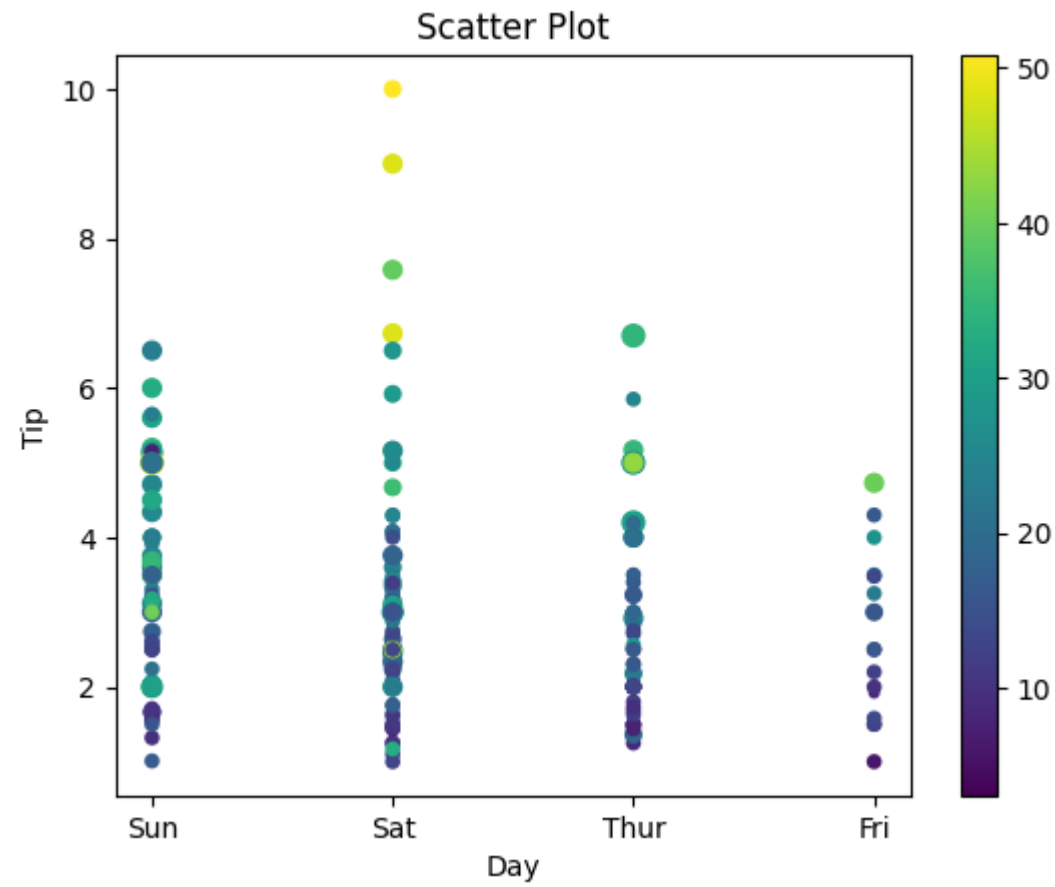
```
In [ ]: plt.scatter(data['total_bill'], data['tip'])

plt.title("Scatter Plot")
plt.xlabel('Total bill')
plt.ylabel('Tip')

plt.show()
```

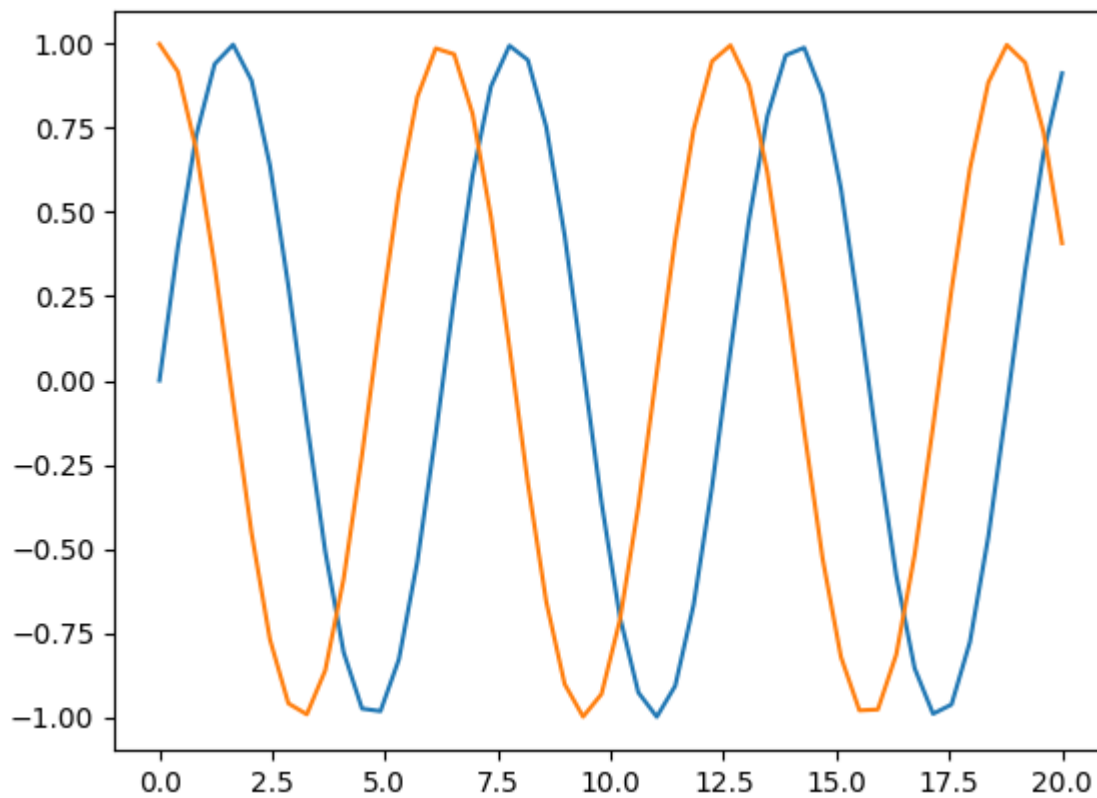


```
In [ ]: plt.scatter(data['day'], data['tip'], s=data['size']*10, c=data['total_bill'])  
# Adding Title to the Plot  
plt.title("Scatter Plot")  
plt.xlabel('Day')  
plt.ylabel('Tip')  
  
plt.colorbar()  
plt.show()
```



```
In [ ]: x = np.linspace(0, 20)
y1 = np.sin(x)
y2 = np.cos(x)

plt.plot(x, y1)
plt.plot(x, y2)
plt.show()
```

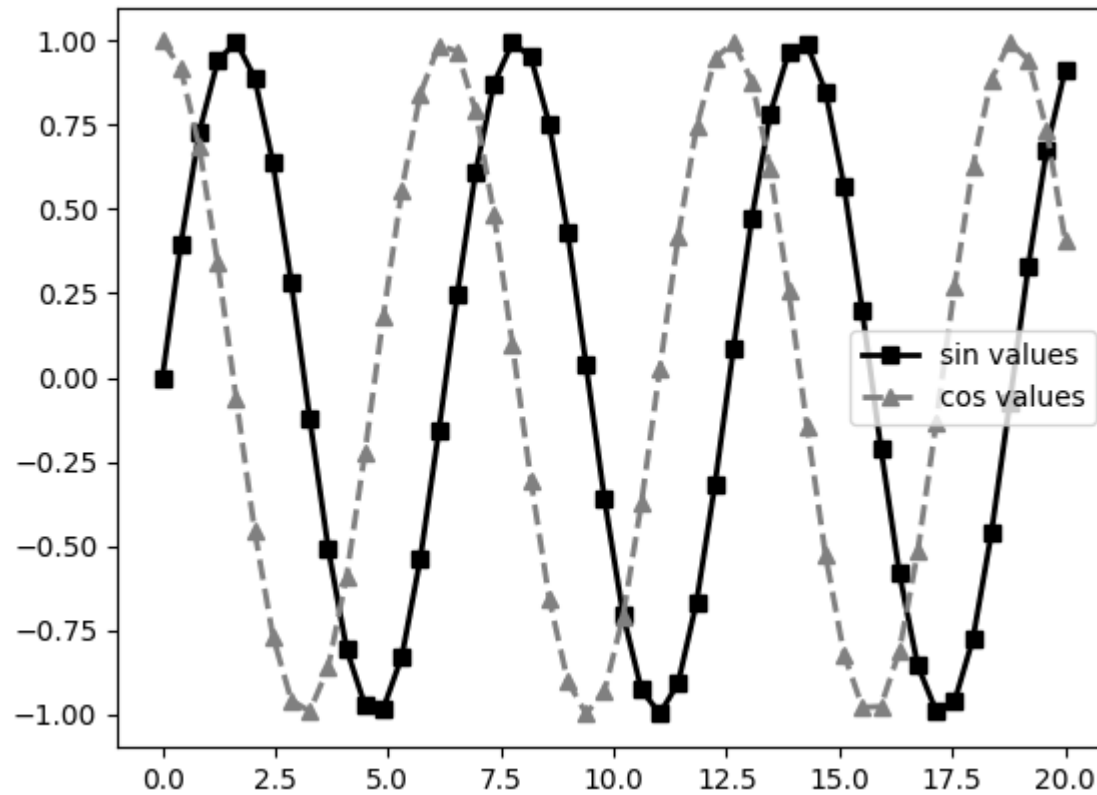


```
In [ ]: x = np.linspace(0, 20)
y1 = np.sin(x)
y2 = np.cos(x)
# plot
plt.figure()
plt.plot(x, y1,
         color='black',
         linestyle='--',
         linewidth=2,
         marker='s',
         markersize=6,
         label='sin values')

plt.plot(x, y2,
         color='gray',
```

```
linestyle='--',  
linewidth=2,  
marker='^',  
markersize=6,  
label='cos values')
```

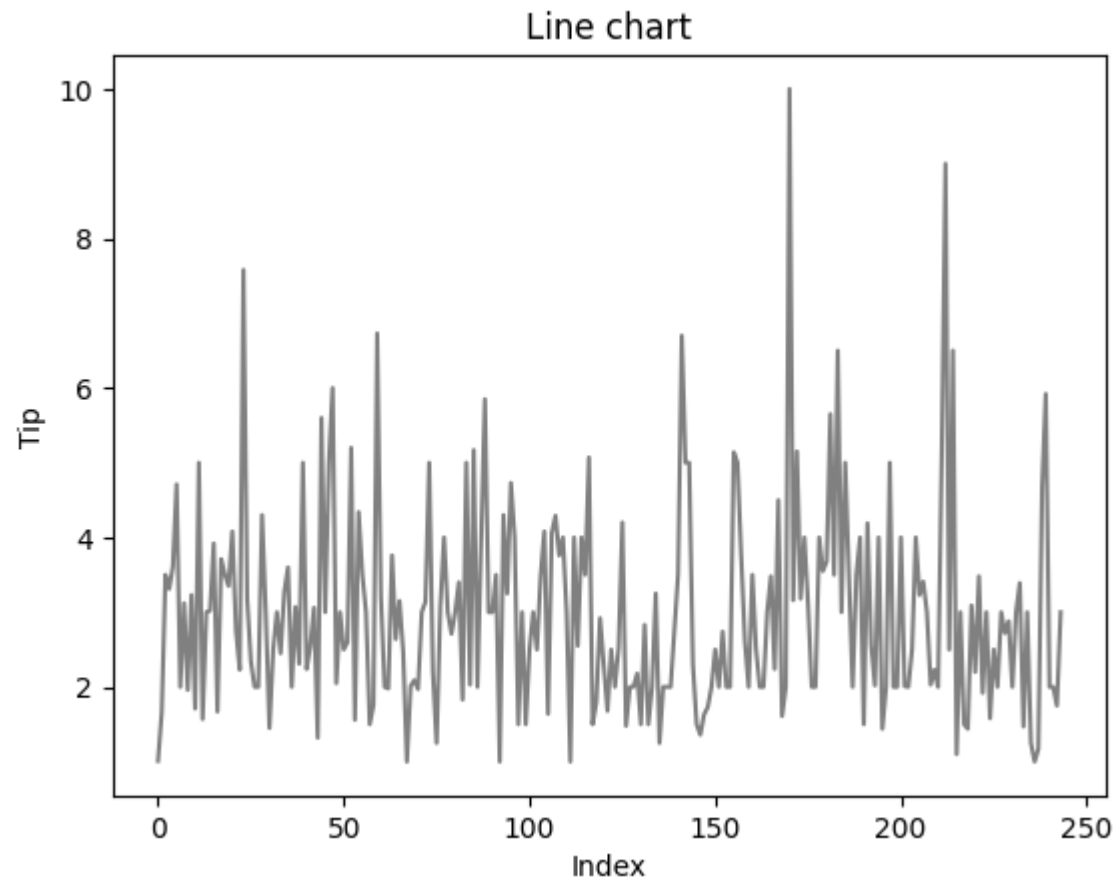
```
plt.legend()  
plt.show()
```



```
In [ ]: plt.plot(data['tip'], color='gray')
```

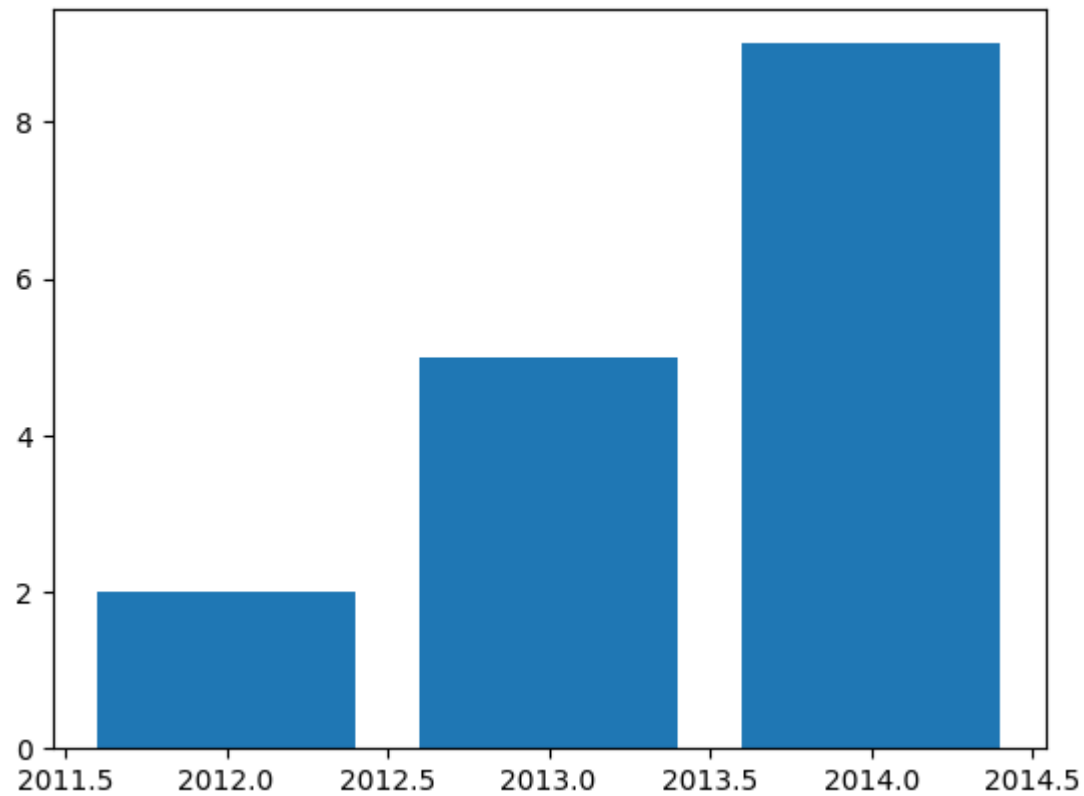
```
plt.title("Line chart")  
plt.xlabel('Index')  
plt.ylabel('Tip')
```

```
plt.show()
```



```
In [ ]: years = np.arange(2012, 2015)
values = [2, 5, 9]
plt.figure()
plt.bar(years, values)
plt.show()
```

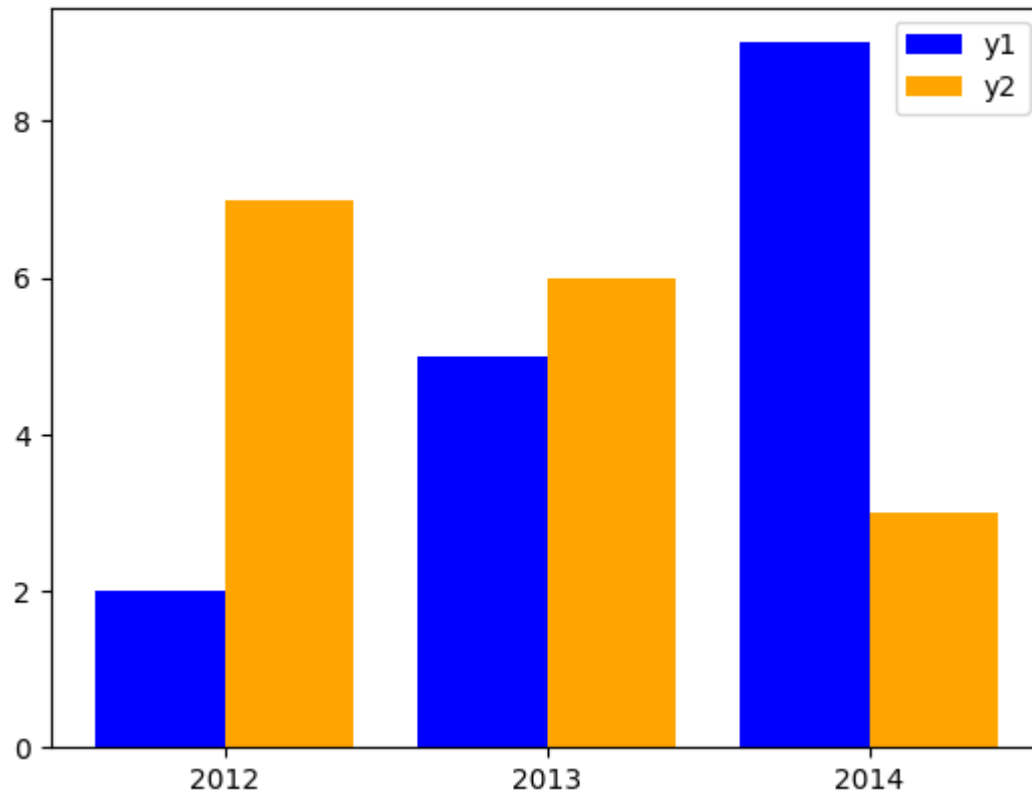




```
In [ ]: years = np.arange(2012, 2015)
category1_values = [2, 5, 9]
category2_values = [7, 6, 3]
plt.figure()
plt.bar(years - 0.2,
        category1_values,
        color='blue',
        edgecolor='none',
        width=0.4,
        align='center',
        label='y1')

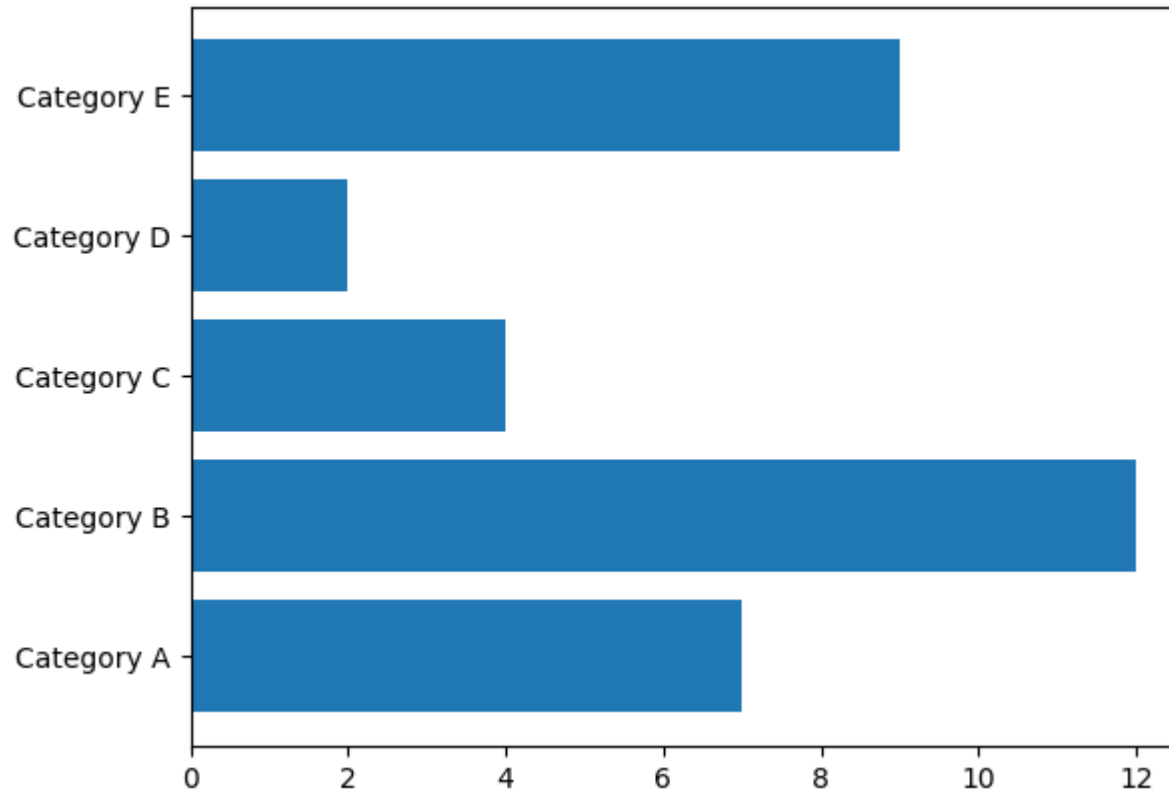
plt.bar(years + 0.2,
        category2_values,
        color='orange',
```

```
edgecolor='none',  
width=0.4,  
align='center',  
label='y2')  
  
plt.xticks(years, [str(year) for year in years])  
plt.legend()  
plt.show()
```



```
In [ ]: categories = ['A', 'B', 'C', 'D', 'E']  
values = [7, 12, 4, 2, 9]  
  
plt.barh(np.arange(len(categories)), values)  
plt.yticks(np.arange(len(categories)),  
           [f'Category {x}' for x in categories])
```

```
plt.show()
```

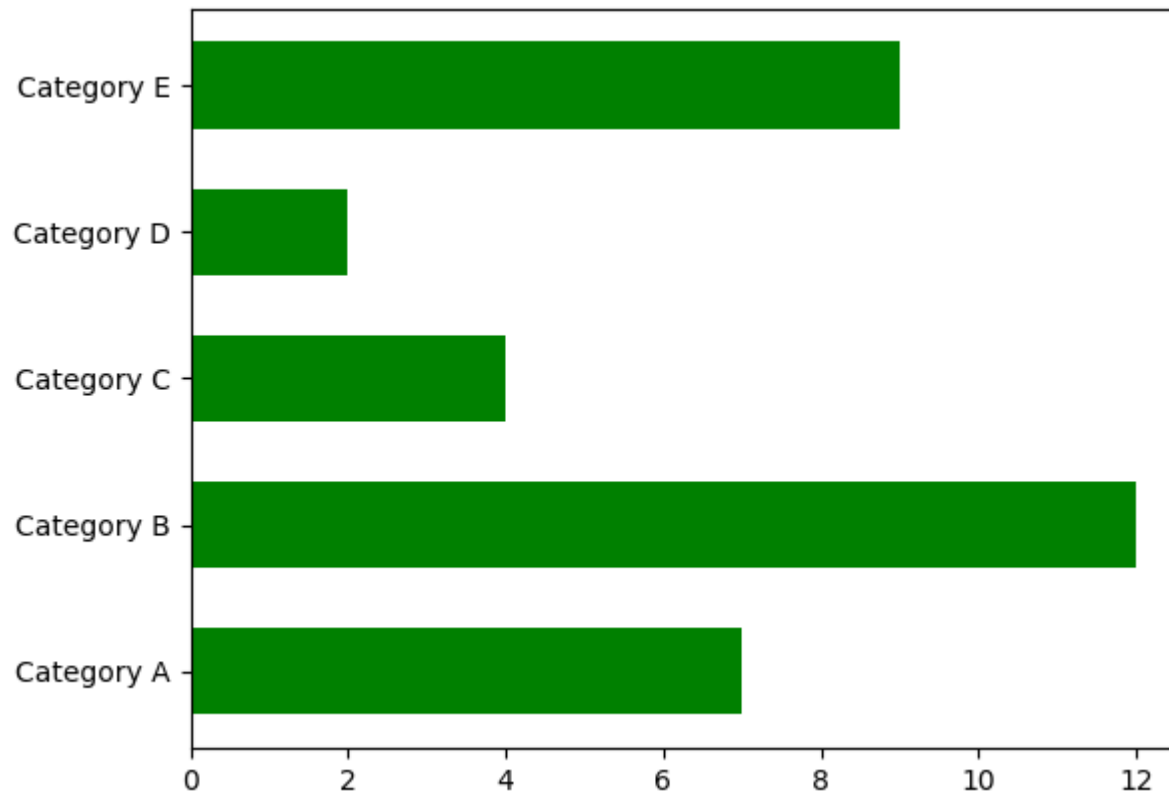


```
In [ ]: categories = ['A', 'B', 'C', 'D', 'E']
values = [7, 12, 4, 2, 9]

plt.barh(np.arange(len(categories)),
         values,
         color='green',
         edgecolor='none',
         height=0.6,
         align='center')

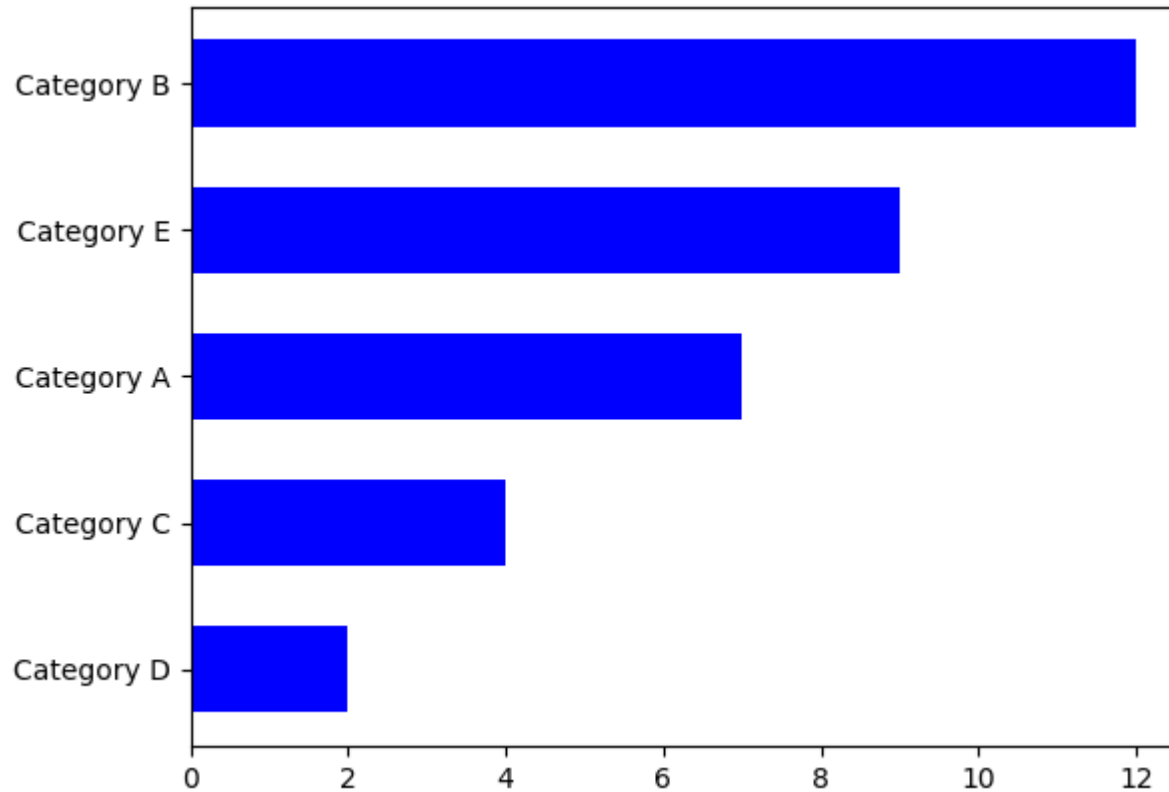
plt.yticks(np.arange(len(categories)),
```

```
['Category {}'.format(x) for x in categories])  
plt.show()
```

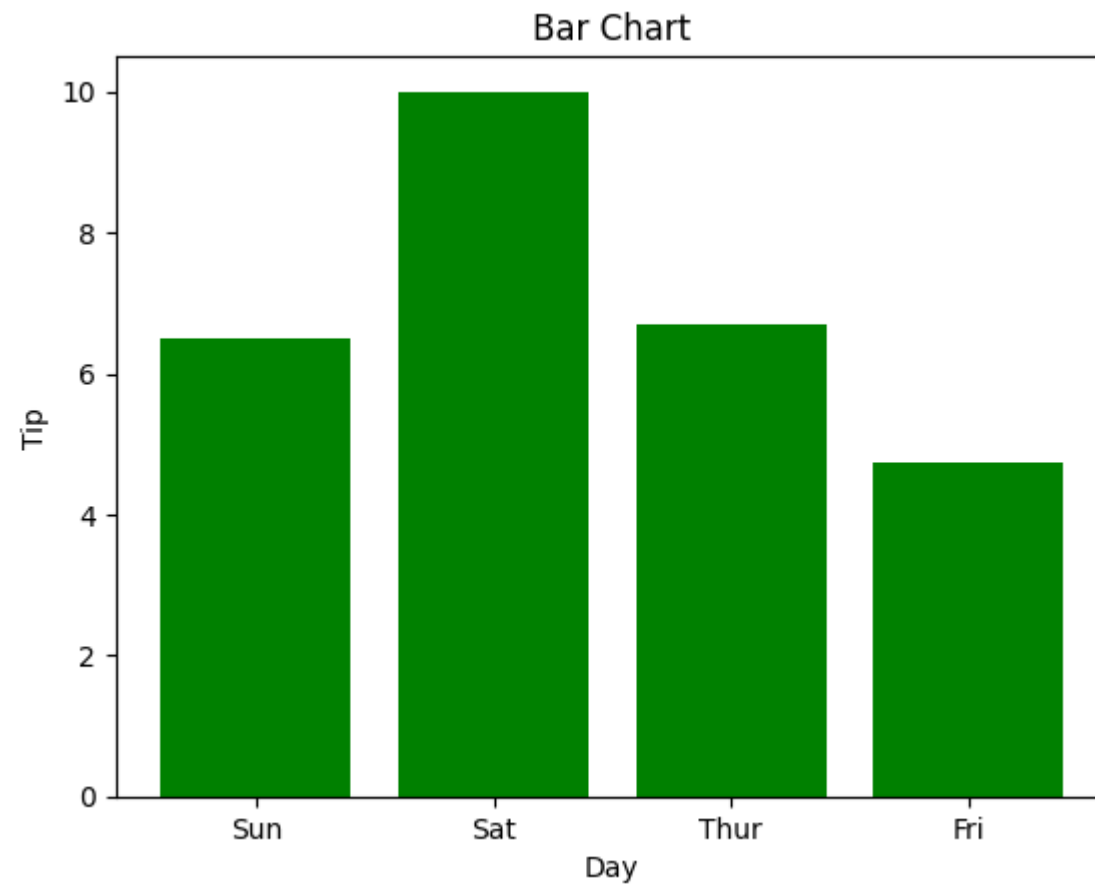


```
In [ ]: categories = ['A', 'B', 'C', 'D', 'E']  
values = [7, 12, 4, 2, 9]  
  
category_values = pd.DataFrame({'categories': categories,  
                                'values': values})  
  
category_values.sort_values(by='values', ascending=True, inplace=True)  
categories = category_values['categories'].values  
values = category_values['values'].values  
  
plt.barh(np.arange(len(categories)),  
          values,
```

```
color='blue',  
edgecolor='none',  
height=0.6,  
align='center')  
  
plt.yticks(np.arange(len(categories)),  
['Category {}'.format(x) for x in categories])  
plt.show()
```



```
In [ ]: plt.bar(data['day'], data['tip'], color='green')  
plt.title("Bar Chart")  
# Setting the X and Y labels  
plt.xlabel('Day')  
plt.ylabel('Tip')  
plt.show()
```



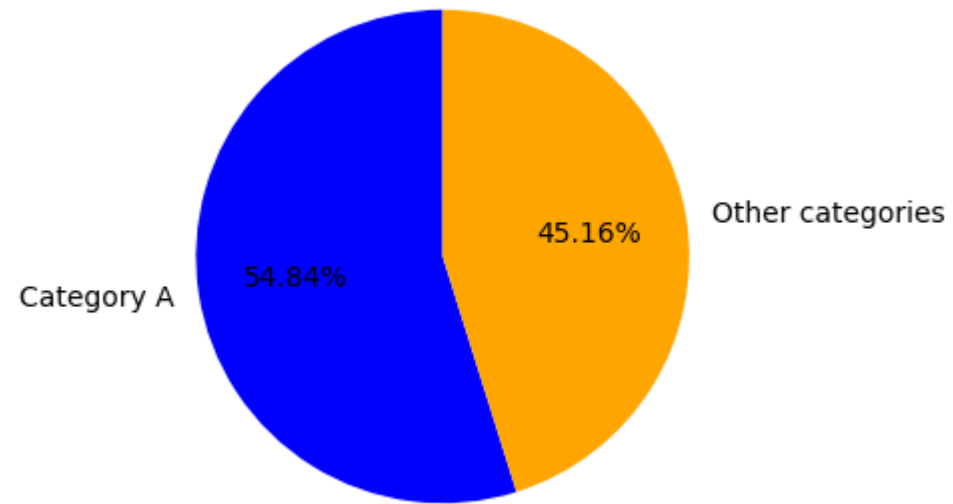
```
In [ ]: counts = [17, 14]
plt.figure(figsize=(4, 4))
plt.pie(counts)
plt.show()
```



```
In [ ]: counts = [17, 14]
plt.figure(figsize=(4, 4))

plt.pie(counts,
        colors=['blue', 'orange'],
        labels=['Category A', 'Other categories'],
        startangle=90,
        autopct='%1.2f%%')

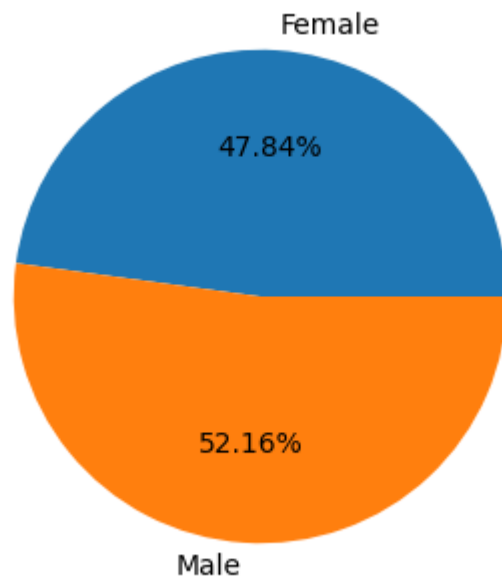
plt.show()
```



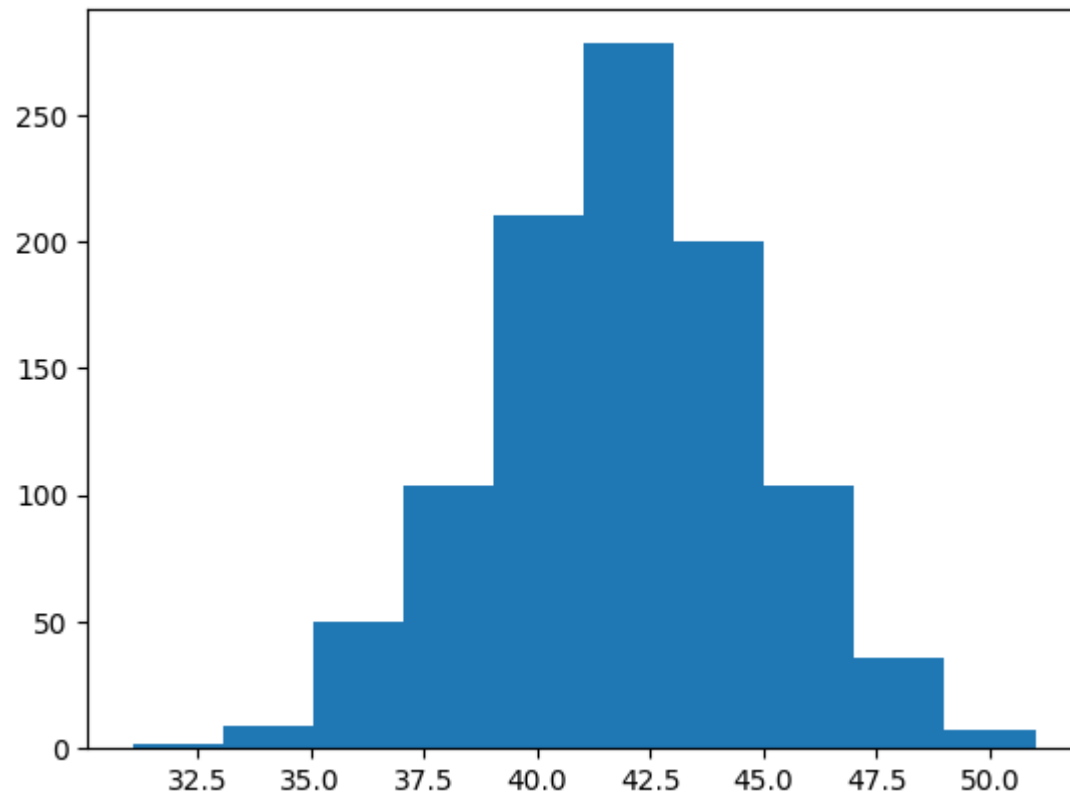
```
In [ ]: grp_data = data.groupby('sex').tip.mean().reset_index()
print(grp_data)
plt.figure(figsize=(4, 4))
plt.pie(grp_data.tip, labels=grp_data.sex, autopct='%1.2f%%')
plt.show()
```

	sex	tip
0	Female	2.833448
1	Male	3.089618



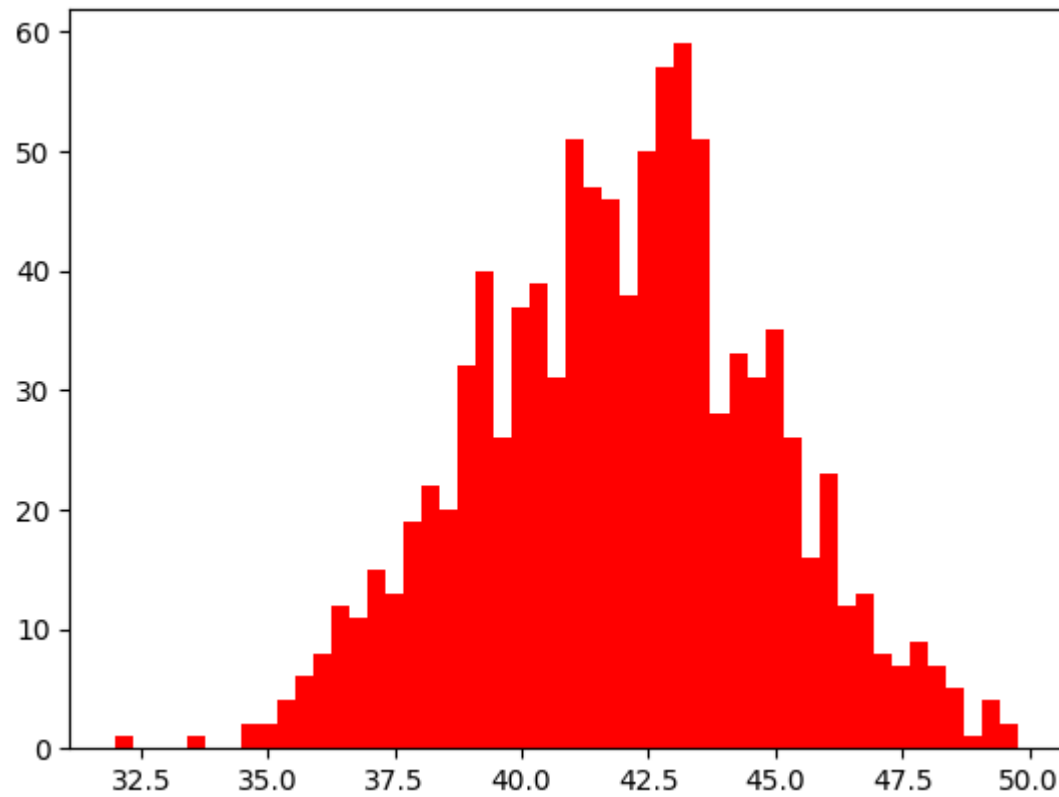


```
In [ ]: column_data = np.random.normal(42, 3, 1000)
plt.figure()
plt.hist(column_data)
plt.show()
```

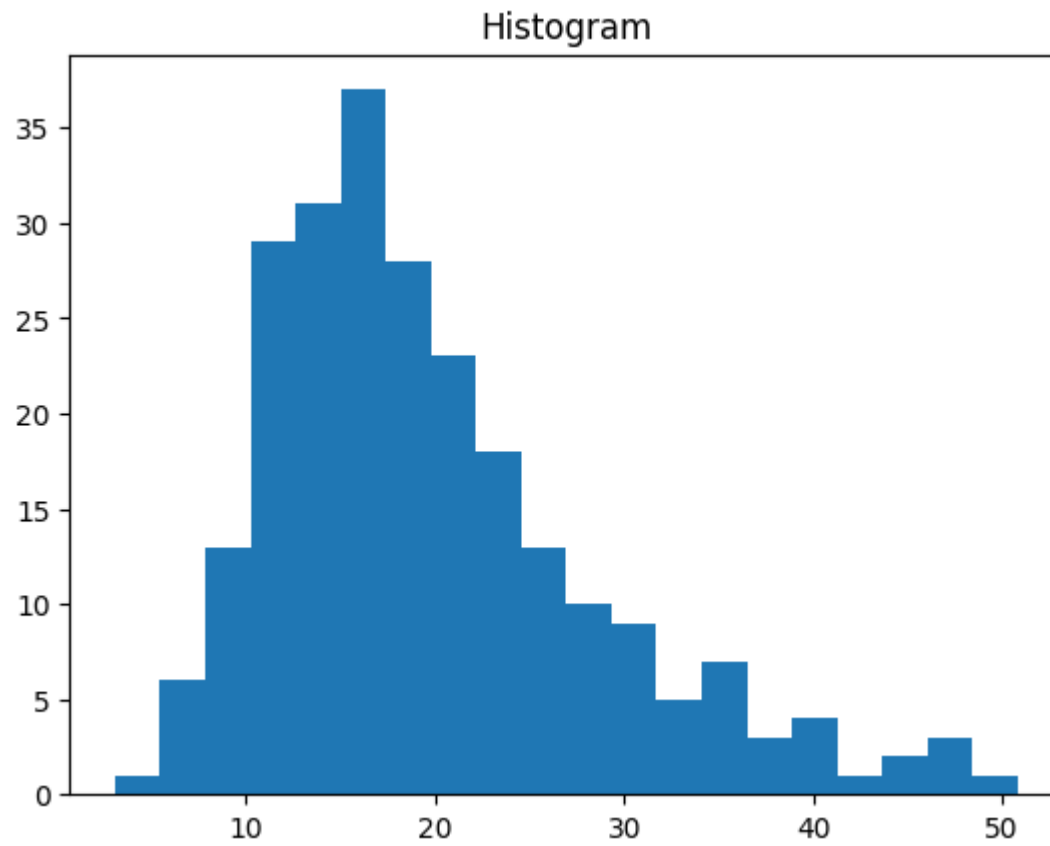


```
In [ ]: column_data = np.random.normal(42, 3, 1000)

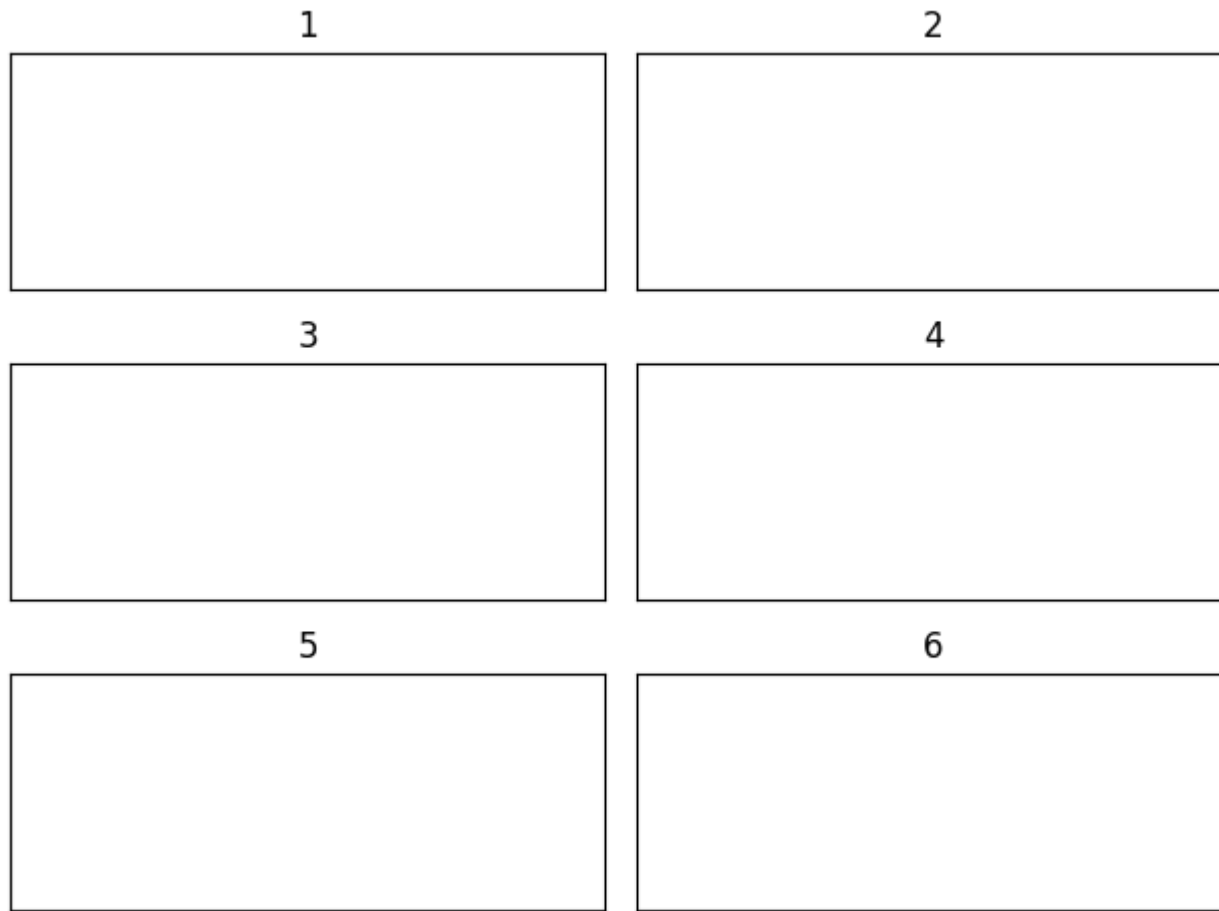
plt.hist(column_data,
         color='red',
         bins=50)
plt.show()
```



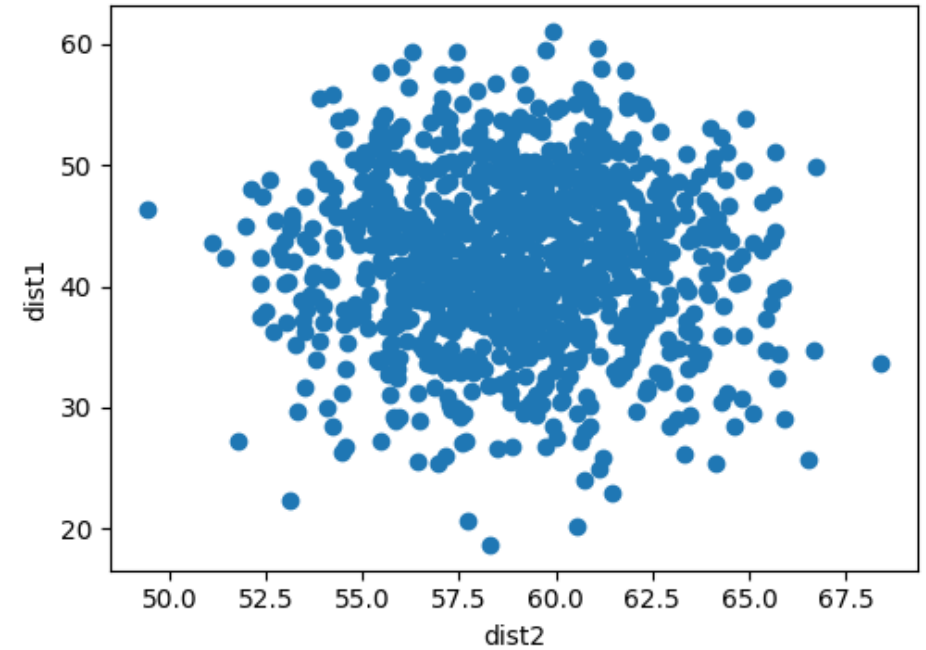
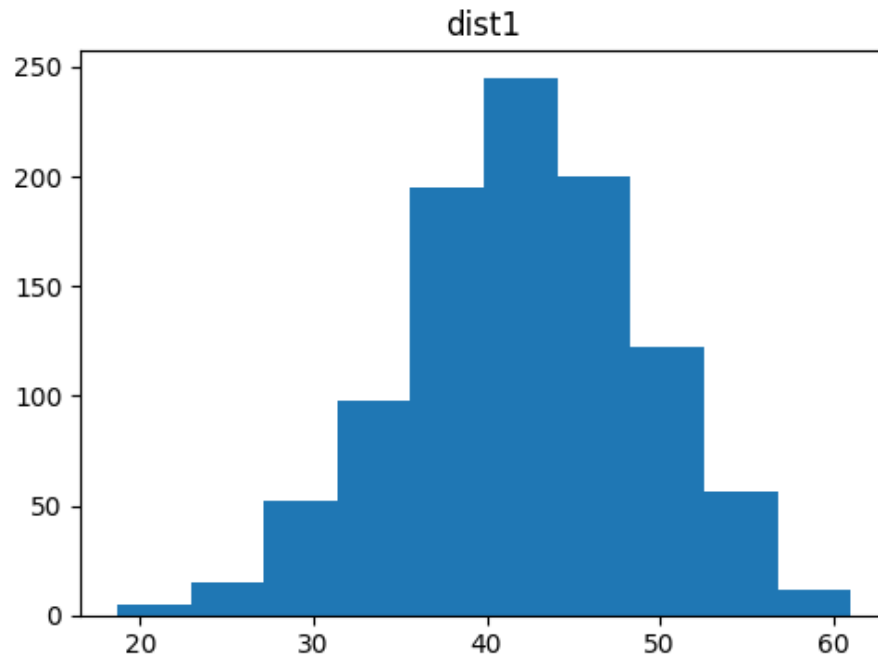
```
In [ ]: plt.hist(data['total_bill'], bins=20)
plt.title("Histogram")
# Adding the Legends
plt.show()
```



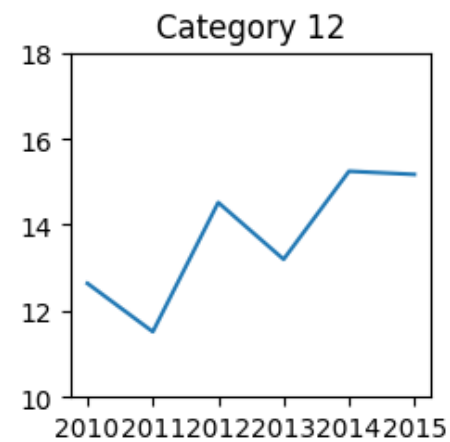
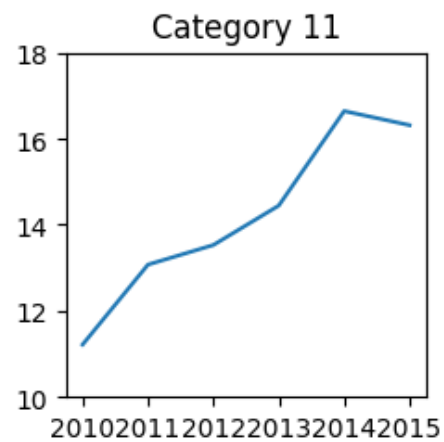
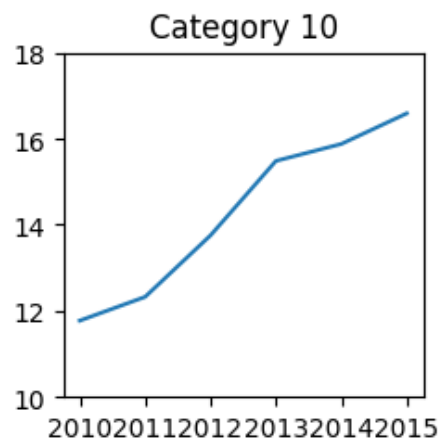
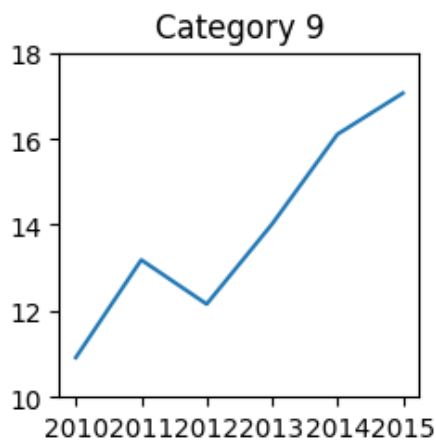
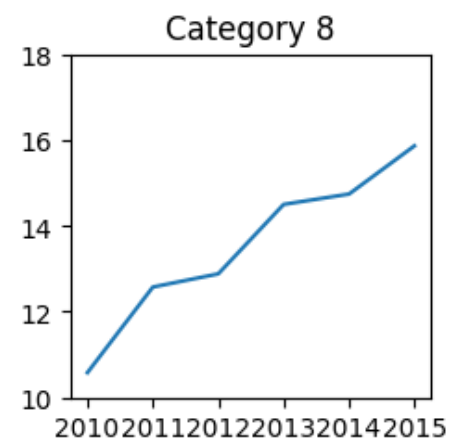
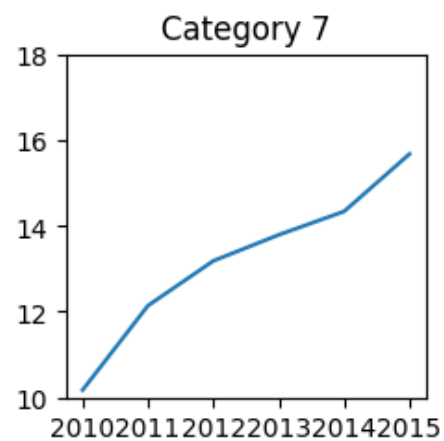
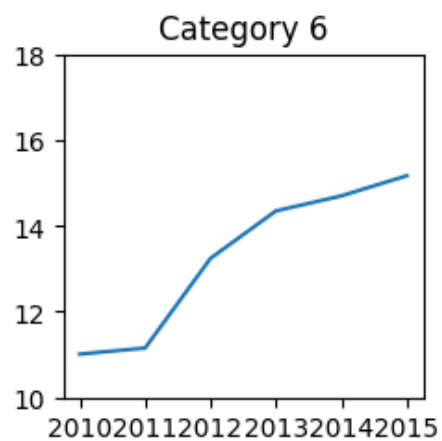
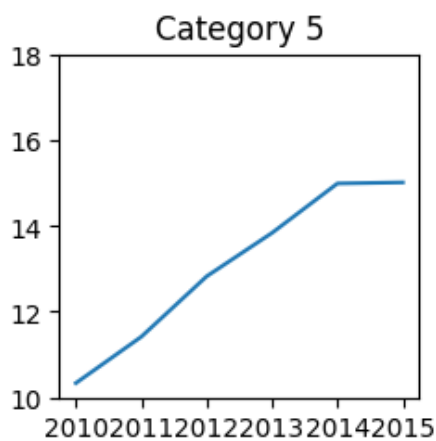
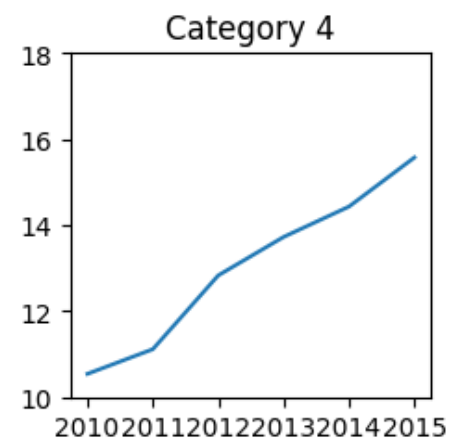
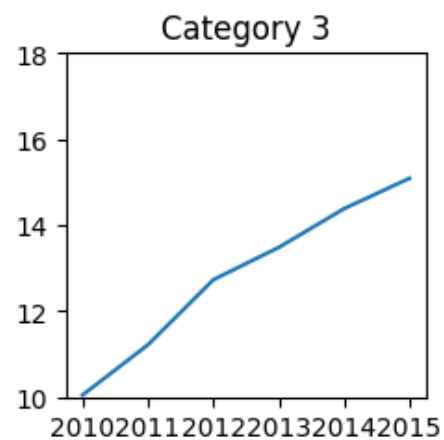
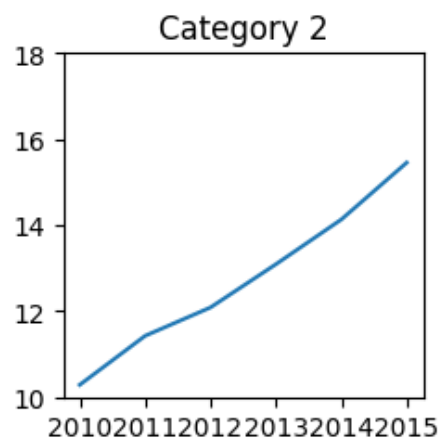
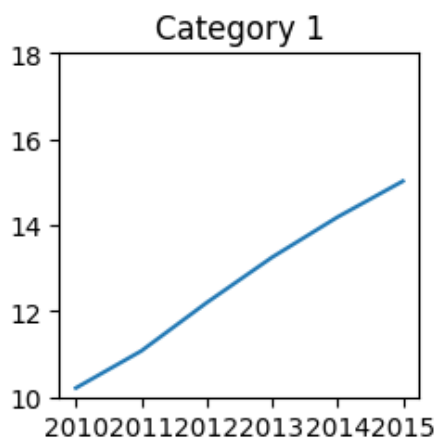
```
In [ ]: for i in range(1, 7):  
        plt.subplot(3, 2, i)  
        plt.title(i)  
        plt.xticks([])  
        plt.yticks([])  
        plt.tight_layout()
```

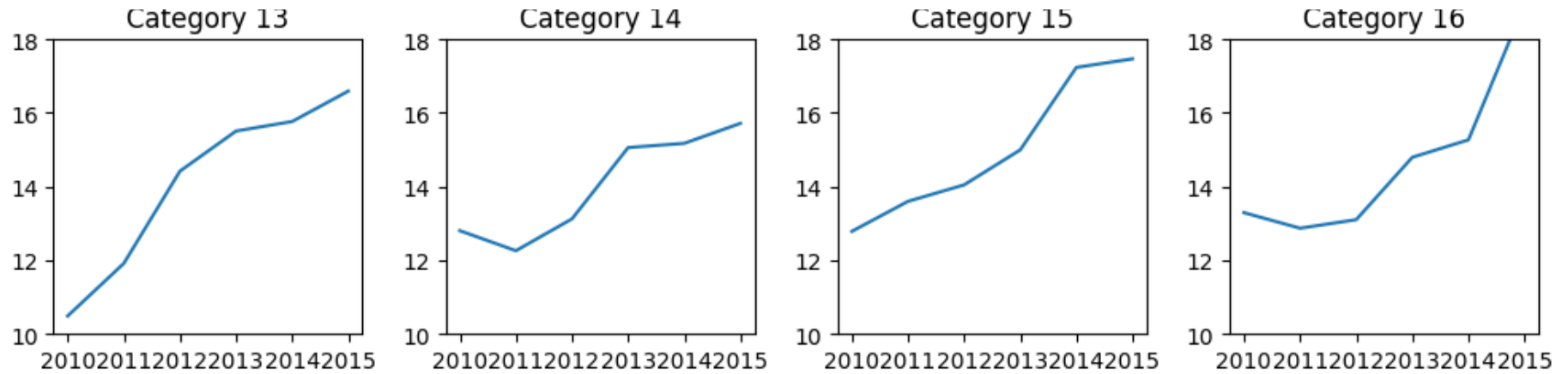


```
In [ ]: dist1 = np.random.normal(42, 7, 1000)
dist2 = np.random.normal(59, 3, 1000)
plt.figure(figsize=(10, 4))
plt.subplot(1, 2, 1)
plt.hist(dist1)
plt.title('dist1')
plt.subplot(1, 2, 2)
plt.scatter(dist2, dist1)
plt.xlabel('dist2')
plt.ylabel('dist1')
plt.tight_layout()
```



```
In [ ]: years = np.arange(2010, 2016)
plt.figure(figsize=(10, 10))
for category_num in range(1, 17):
    plt.subplot(4, 4, category_num)
    y_vals = np.arange(10, 16) + (np.random.random(6) * category_num / 4.)
    plt.plot(years, y_vals)
    plt.ylim(10, 18)
    plt.xticks(years, [str(year) for year in years])
    plt.title('Category {}'.format(category_num))
plt.tight_layout()
```

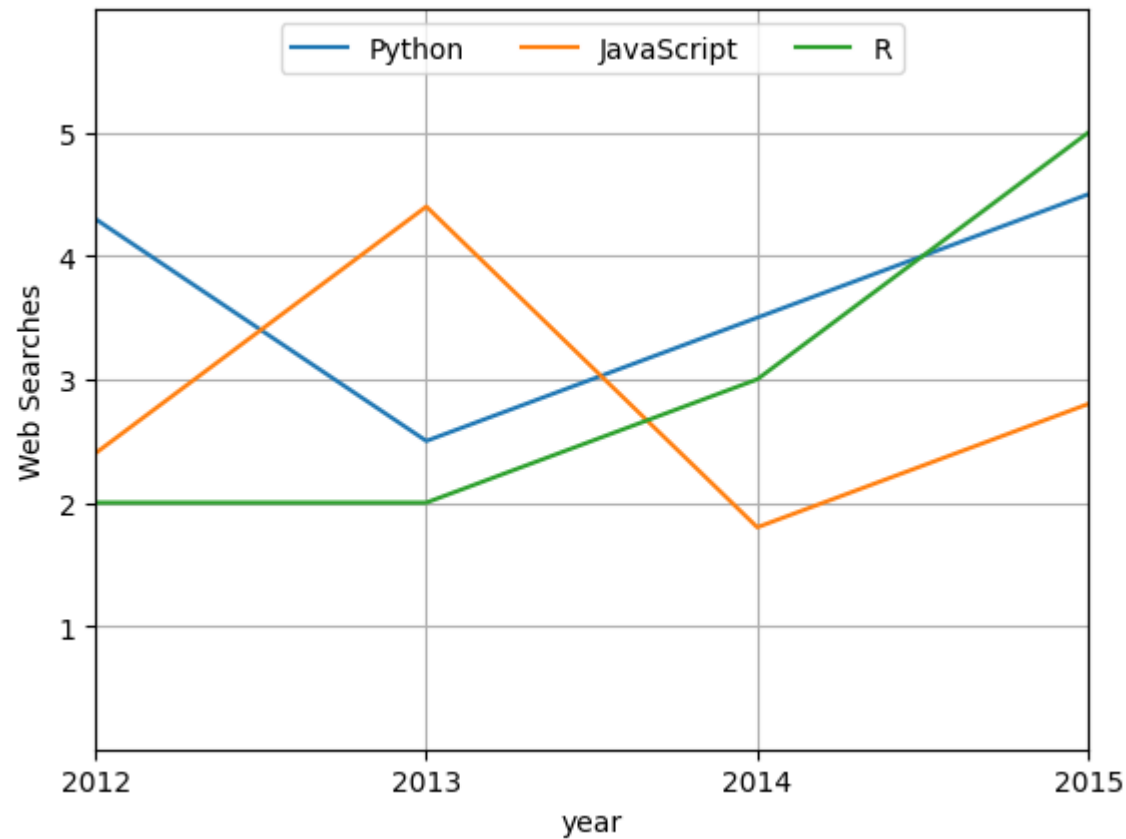




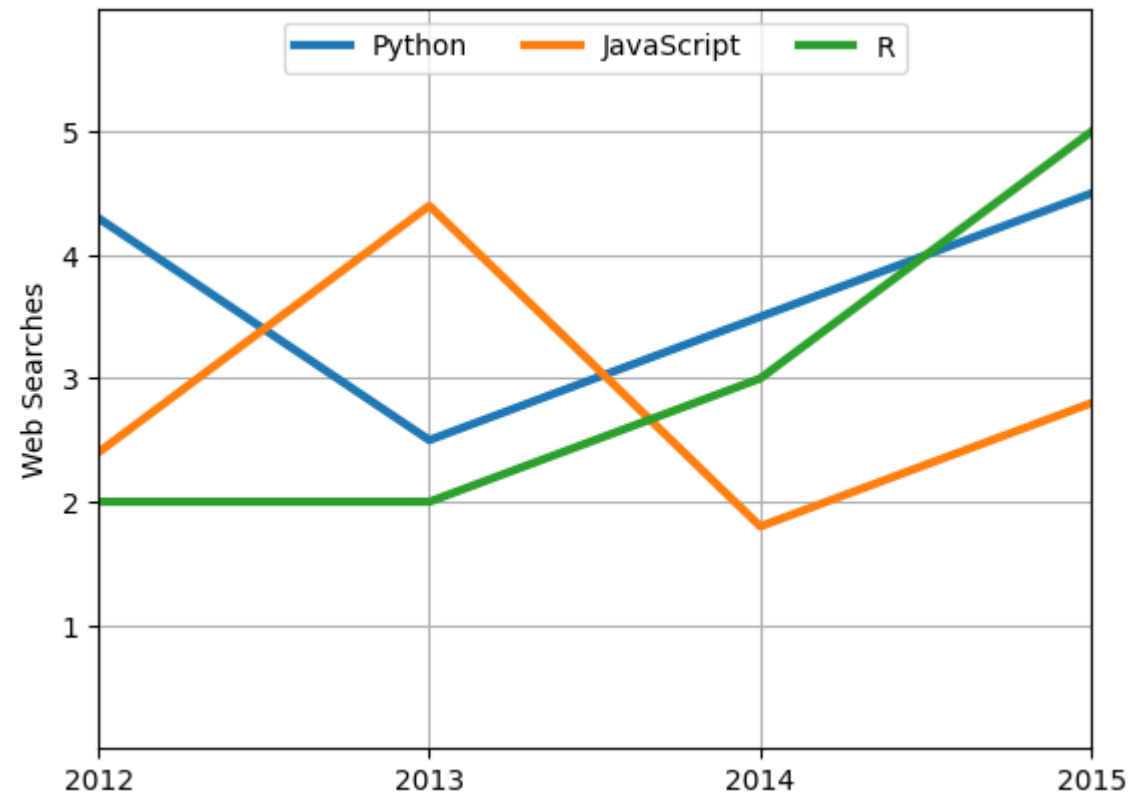
```
In [ ]: x1_values = [2012, 2013, 2014, 2015]
y1_values = [4.3, 2.5, 3.5, 4.5]
x2_values = [2012, 2013, 2014, 2015]
y2_values = [2.4, 4.4, 1.8, 2.8]
x3_values = [2012, 2013, 2014, 2015]
y3_values = [2, 2, 3, 5]

plt.figure()
plt.plot(x1_values, y1_values, label='Python')
plt.plot(x2_values, y2_values, label='JavaScript')
plt.plot(x3_values, y3_values, label='R')
plt.xlim(2012, 2015)
plt.ylim(0, 6)
plt.xticks([2012, 2013, 2014, 2015], ['2012', '2013', '2014', '2015'])
plt.yticks([1, 2, 3, 4, 5])
plt.xlabel('year')
plt.ylabel('Web Searches')
plt.legend(loc='upper center', ncol=3)
plt.grid(True)
plt.savefig('web-searches.png', dpi=150)
```





```
In [ ]: plt.figure()
plt.plot(x1_values, y1_values, label='Python', lw=3, color='#1f77b4')
plt.plot(x2_values, y2_values, label='JavaScript', lw=3, color='#ff7f0e')
plt.plot(x3_values, y3_values, label='R', lw=3, color='#2ca02c')
plt.xlim(2012, 2015)
plt.ylim(0, 6)
plt.xticks([2012, 2013, 2014, 2015], ['2012', '2013', '2014', '2015'])
plt.yticks([1, 2, 3, 4, 5])
plt.xlabel('')
plt.ylabel('Web Searches')
plt.legend(loc='upper center', ncol=3)
# plt.legend(loc='lower center', ncol=3)
plt.grid(True)
plt.savefig('web-searches.png', dpi=150)
```



```
In [ ]: df = pd.read_csv('tips.csv')  
df
```

Out[ ]:

	total_bill	tip	sex	smoker	day	time	size
<b>0</b>	16.99	1.01	Female	No	Sun	Dinner	2
<b>1</b>	10.34	1.66	Male	No	Sun	Dinner	3
<b>2</b>	21.01	3.50	Male	No	Sun	Dinner	3
<b>3</b>	23.68	3.31	Male	No	Sun	Dinner	2
<b>4</b>	24.59	3.61	Female	No	Sun	Dinner	4
...	...	...	...	...	...	...	...
<b>239</b>	29.03	5.92	Male	No	Sat	Dinner	3
<b>240</b>	27.18	2.00	Female	Yes	Sat	Dinner	2
<b>241</b>	22.67	2.00	Male	Yes	Sat	Dinner	2
<b>242</b>	17.82	1.75	Male	No	Sat	Dinner	2
<b>243</b>	18.78	3.00	Female	No	Thur	Dinner	2

244 rows × 7 columns

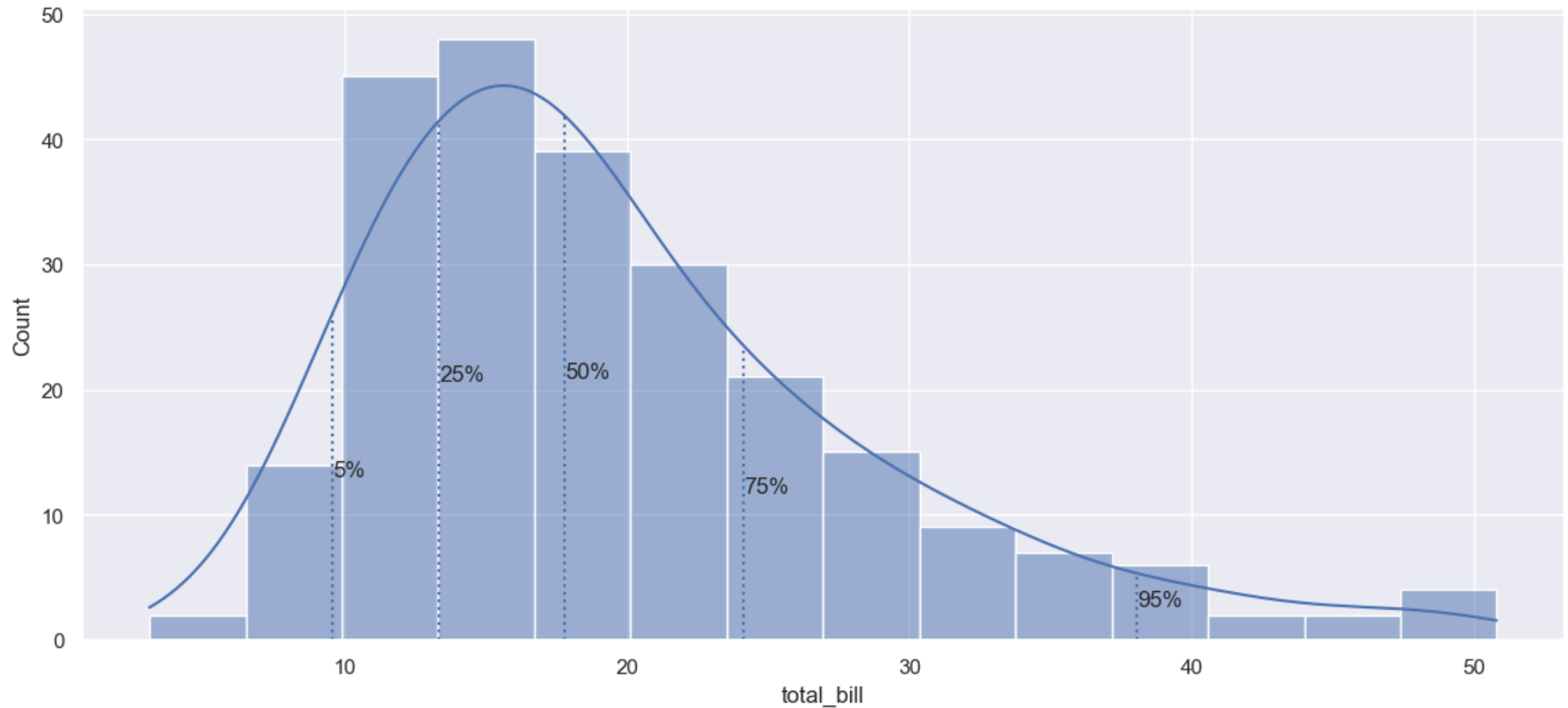
```

In [ ]: sns.set(rc = {'figure.figsize':(14, 6)})
ax = sns.histplot(x = data['total_bill'], kde=True)
quant_5 = data['total_bill'].quantile(0.05)
quant_25 = data['total_bill'].quantile(0.25)
quant_50 = data['total_bill'].quantile(0.5)
quant_75 = data['total_bill'].quantile(0.75)
quant_95 = data['total_bill'].quantile(0.95)
quant_dict = {'5%': quant_5, '25%': quant_25, '50%': quant_50, '75%': quant_75, '95%': quant_95}
kdeline = ax.lines[0]
xs = kdeline.get_xdata()
ys = kdeline.get_ydata()
for key, value in quant_dict.items():
    height = np.interp(value, xs, ys)
    ax.vlines(value, 0, height, ls=':')

```

```
ax.text(value , height * 0.5, key, rotation=0)
plt.show()
```

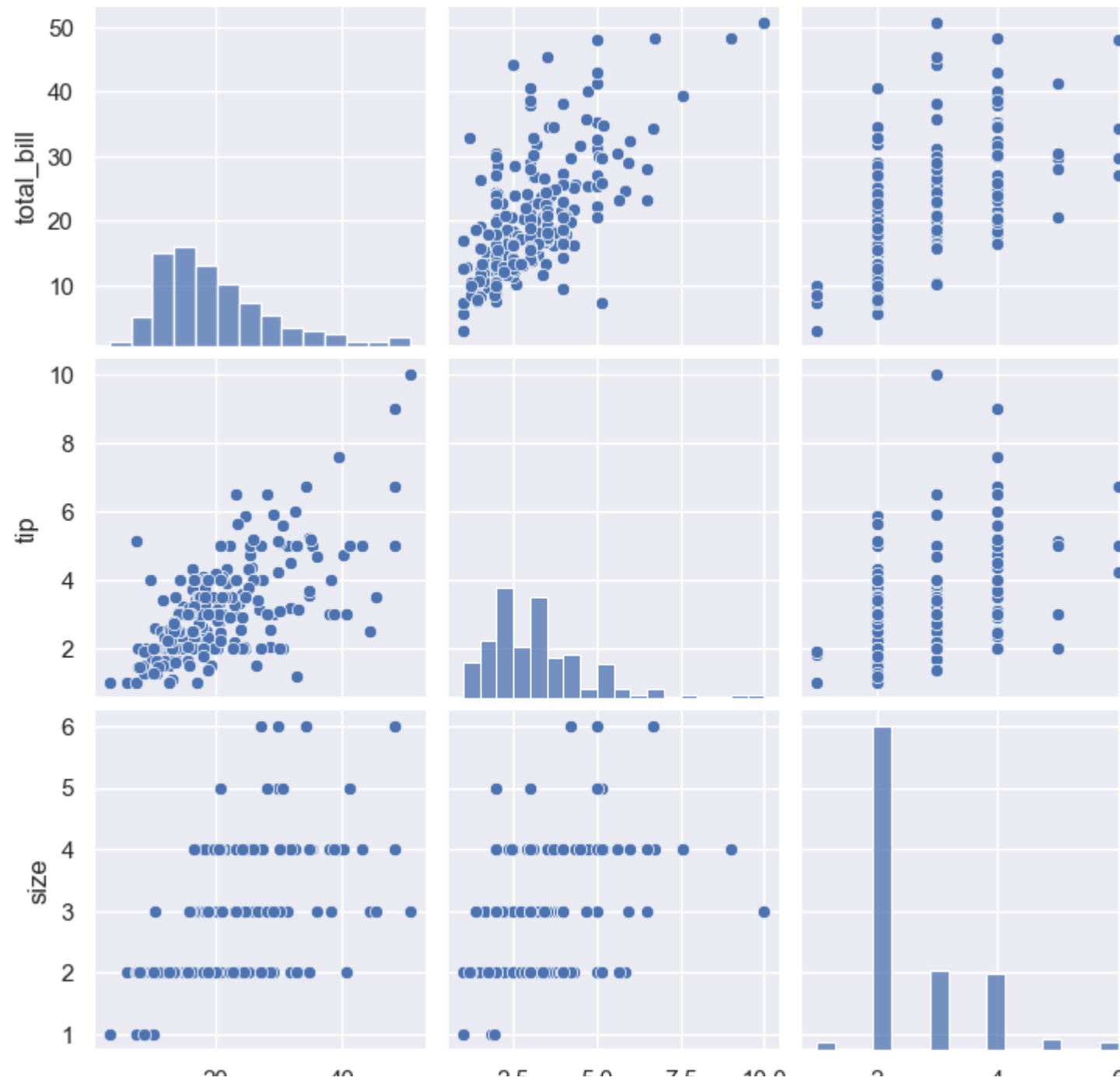
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\\_oldcore.py:1498: FutureWarning: is\_categorical\_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead  
 if pd.api.types.is\_categorical\_dtype(vector):  
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\\_oldcore.py:1119: FutureWarning: use\_inf\_as\_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.  
 with pd.option\_context('mode.use\_inf\_as\_na', True):



```
In [ ]: sns.pairplot(df)
plt.show()
```

```
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
    if pd.api.types.is_categorical_dtype(vector):
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
    if pd.api.types.is_categorical_dtype(vector):
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
    if pd.api.types.is_categorical_dtype(vector):
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c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
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c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
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c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical
```





20 40 2.5 5.0 7.5 10.0 2 4 6  
total\_bill tip size

```
In [ ]: df.value_counts('smoker')  
sns.pairplot(df, hue='smoker')  
plt.show()
```

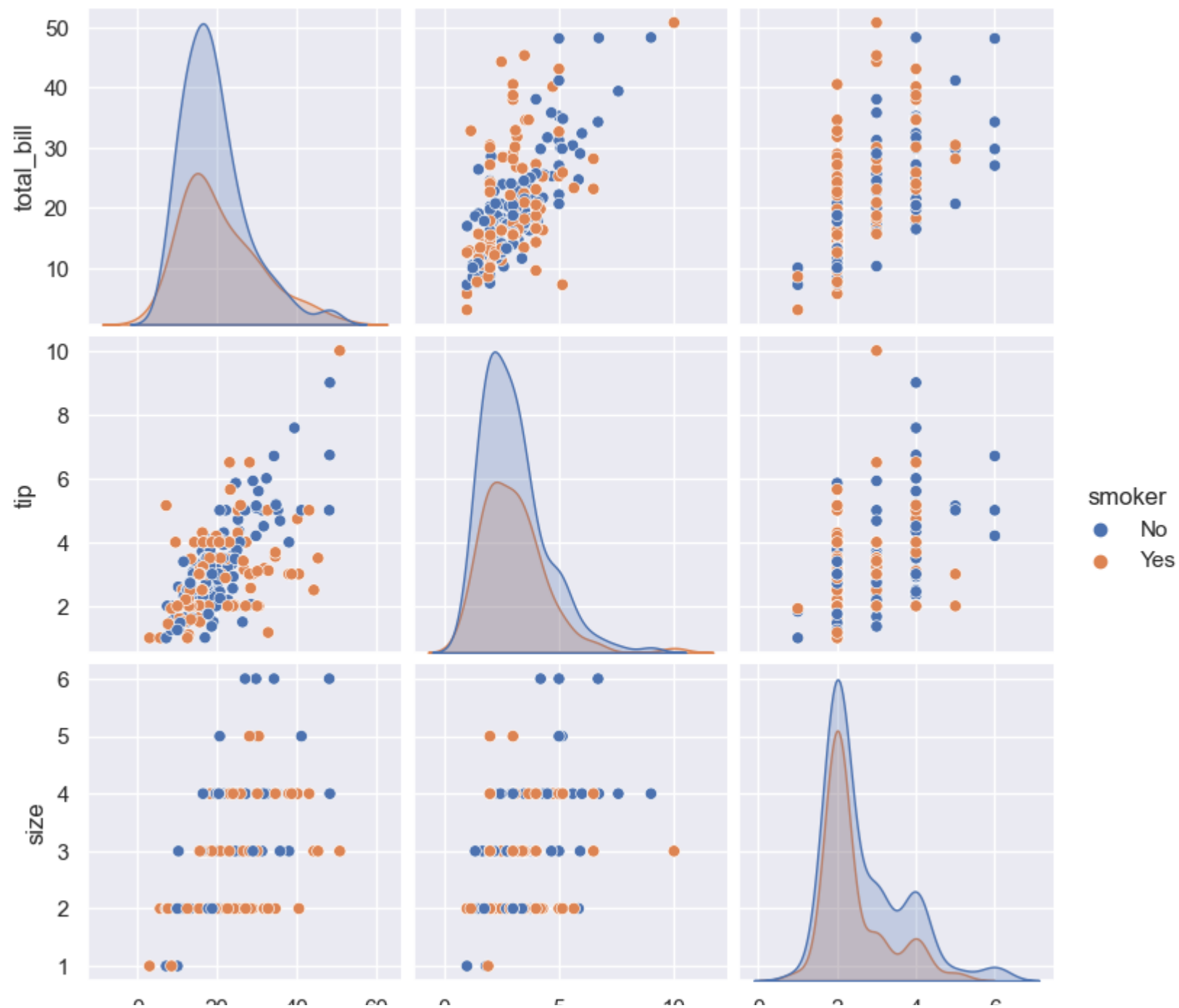


```
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c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_n
a option is deprecated and will be removed in a future version. Convert inf values to NaN before operating instead.
    with pd.option_context('mode.use_inf_as_na', True):
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categoric
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```

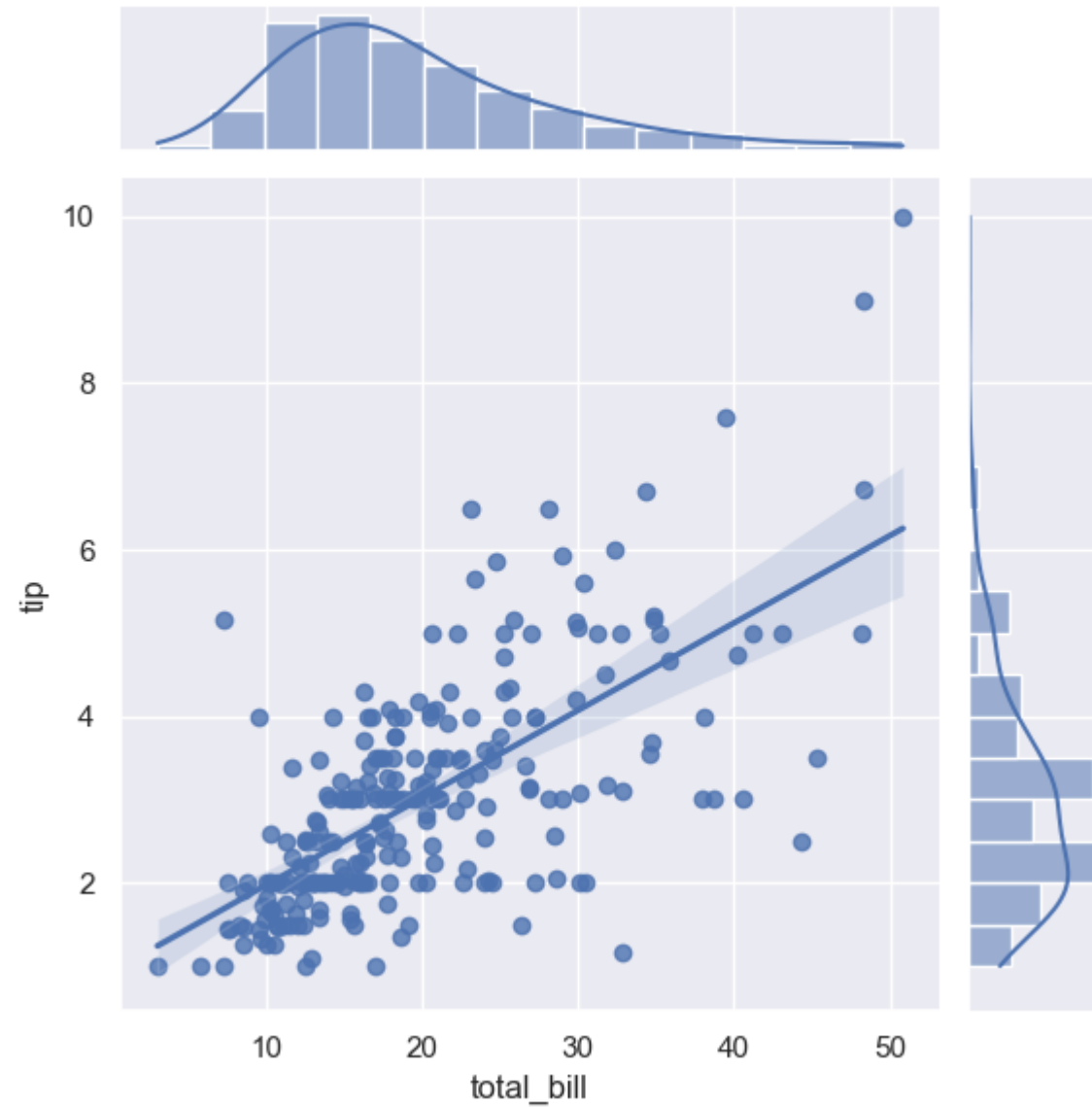
```
    if pd.api.types.is_categorical_dtype(vector):  
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    if pd.api.types.is_categorical_dtype(vector):
```





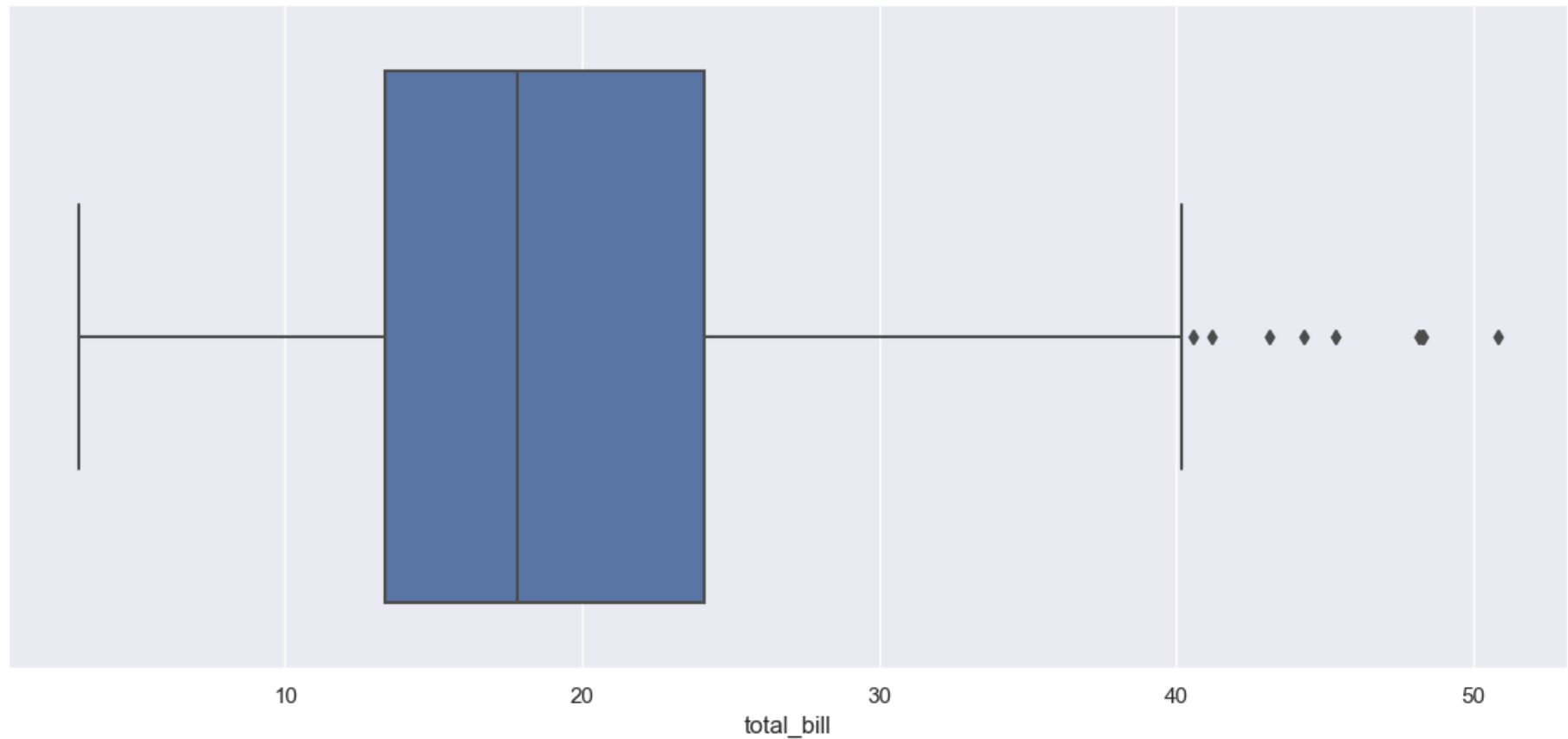
```
In [ ]: sns.jointplot(x="total_bill", y="tip", data=df, kind="reg")
plt.show()
```

```
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
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  with pd.option_context('mode.use_inf_as_na', True):
```



```
In [ ]: sns.boxplot(x=df["total_bill"])
plt.show()
```

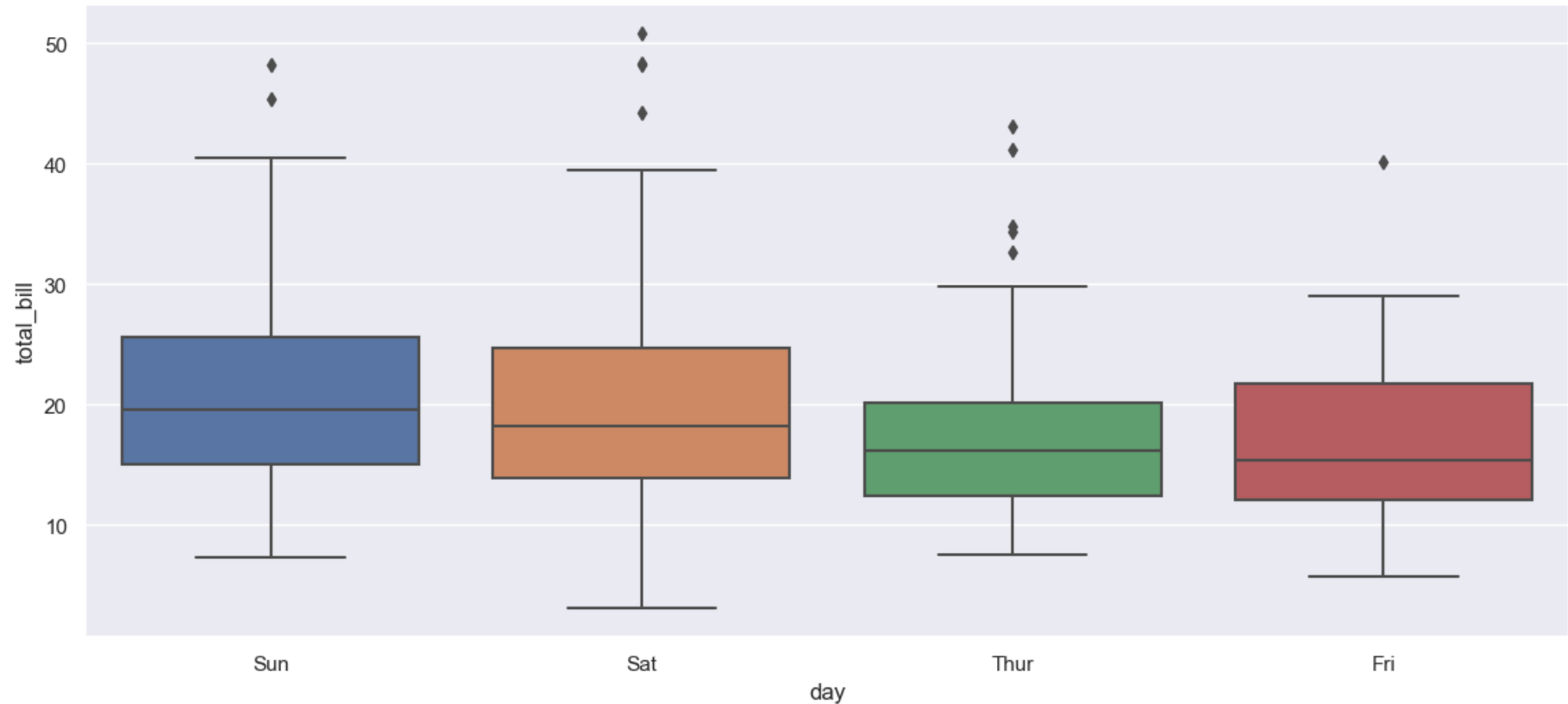
```
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
  if pd.api.types.is_categorical_dtype(vector):
```



```
In [ ]: sns.boxplot(x="day", y="total_bill", data=df)
plt.show()
```



```
c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\_oldcore.py:1498: FutureWarning: is_categorical_dtype is deprecated and will be removed in a future version. Use isinstance(dtype, CategoricalDtype) instead
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  if pd.api.types.is_categorical_dtype(vector):
```



```
In [ ]: flights_long = sns.load_dataset("flights")
         flights_long
```

Out[ ]:

	year	month	passengers
<b>0</b>	1949	Jan	112
<b>1</b>	1949	Feb	118
<b>2</b>	1949	Mar	132
<b>3</b>	1949	Apr	129
<b>4</b>	1949	May	121
...	...	...	...
<b>139</b>	1960	Aug	606
<b>140</b>	1960	Sep	508
<b>141</b>	1960	Oct	461
<b>142</b>	1960	Nov	390
<b>143</b>	1960	Dec	432

144 rows × 3 columns

```
In [ ]: flights = pd.pivot(columns=['year', 'month'], data=flights_long)
        flights
```

Out[ ]:

	year	1949 ...										1960										
	month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	...	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0	112.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
	1	NaN	118.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
	2	NaN	NaN	132.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
	3	NaN	NaN	NaN	129.0	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
	4	NaN	NaN	NaN	NaN	121.0	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	139	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	606.0	NaN	NaN	NaN	NaN
	140	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	508.0	NaN	NaN	NaN
	141	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	461.0	NaN	NaN
	142	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	390.0	NaN
	143	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	432.0

144 rows × 144 columns



```
In [ ]: f, ax = plt.subplots(figsize=(16, 8))
sns.heatmap(flights, annot=True, fmt=".0f")
plt.show()
```

```

-----
ValueError                                Traceback (most recent call last)
c:\Users\Rommel\OneDrive\Desktop\Coding\Academic\FODS\exp6 missing values\data_vis.ipynb Cell 36 line 2
      <a href='vscode-notebook-cell:/c%3A/Users/Rommel/OneDrive/Desktop/Coding/Academic/FODS/exp6%20missing%20values/data_vis.i
pynb#X50sZmlsZQ%3D%3D?line=0'>1</a> f, ax = plt.subplots(figsize=(16, 8))
----> <a href='vscode-notebook-cell:/c%3A/Users/Rommel/OneDrive/Desktop/Coding/Academic/FODS/exp6%20missing%20values/data_vis.i
pynb#X50sZmlsZQ%3D%3D?line=1'>2</a> sns.heatmap(flights, annot=True, fmt=".0f")
      <a href='vscode-notebook-cell:/c%3A/Users/Rommel/OneDrive/Desktop/Coding/Academic/FODS/exp6%20missing%20values/data_vis.i
pynb#X50sZmlsZQ%3D%3D?line=2'>3</a> plt.show()

File c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\matrix.py:446, in heatmap(data, vmin, vm
ax, cmap, center, robust, annot, fmt, annot_kws, linewidths, linecolor, cbar, cbar_kws, cbar_ax, square, xticklabels, yticklabel
s, mask, ax, **kwargs)
    365 """Plot rectangular data as a color-encoded matrix.
    366
    367 This is an Axes-level function and will draw the heatmap into the
    (...)
    443
    444 """
    445 # Initialize the plotter object
--> 446 plotter = _HeatMapper(data, vmin, vmax, cmap, center, robust, annot, fmt,
    447                        annot_kws, cbar, cbar_kws, xticklabels,
    448                        yticklabels, mask)
    450 # Add the pcolormesh kwargs here
    451 kwargs["linewidths"] = linewidths

File c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\matrix.py:163, in _HeatMapper.__init__(s
elf, data, vmin, vmax, cmap, center, robust, annot, fmt, annot_kws, cbar, cbar_kws, xticklabels, yticklabels, mask)
    160 self.ylabel = ylabel if ylabel is not None else ""
    162 # Determine good default values for the colormapping
--> 163 self._determine_cmap_params(plot_data, vmin, vmax,
    164                             cmap, center, robust)
    166 # Sort out the annotations
    167 if annot is None or annot is False:

File c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\seaborn\matrix.py:202, in _HeatMapper._determine
_cmap_params(self, plot_data, vmin, vmax, cmap, center, robust)
    200     vmin = np.nanpercentile(calc_data, 2)
    201     else:
--> 202     vmin = np.nanmin(calc_data)

```

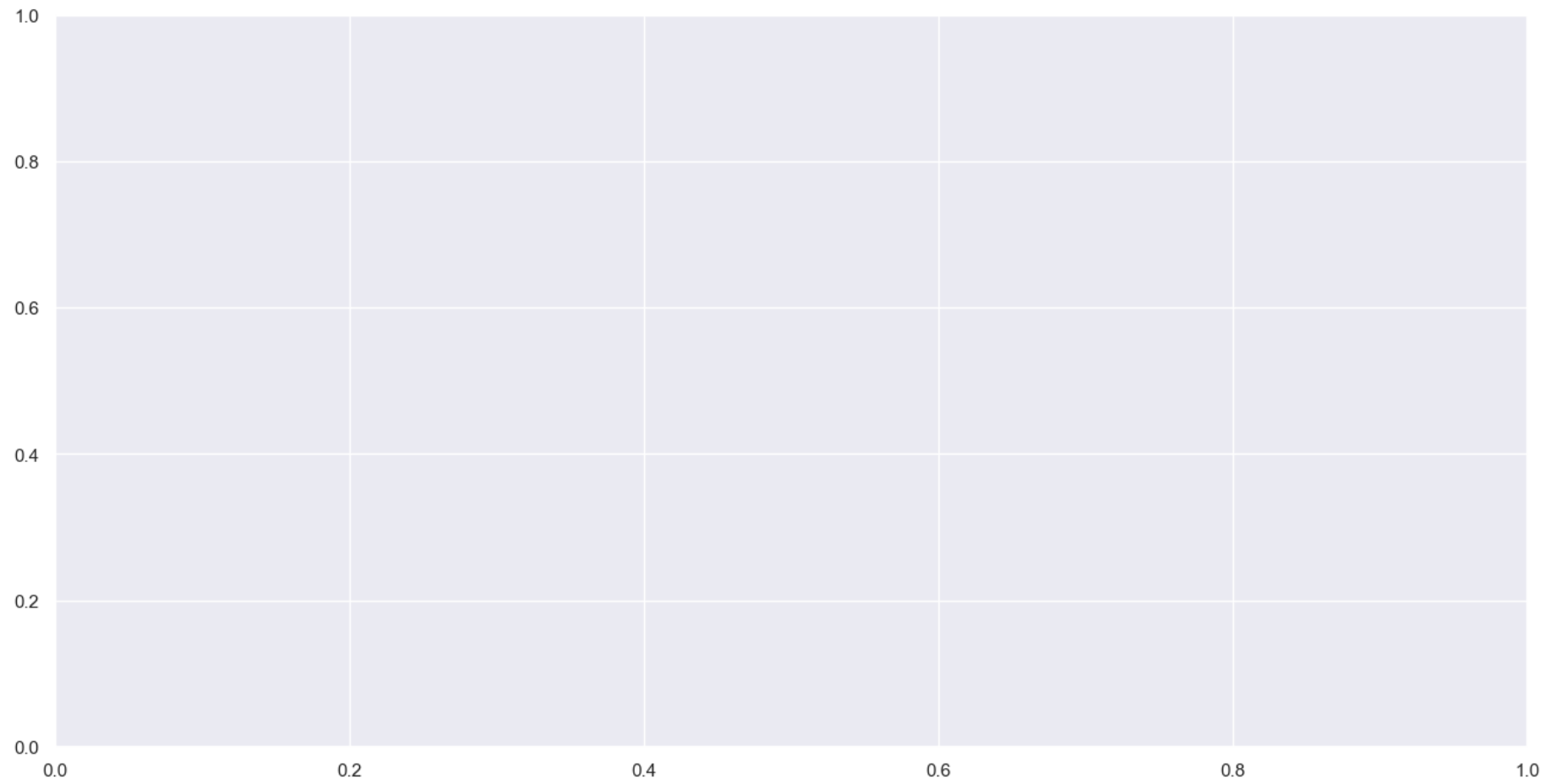
```
203 if vmax is None:
204     if robust:
```

File <\_\_array\_function\_\_ internals>:200, in nanmin(\*args, \*\*kwargs)

File c:\Users\Rommel\AppData\Local\Programs\Python\Python311\Lib\site-packages\numpy\lib\nanfunctions.py:343, in nanmin(a, axis, out, keepdims, initial, where)

```
338     kwargs['where'] = where
340 if type(a) is np.ndarray and a.dtype != np.object_:
341     # Fast, but not safe for subclasses of ndarray, or object arrays,
342     # which do not implement isnan (gh-9009), or fmin correctly (gh-8975)
--> 343     res = np.fmin.reduce(a, axis=axis, out=out, **kwargs)
344     if np.isnan(res).any():
345         warnings.warn("All-NaN slice encountered", RuntimeWarning,
346                       stacklevel=3)
```

**ValueError:** zero-size array to reduction operation fmin which has no identity



In [ ]: