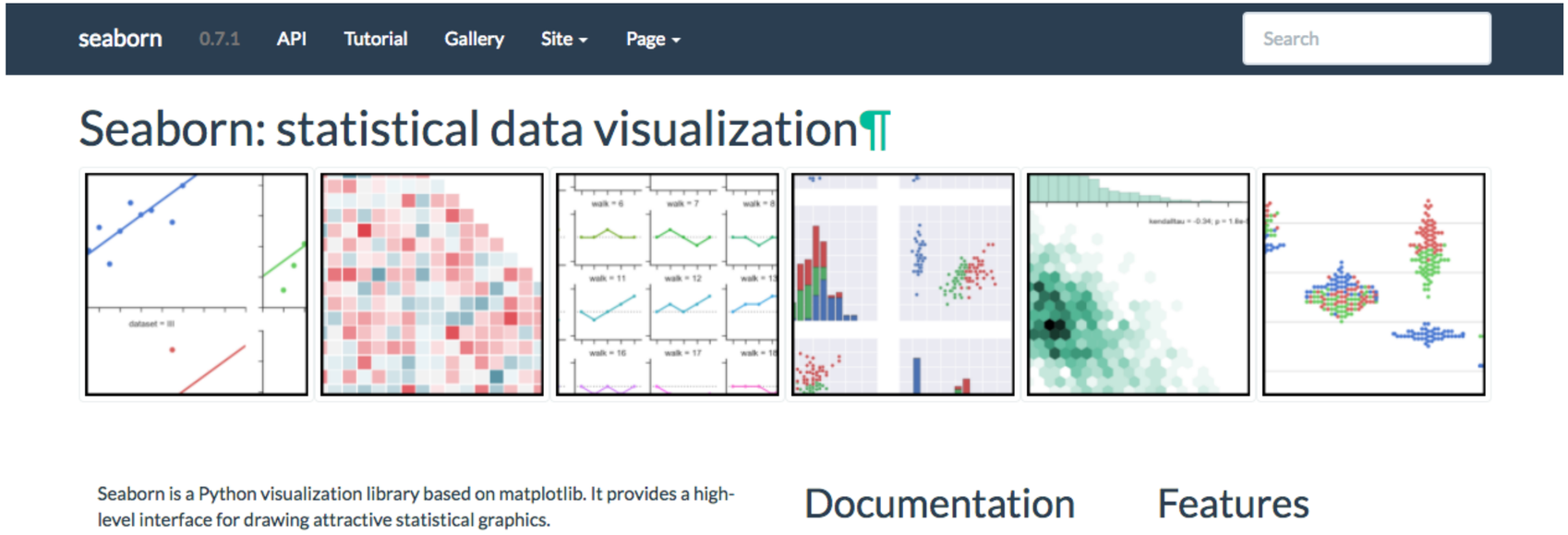
INTRODUCTION TO DATA VISUALIZATION WITH PYTHON

Visualizing Regressions

Seaborn



https://stanford.edu/~mwaskom/software/seaborn/

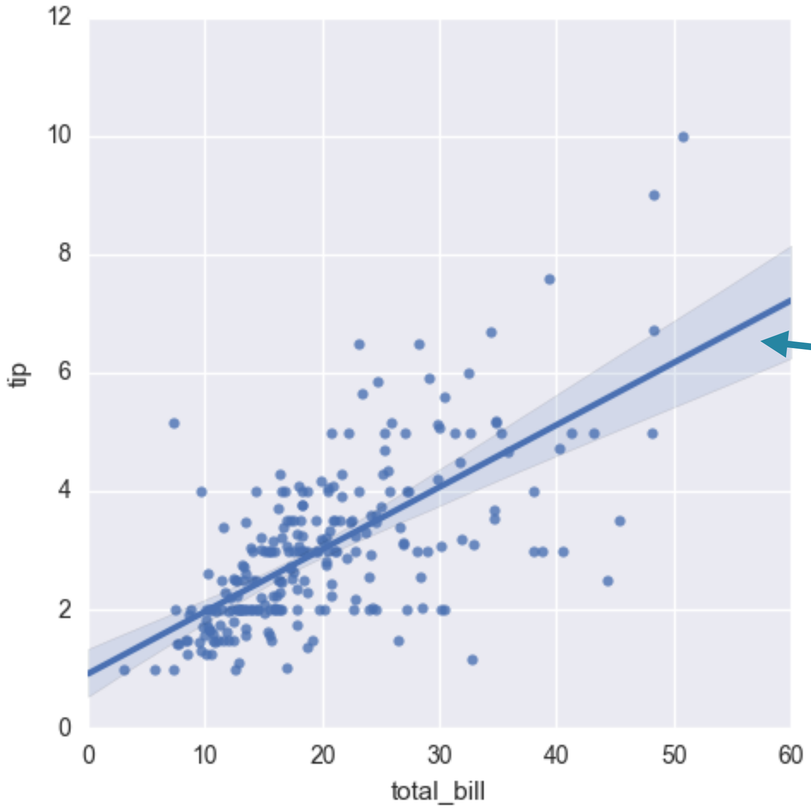
Recap: Pandas DataFrames

- Labelled tabular data structure
- Labels on rows: *index*
- Labels on columns: *columns*
- Columns are Pandas *Series*

Recap: Pandas DataFrames

	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
...	...	...	...	...	...	...	...

Linear regression plots



95% confidence

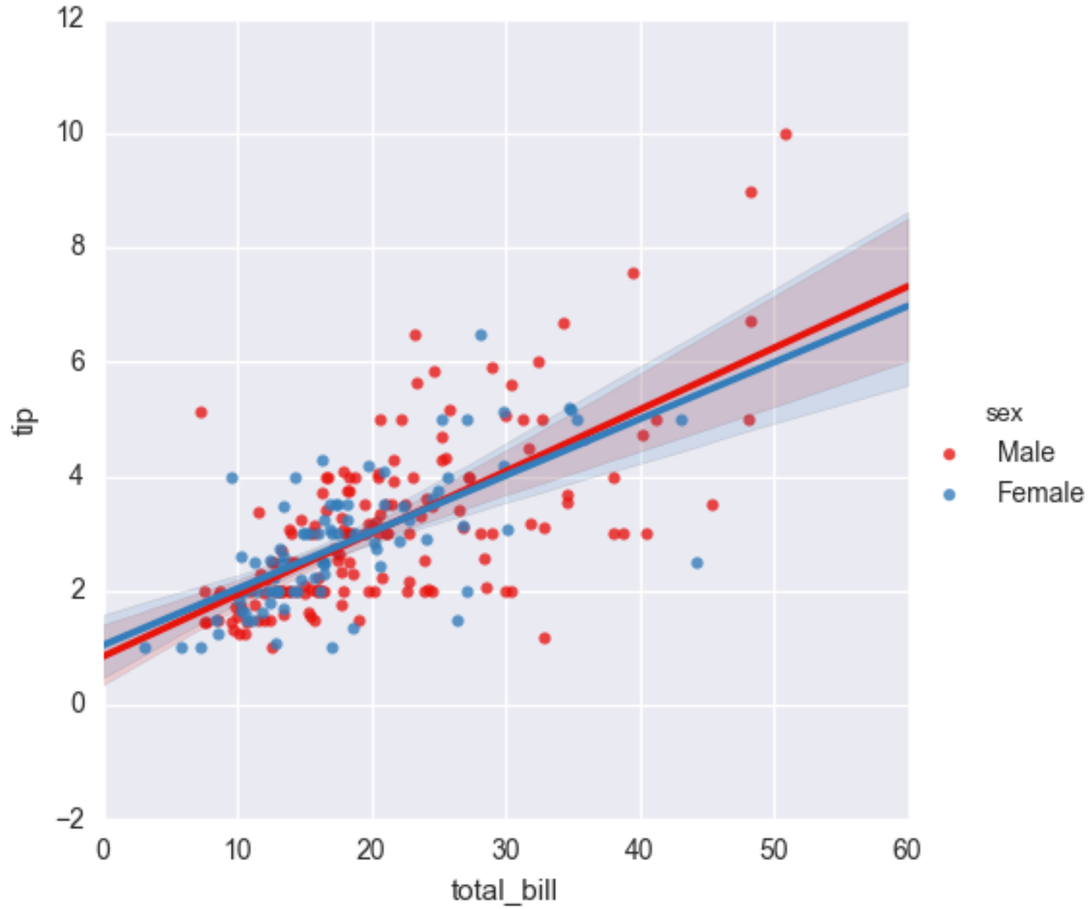
Using lmplot()

```
In [1]: import pandas as pd

In [2]: import matplotlib.pyplot as plt

In [3]: import seaborn as sns

In [4]: tips =sns.load_dataset('tips')

In [5]: sns.lmplot(x= 'total_bill', y='tip', data=tips)

In [6]: plt.show()
```

Factors

	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
...	...	...	...	...	...	...	...

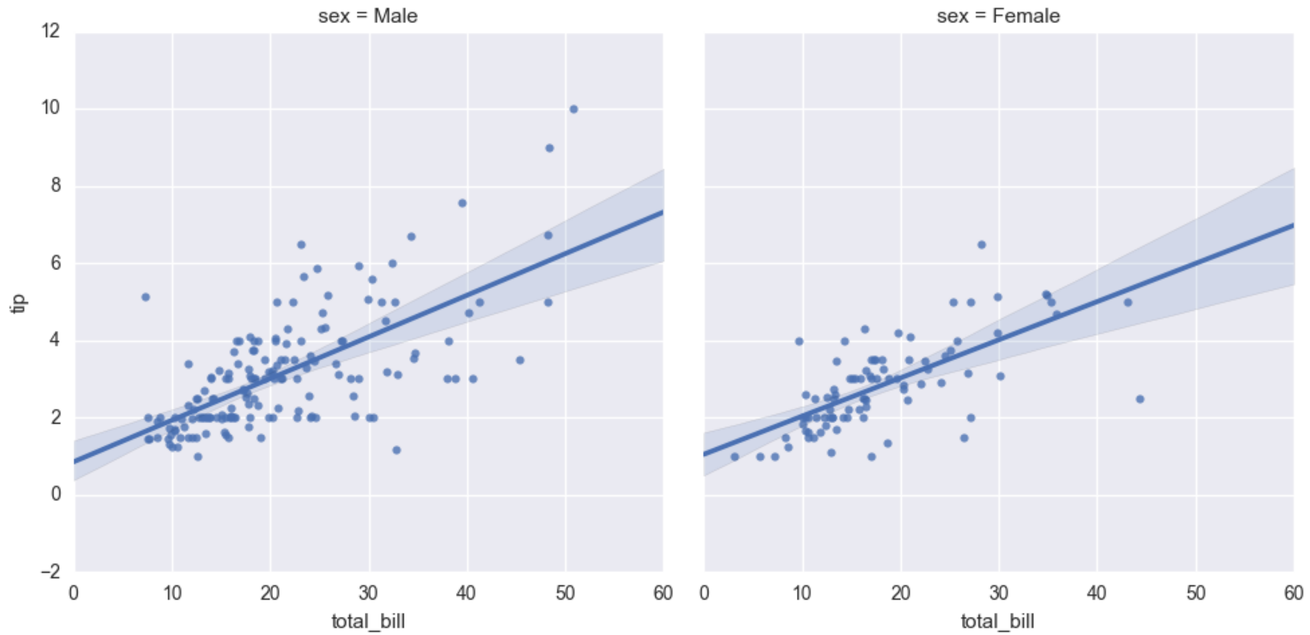
Grouping factors (same plot)



Using hue=...

```
In [7]: sns.lmplot(x='total_bill', y='tip', data=tips, hue='sex',
   ...:                palette='Set1')

In [8]: plt.show()
```

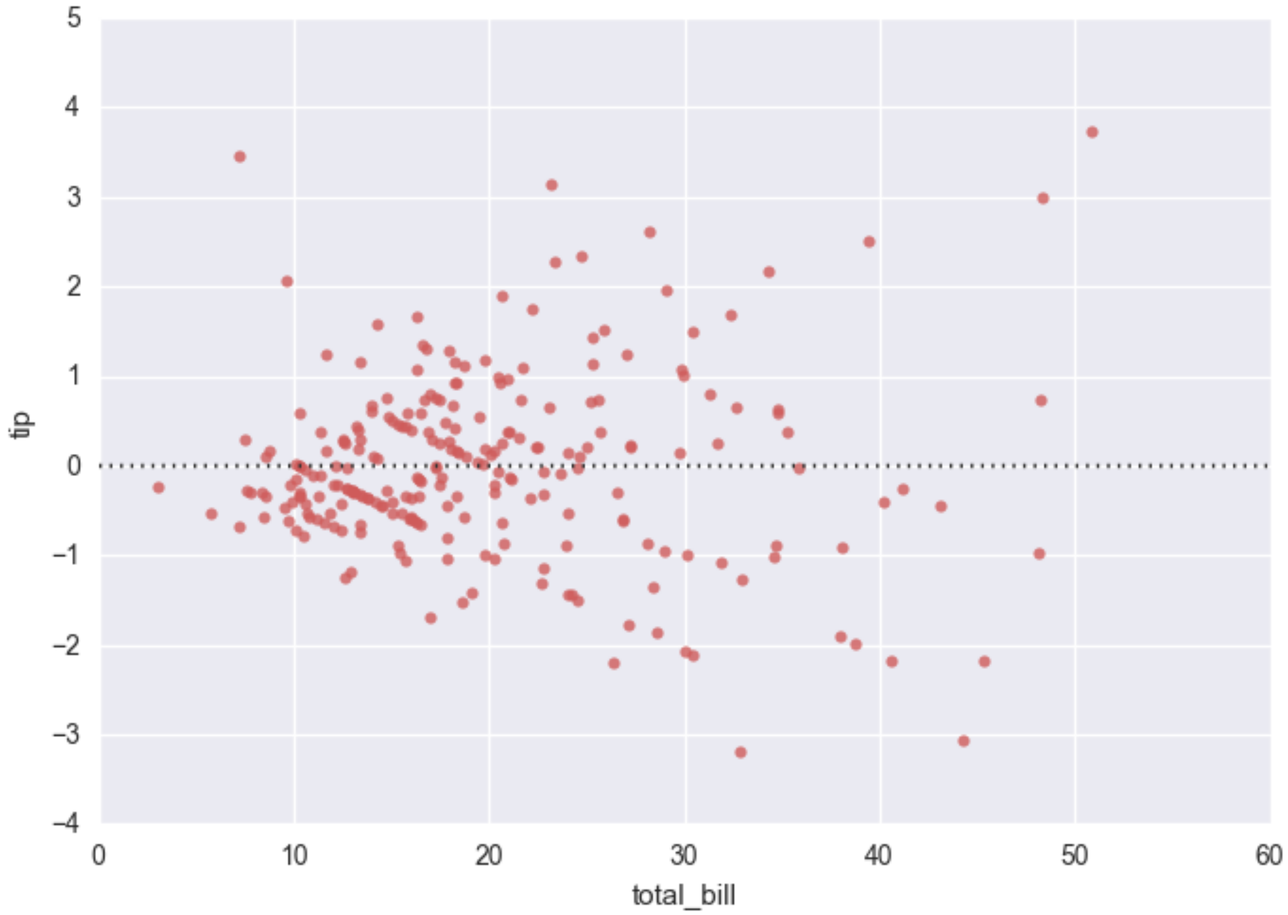
Grouping factors (subplots)



Using col=...

```
In [9]: sns.lmplot(x='total_bill', y='tip', data=tips, col='sex')

In [10]: plt.show()
```

Residual plots



Using residplot()

```
In [11]: sns.residplot(x='age',y='fare',data=tips,color='indianred')

In [12]: plt.show()
```

- Similar arguments as lmplot() but more flexible
  - x, y can be *arrays or strings*
  - data is DataFrame (optional)
- Optional arguments (e.g., color) as in Matplotlib

INTRODUCTION TO DATA VISUALIZATION WITH PYTHON

Let’s practice!

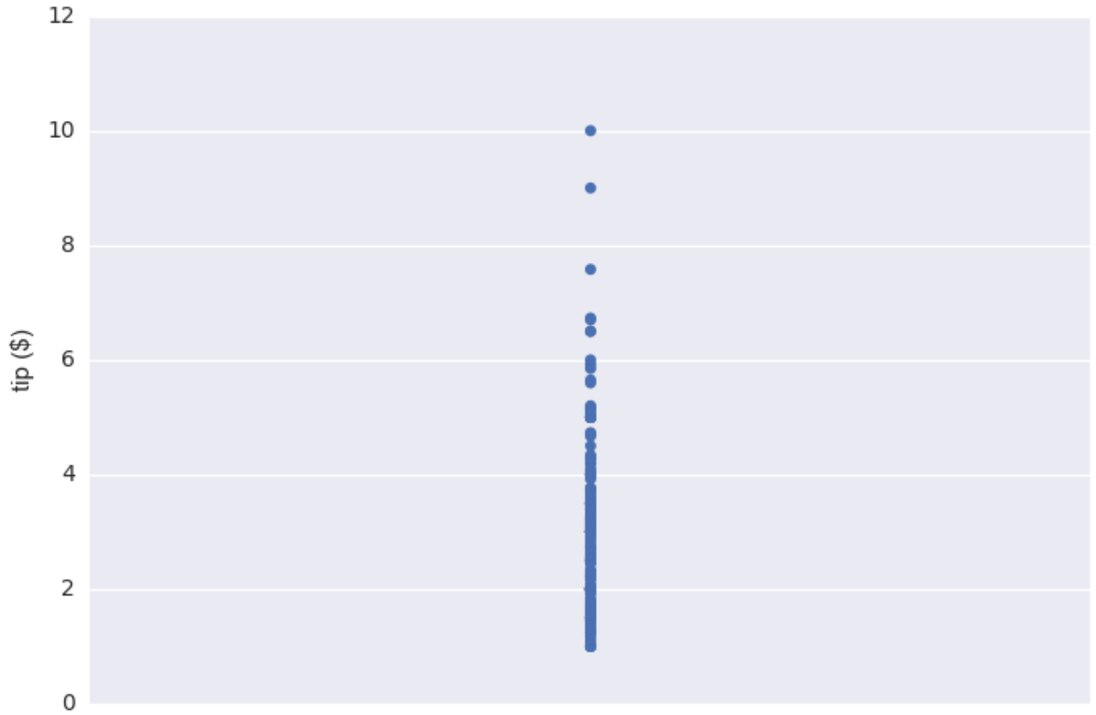
INTRODUCTION TO DATA VISUALIZATION WITH PYTHON

Visualizing univariate distributions

Visualizing data

- Univariate → “one variable”
- Visualization techniques for sampled univariate data
  - Strip plots
  - Swarm plots
  - Violin plots

Strip plot



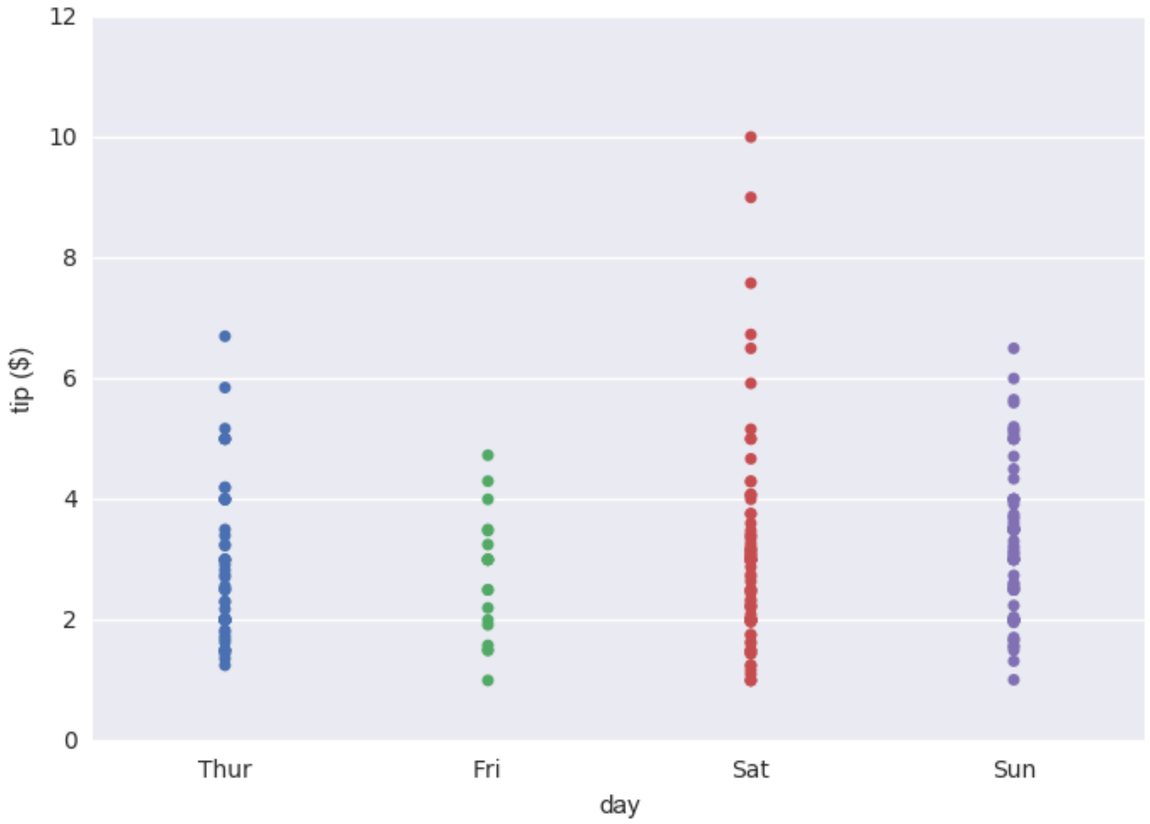
Using stripplot()

```
In [1]: sns.stripplot(y= 'tip', data=tips)

In [2]: plt.ylabel('tip ($)')

In [3]: plt.show()
```

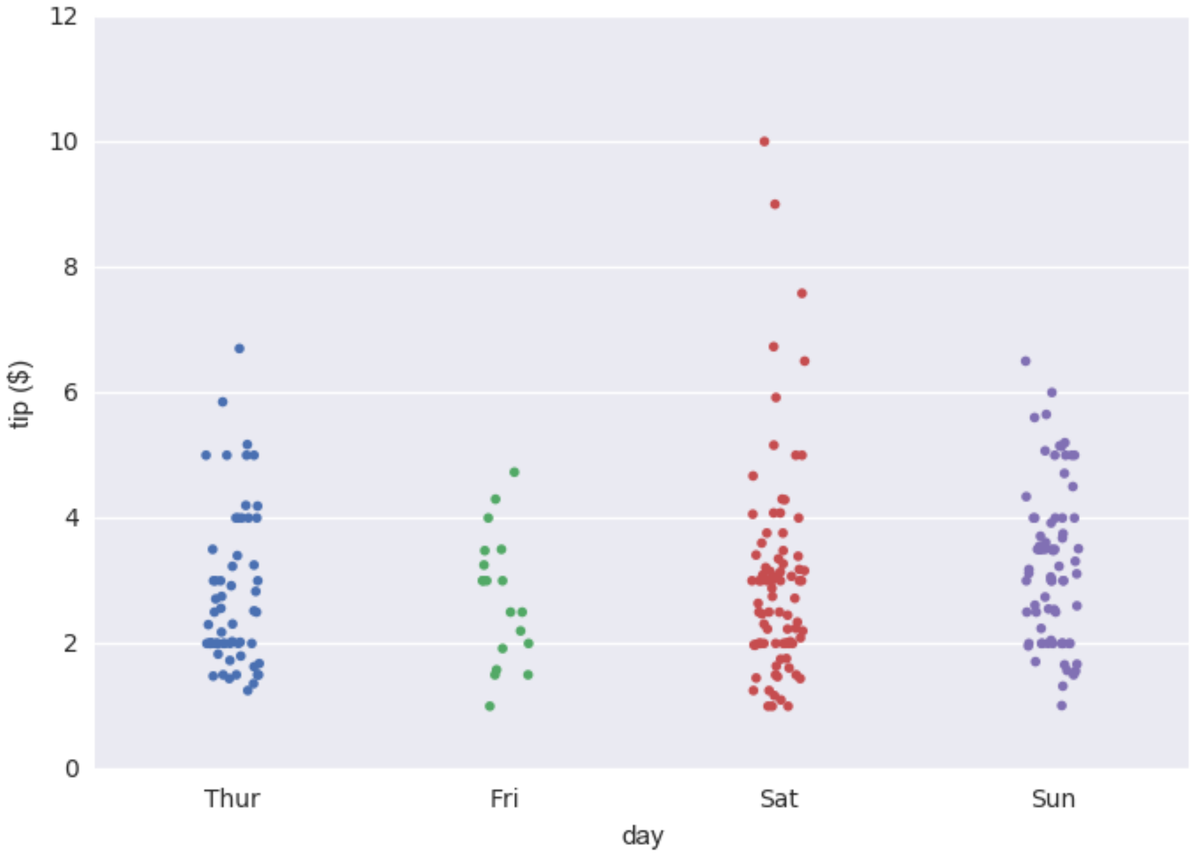
Grouping with stripplot()

```
In [4]: sns.stripplot(x='day', y='tip', data=tip)

In [5]: plt.ylabel('tip ($)')

In [6]: plt.show()
```

Grouped strip plot



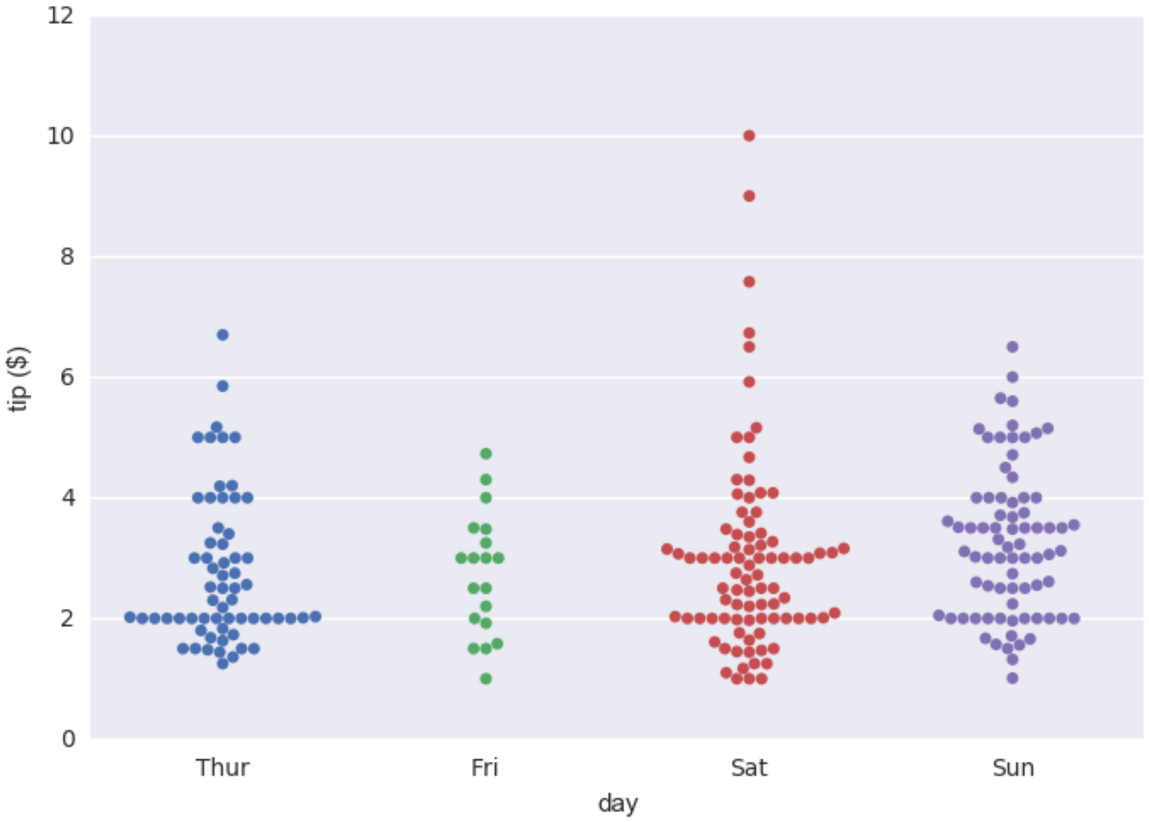
Spreading out strip plots



Spreading out strip plots

```
In [7]: sns.stripplot(x='day', y='tip', data=tip, size=4,
   ...:                   jitter=True)

In [8]: plt.ylabel('tip ($)')

In [9]: plt.show()
```

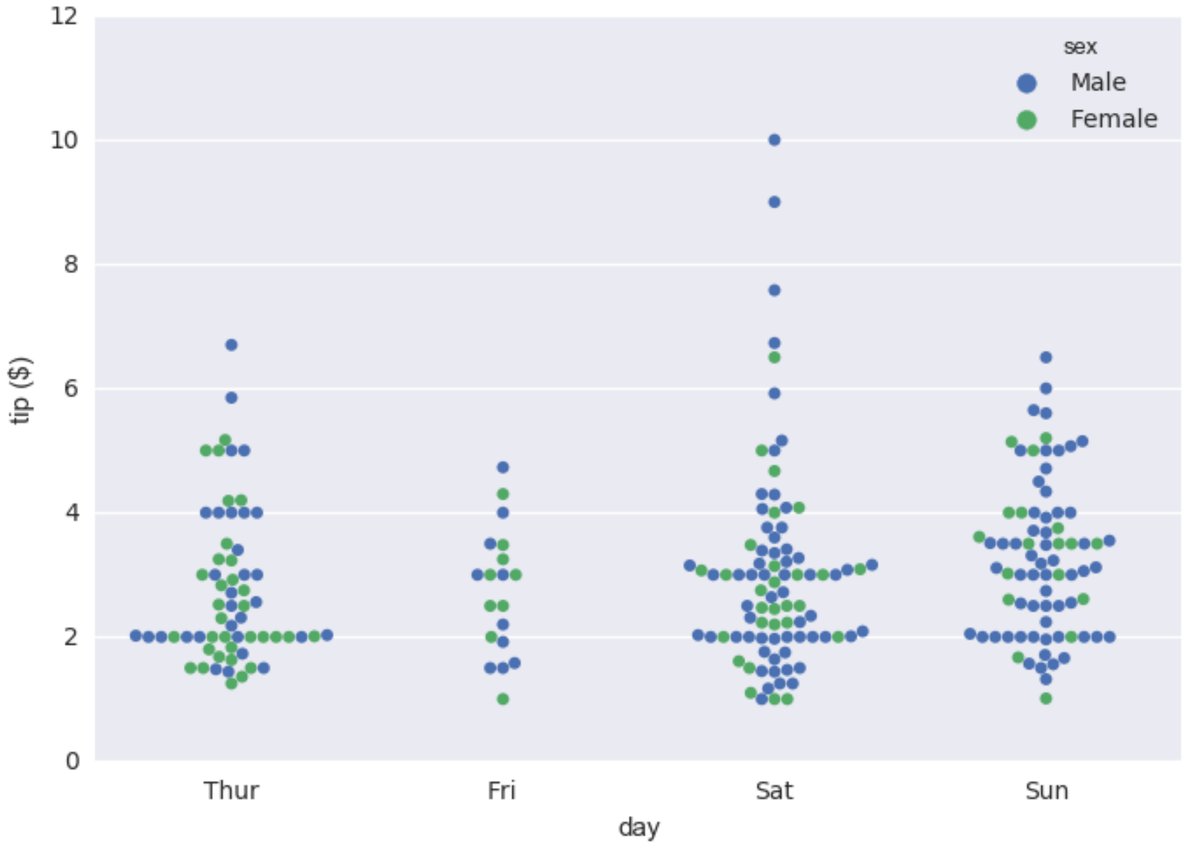
Swarm plot



Using swarmplot()

```
In [10]: sns.swarmplot(x='day', y='tip', data=tips)

In [11]: plt.ylabel('tip ($)')

In [12]: plt.show()
```

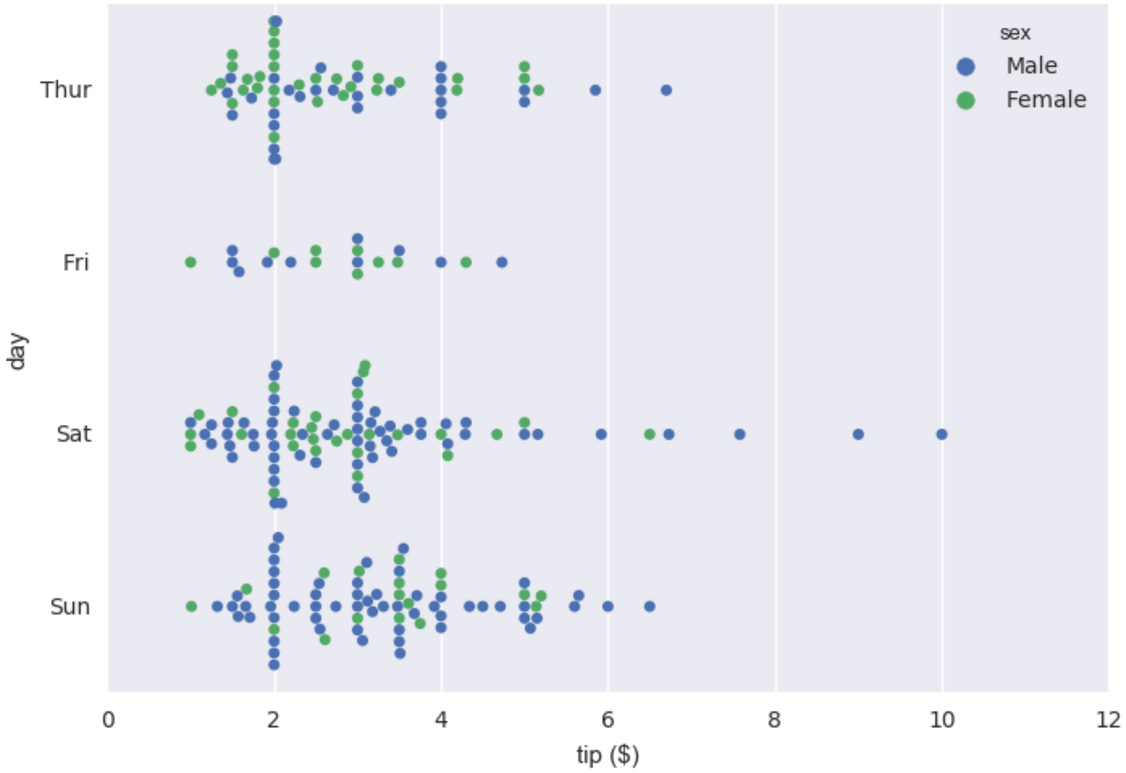
More grouping



More grouping with swarmplot()

```
In [13]: sns.swarmplot(x='day', y='tip', data=tips, hue='sex')

In [14]: plt.ylabel('tip ($)')

In [15]: plt.show()
```

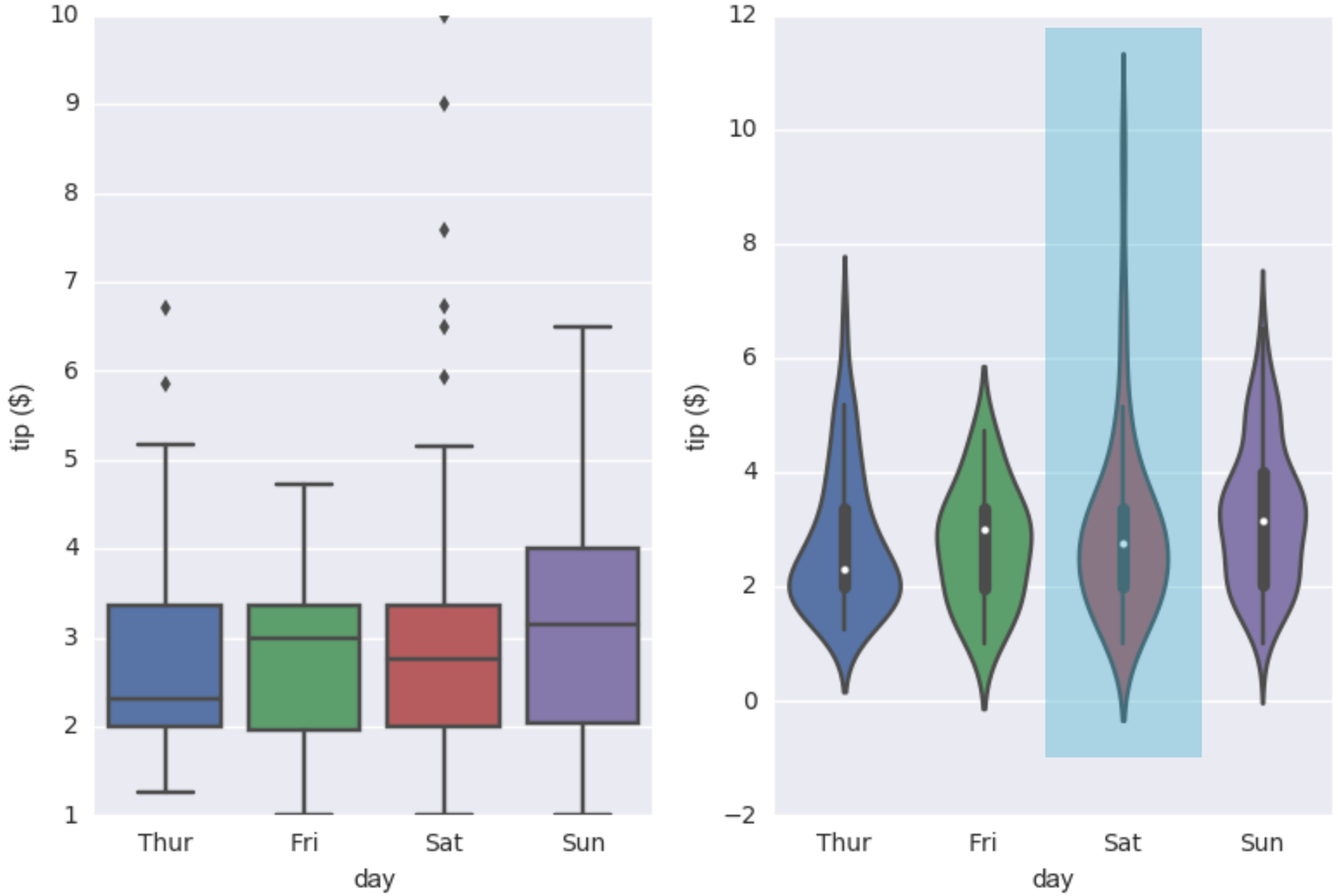
Changing orientation



Changing orientation

```
In [16]: sns.swarmplot(x='tip', y='day', data=tips, hue='sex',
    ...:                orient='h')

In [17]: plt.xlabel('tip ($)')

In [18]: plt.show()
```

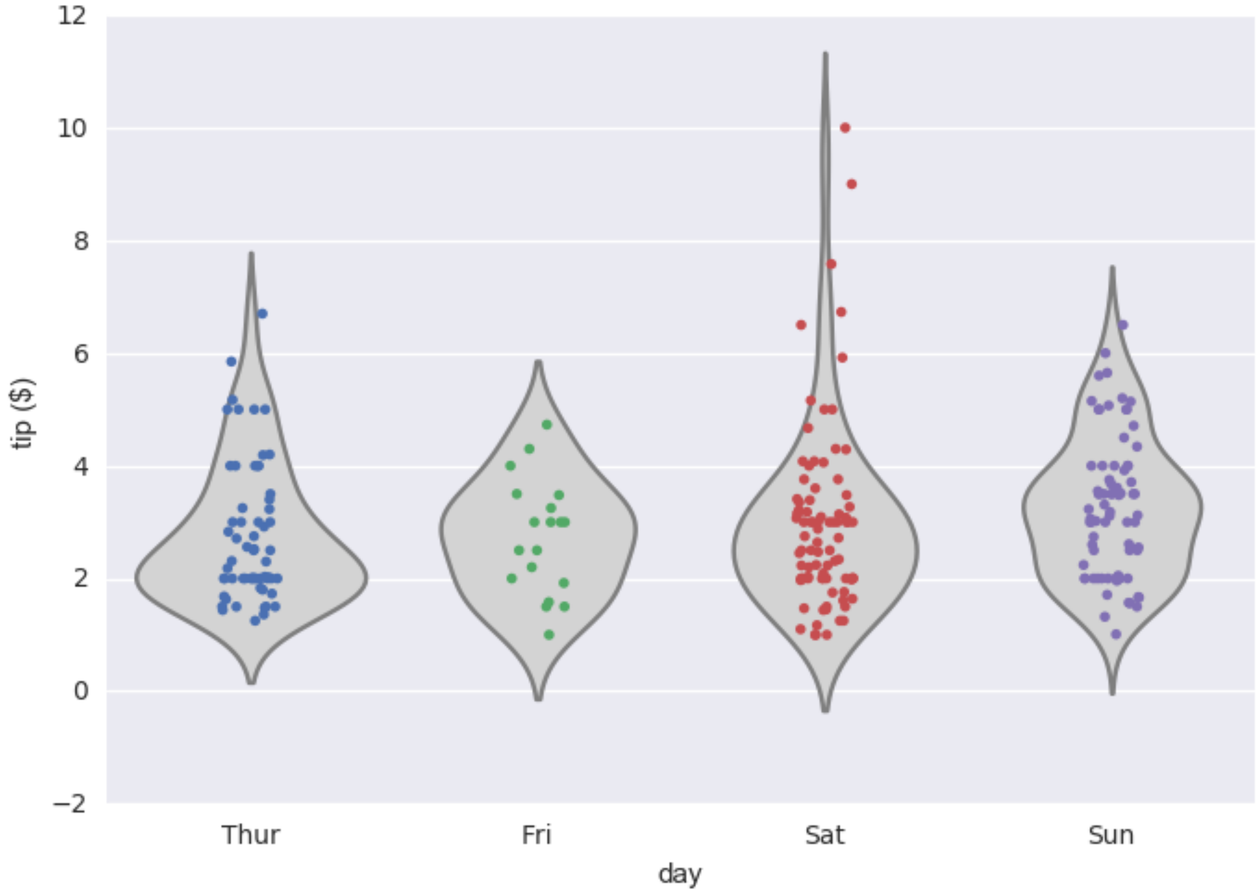
Violin plot


10
9
8
7
6
5
4
3
2
1
tip ($)
Thur
Fri
Sat
Sun
day
12
10
8
6
4
2
0
−2
tip ($)
Thur
Fri
Sat
Sun
day

Using violinplot()

```
In [19]:  plt.subplot(1,2,1)

In [20]: sns.boxplot(x='day', y='tip', data=tips)

In [21]: plt.ylabel('tip ($)')

In [22]: plt.subplot(1,2,2)

In [23]: sns.violinplot(x='day', y='tip', data=tips)

In [24]: plt.ylabel('tip ($)')

In [25]: plt.tight_layout()

In [26]: plt.show()
```

Combining plots



Combining plots

```
In [27]: sns.violinplot(x='day', y='tip', data=tips, inner=None,
    ...:                color='lightgray')

In [28]: sns.stripplot(x='day', y='tip', data=tips, size=4,
    ...:                jitter=True)

In [29]: plt.ylabel('tip ($)')

In [30]: plt.show()
```

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Let’s practice!

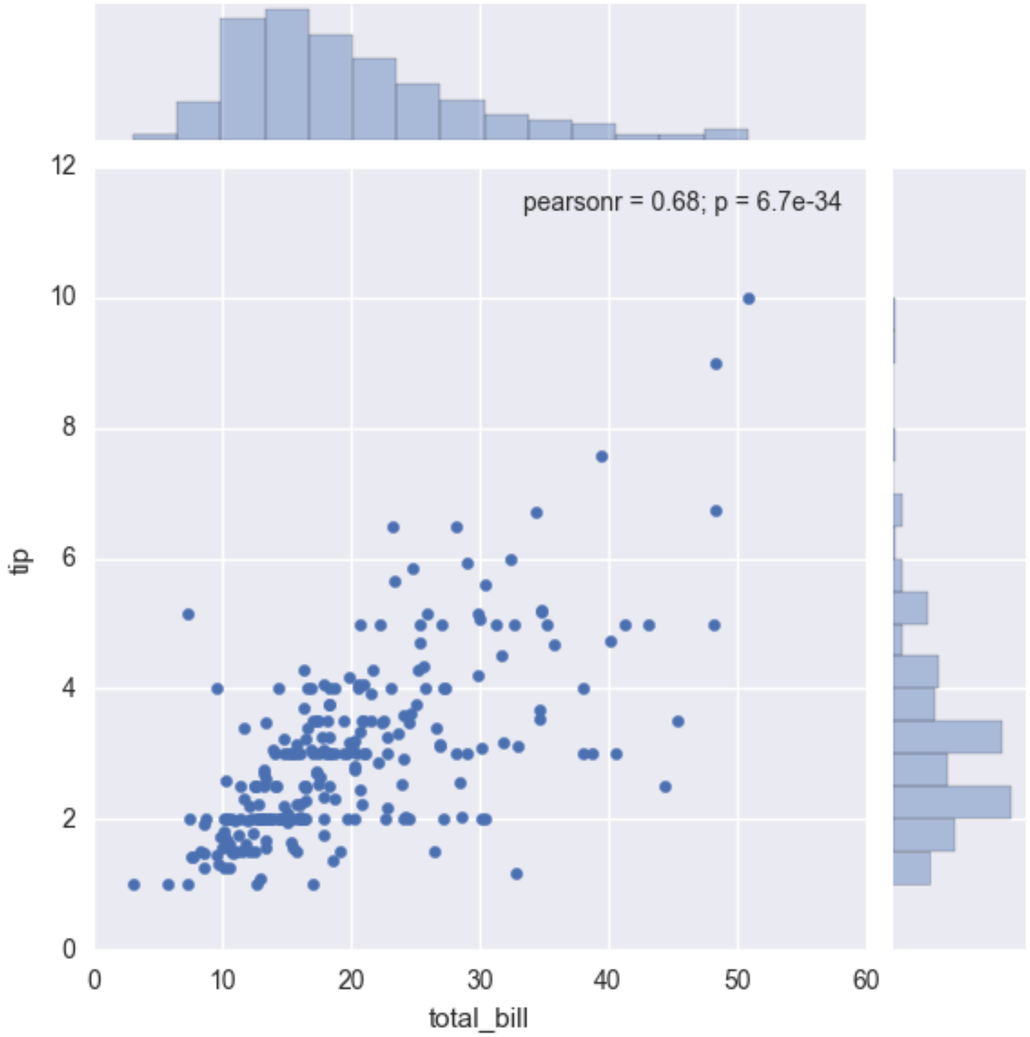
INTRODUCTION TO DATA VISUALIZATION WITH PYTHON

Visualizing Multivariate Distributions

Visualizing data

- Bivariate → “two variables”
- Multivariate → “multiple variables”
- Visualizing relationships in multivariate data
  - Joint plots
  - Pair plots
  - Heat maps

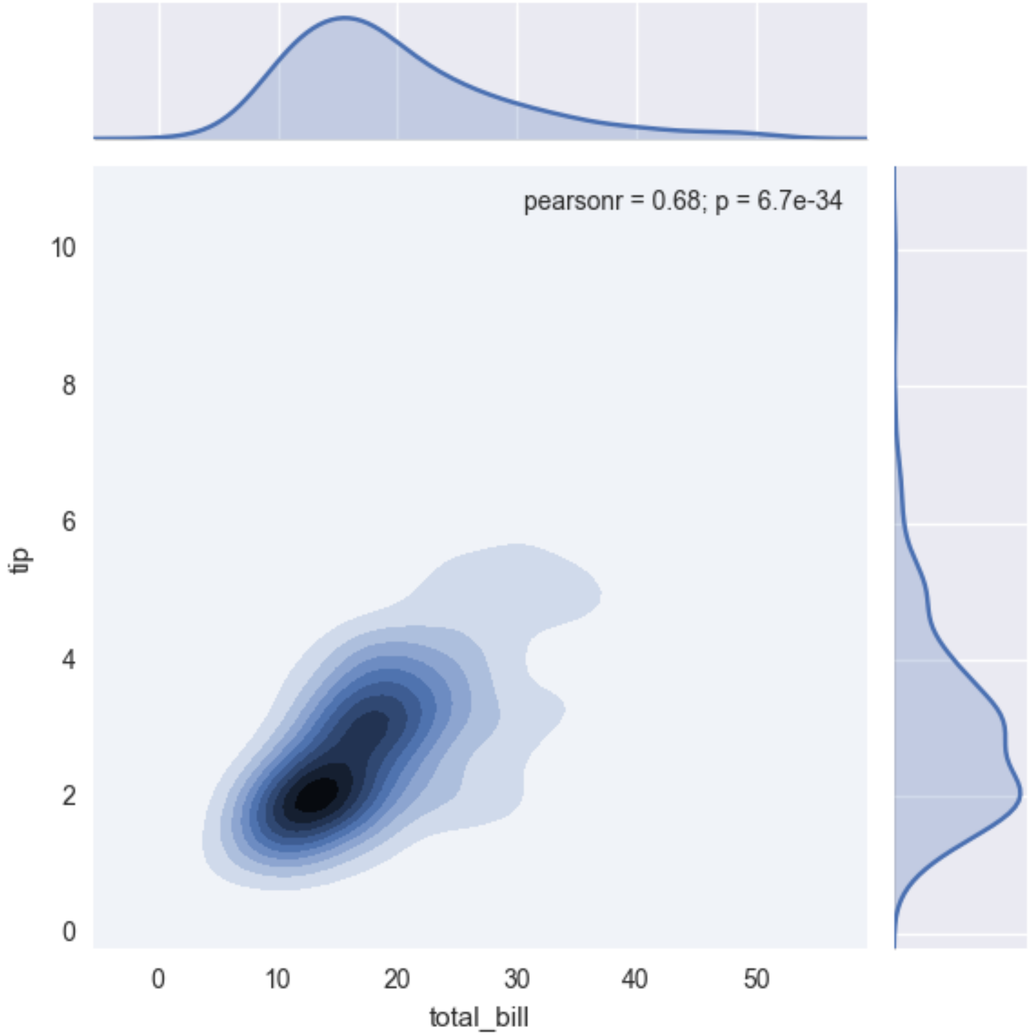
Joint plot


pearsonr = 0.68; p = 6.7e-34
tip
total_bill
0
2
4
6
8
10
12
0
10
20
30
40
50
60

Using jointplot()

```
In [1]: sns.jointplot(x= 'total_bill', y= 'tip', data=tips)

In [2]: plt.show()
```

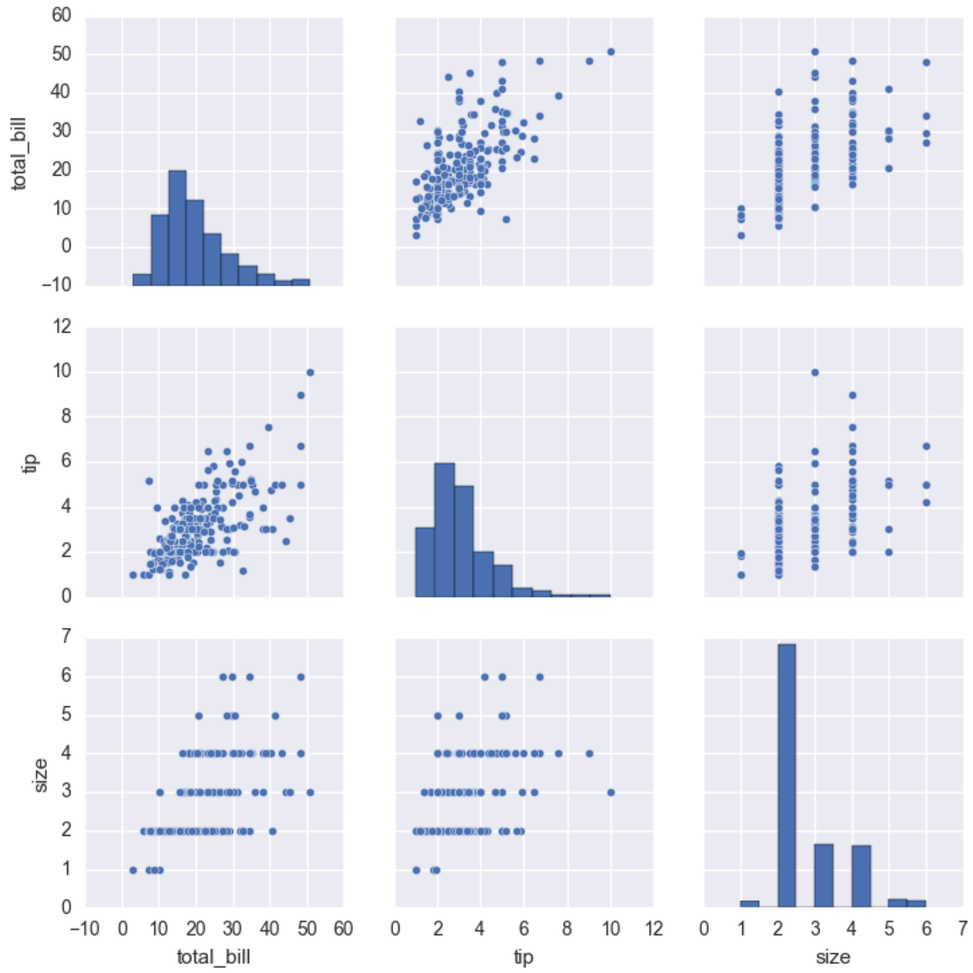
Joint plot using KDE



Using kde=True

```
In [3]: sns.jointplot(x='total_bill', y= 'tip', data=tips,
   ...:                kind='kde')

In [4]: plt.show()
```

Pair plot



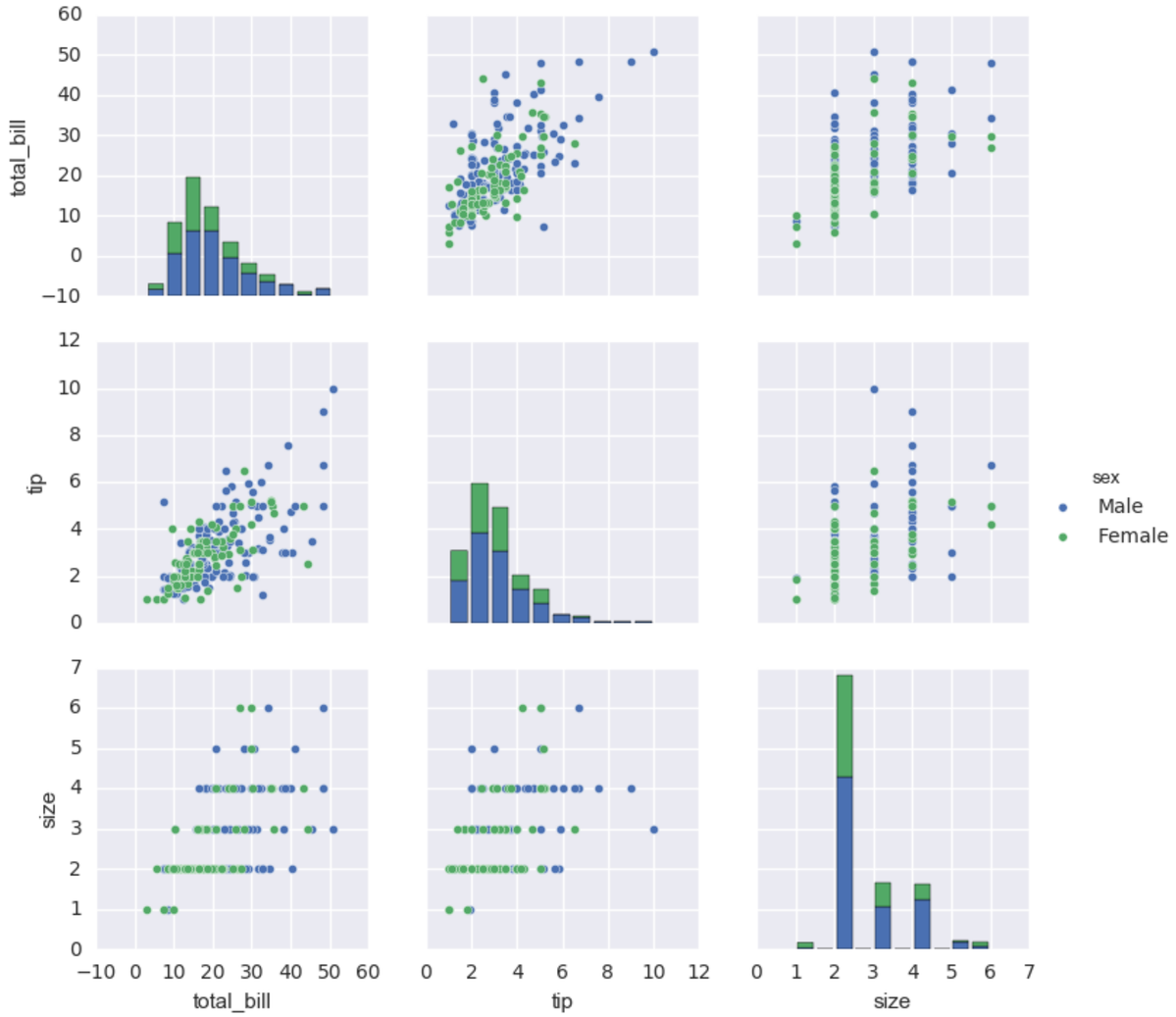
Using pairplot()

```
In [5]: sns.pairplot(tips)

In [6]: plt.show()
```

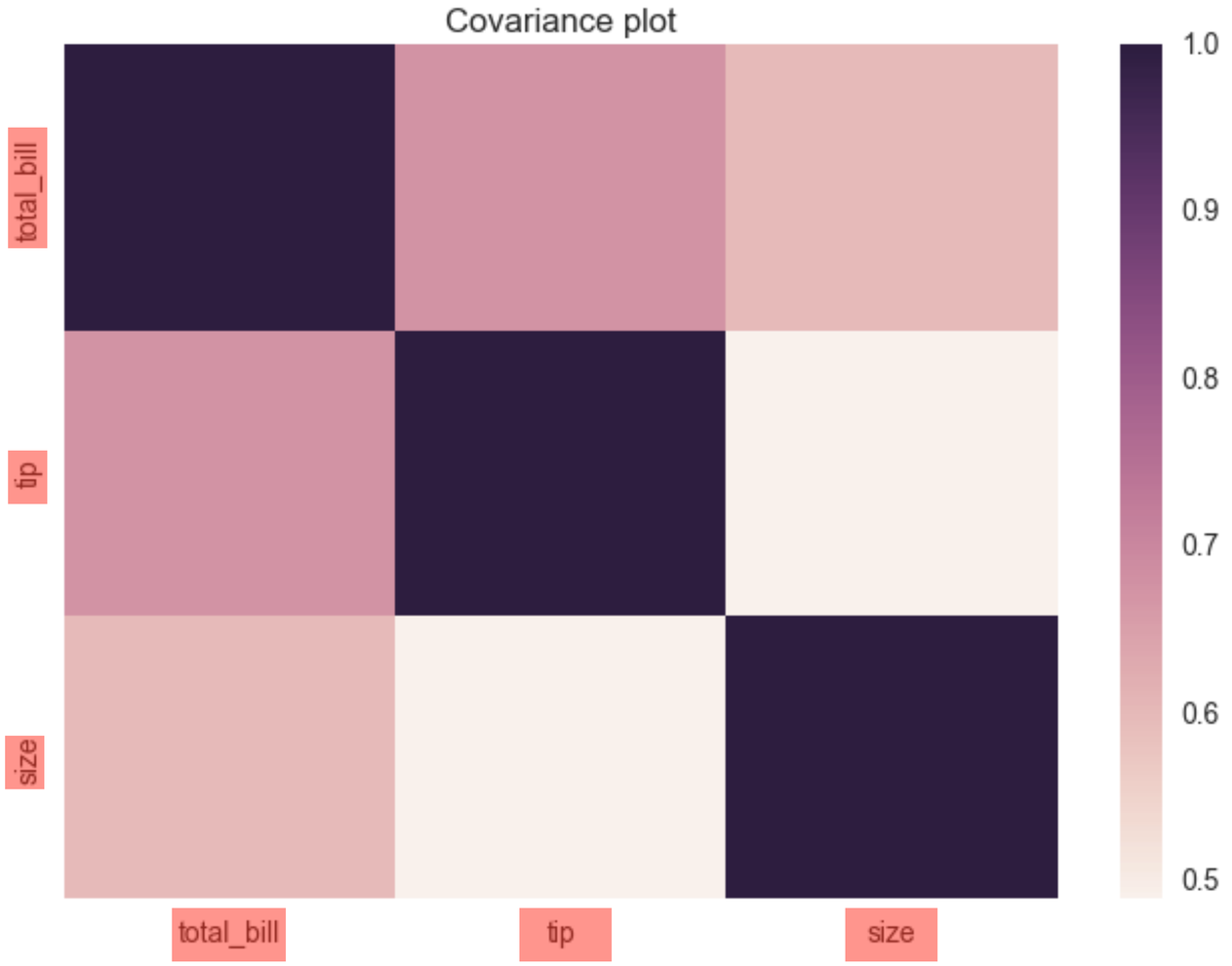
Using pairplot() with hue

```
In [7]: sns.pairplot(tips, hue='sex')

In [8]: plt.show()
```

Using pairplot() with hue



Covariance heat map of tips data



Using heatmap()

```
In [9]:  print(covariance)
             total_bill       tip      size
total_bill     1.000000  0.675734  0.598315
tip            0.675734  1.000000  0.489299
size           0.598315  0.489299  1.000000

In [10]: sns.heatmap(covariance)

In [11]: plt.title('Covariance plot')

In [12]: plt.show()
```

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