Optimal parameters

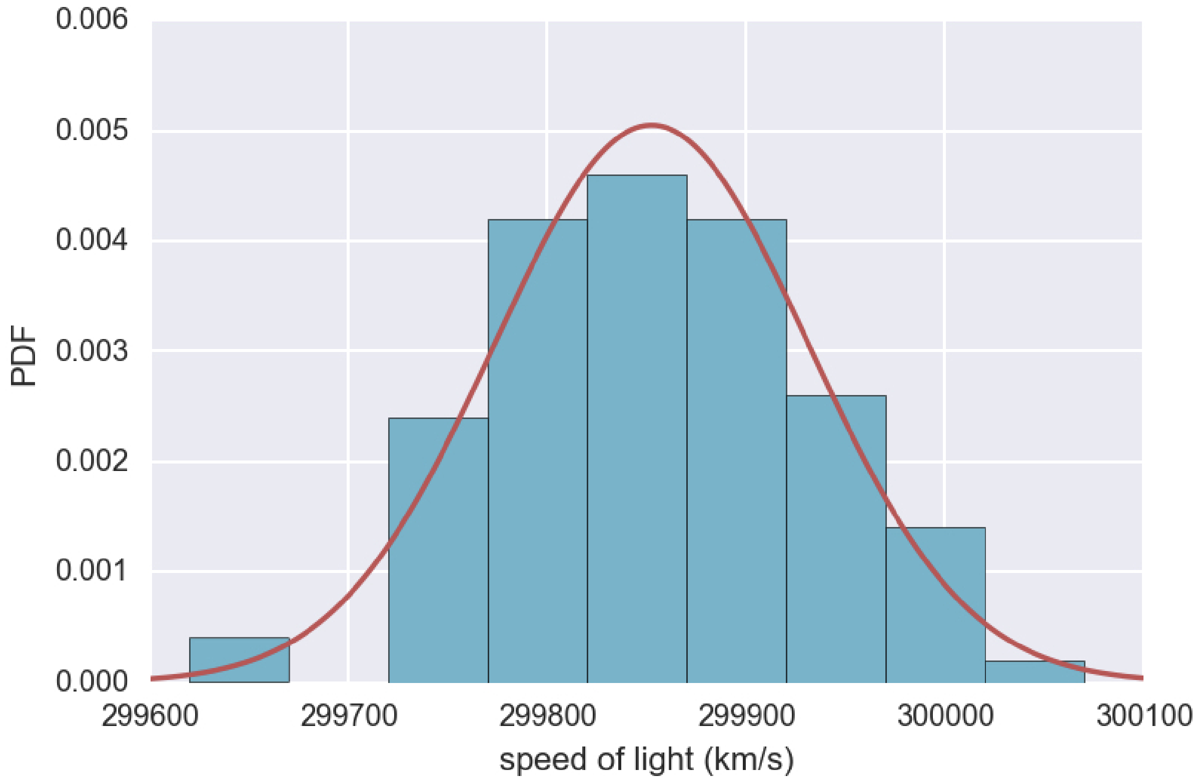
STATISTICAL THINKING IN PYTHON (PART 2)

Justin Bois

Lecturer at the California Institute of Technology

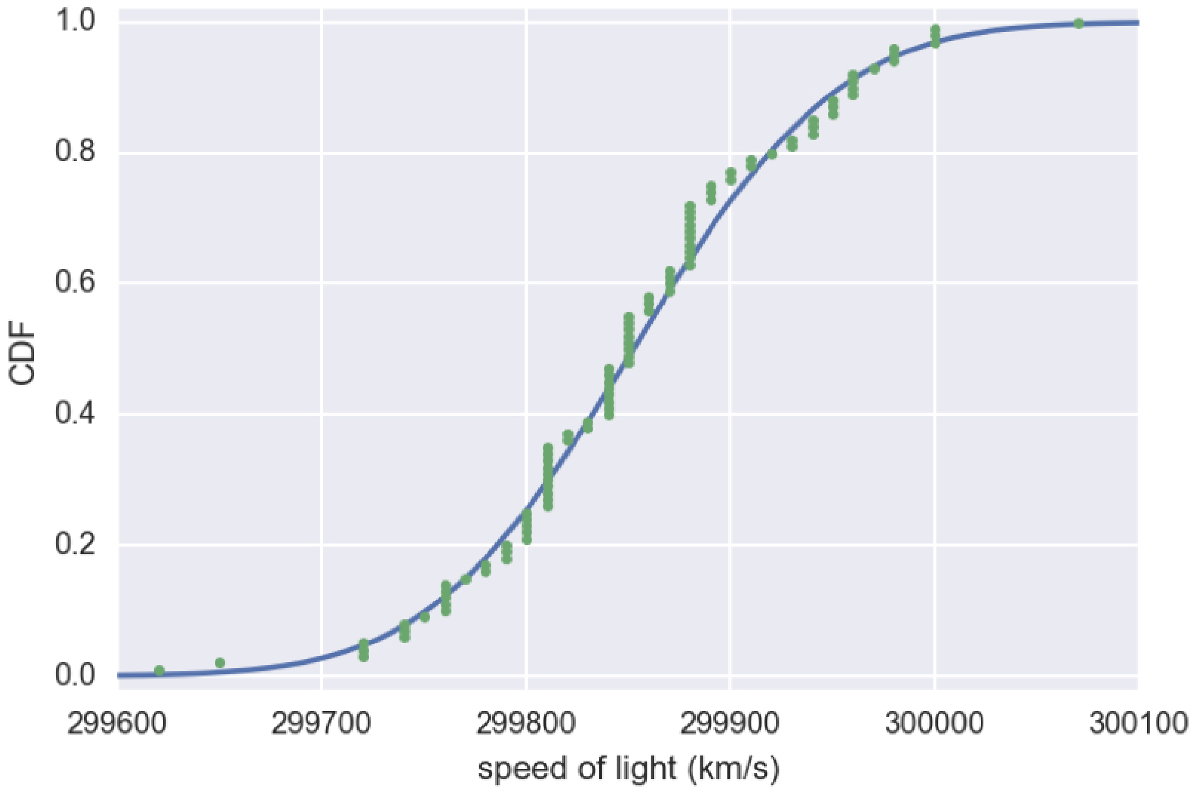
datacamp

Histogram of Michelson's measurements



[1] Data: Michelson, 1880

CDF of Michelson's measurements

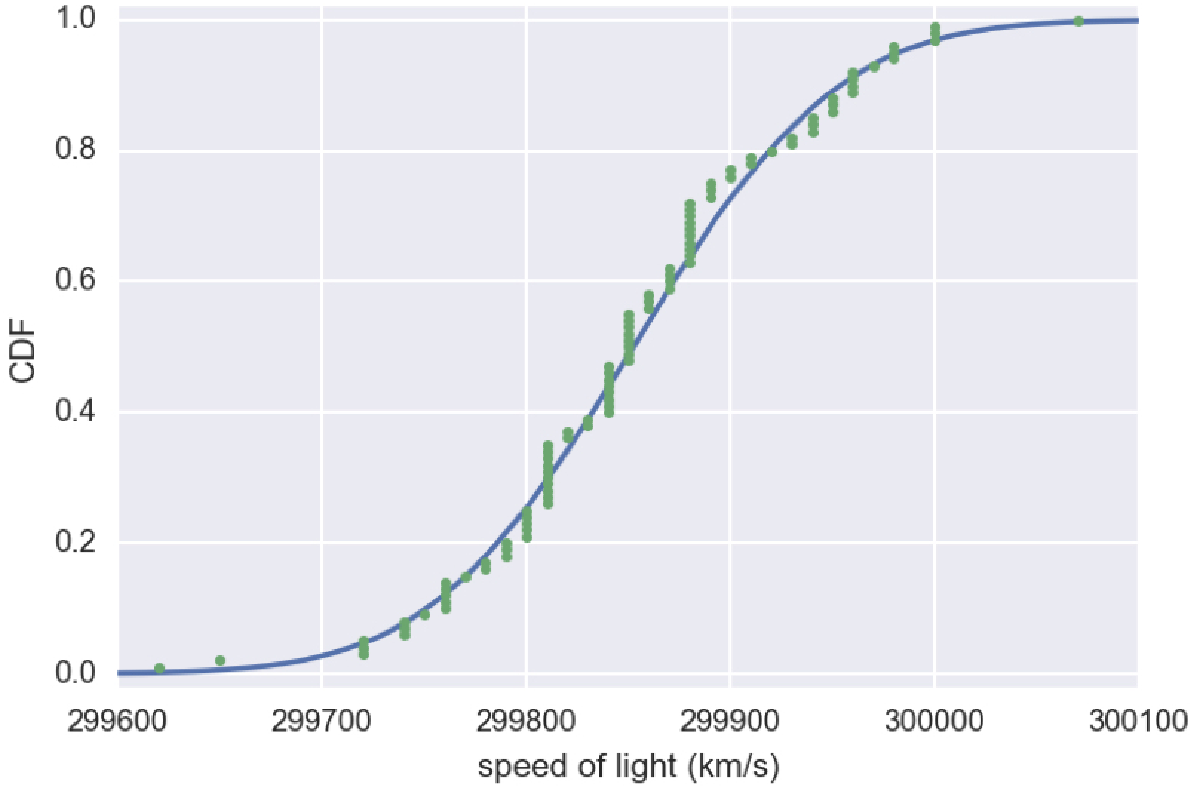


[1] Data: Michelson, 1880

Checking Normality of Michelson data

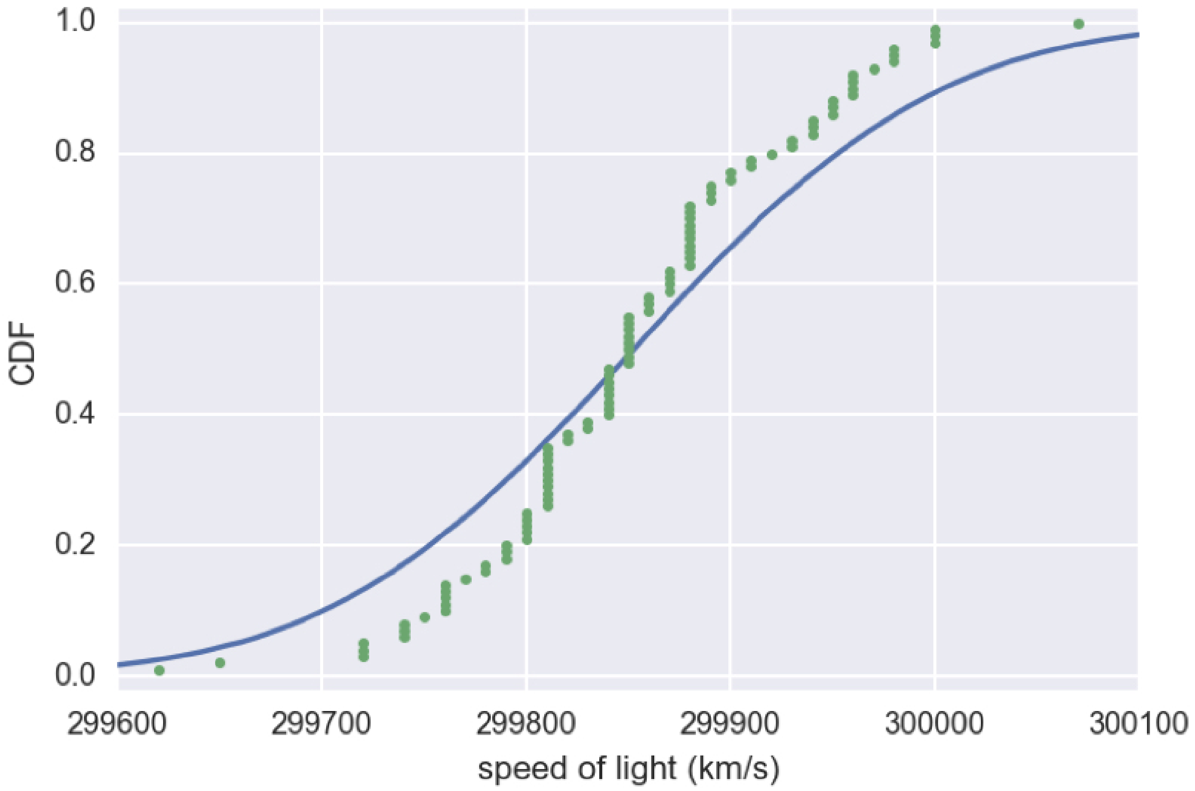
```
import numpy as np
import matplotlib.pyplot as plt
mean = np.mean(michelson_speed_of_light)
std = np.std(michelson_speed_of_light)
samples = np.random.normal(mean, std, size=10000)
```

CDF of Michelson's measurements



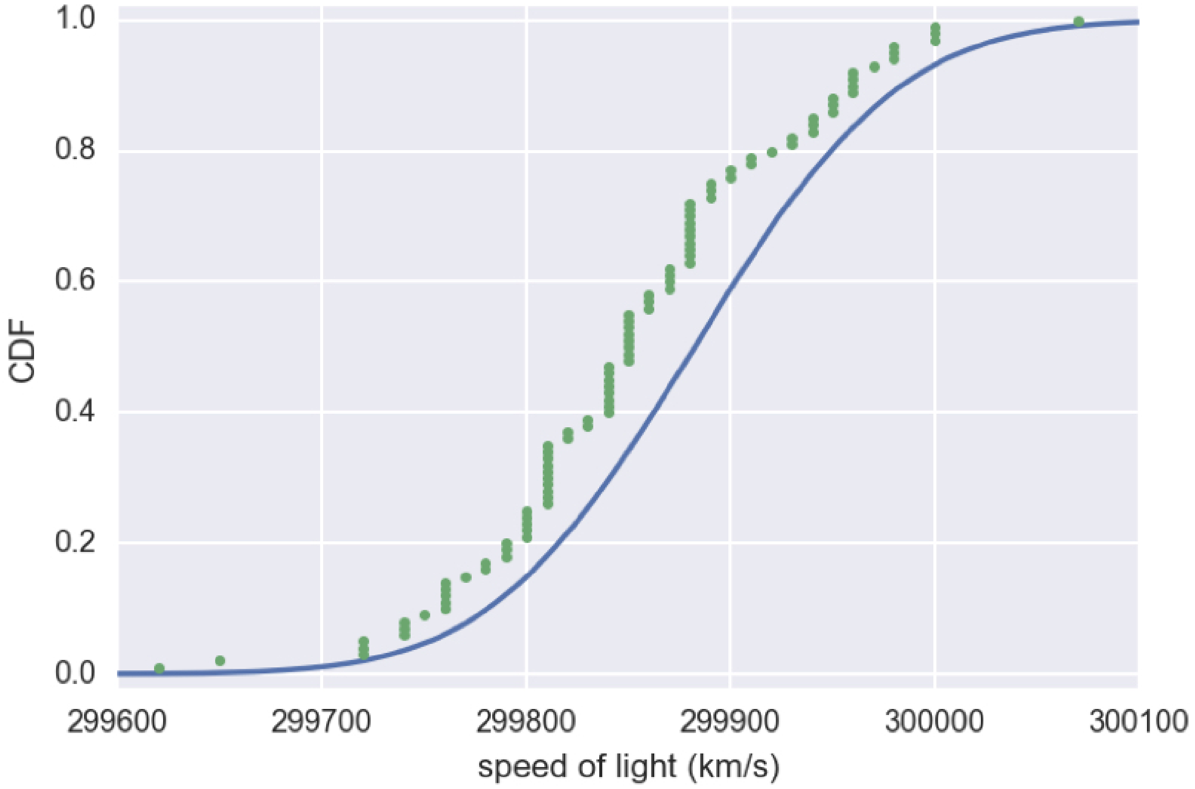
[1] Data: Michelson, 1880

CDF with bad estimate of st. dev.



[1] Data: Michelson, 1880

CDF with bad estimate of mean

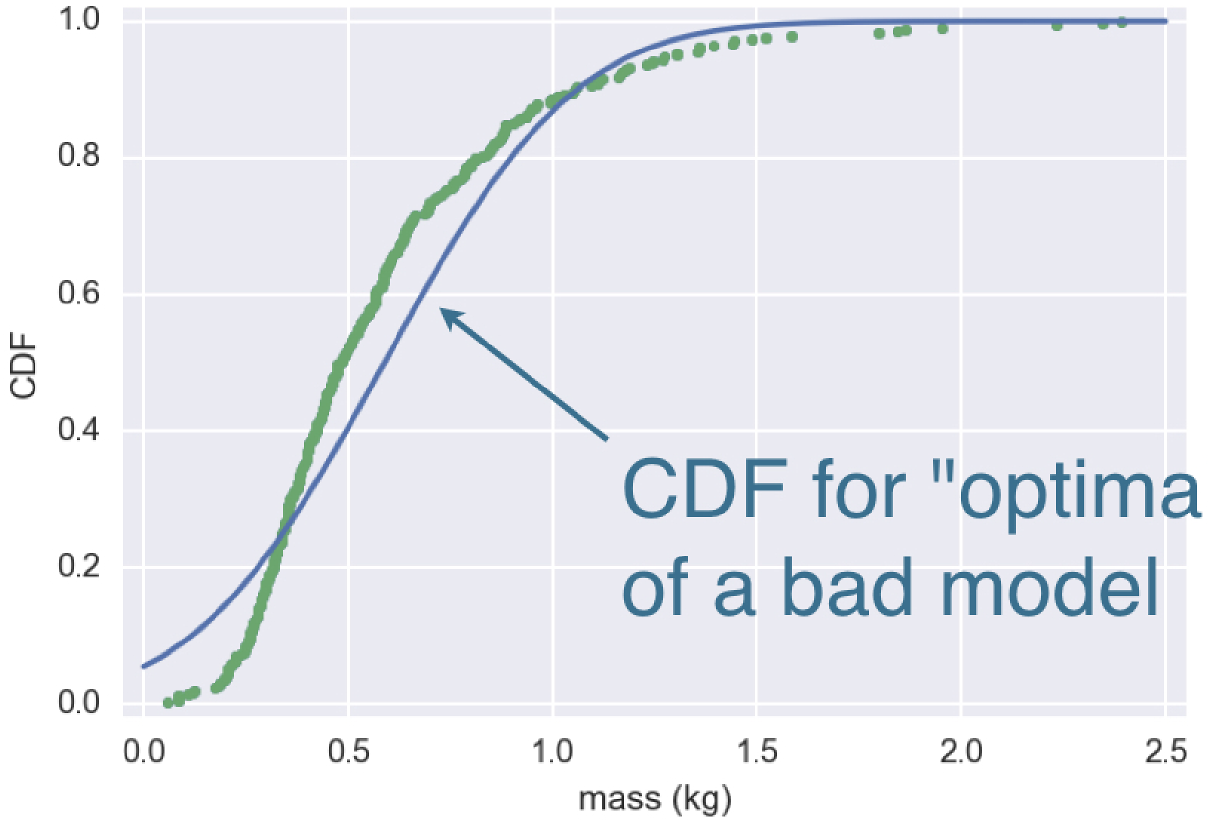


[1] Data: Michelson, 1880

Optimal parameters

- Parameter values that bring the model in closest agreement with the data

Mass of MA large mouth bass



CDF for "optimal" parameters of a bad model

[1] Source: Mass. Dept. of Environmental Protection

Packages to do statistical inference

scipy.stats

Packages to do statistical inference

scipy.stats

statsmodels

Packages to do statistical inference

scipy.stats

statsmodels

hacker stats
with numpy

[1] Knife image: D-M Commons, CC BY-SA 3.0

Let's practice!

STATISTICAL THINKING IN PYTHON (PART 2)

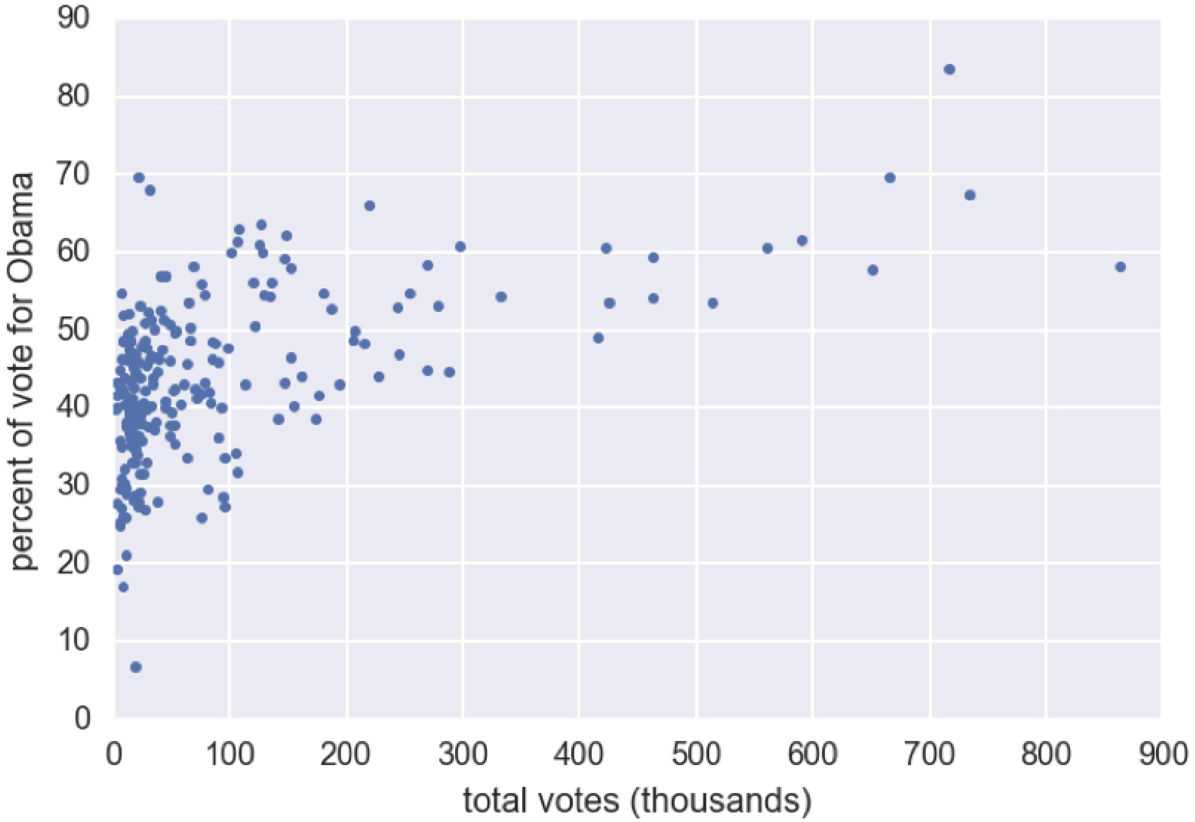
Linear regression by least squares

STATISTICAL THINKING IN PYTHON (PART 2)

Justin Bois

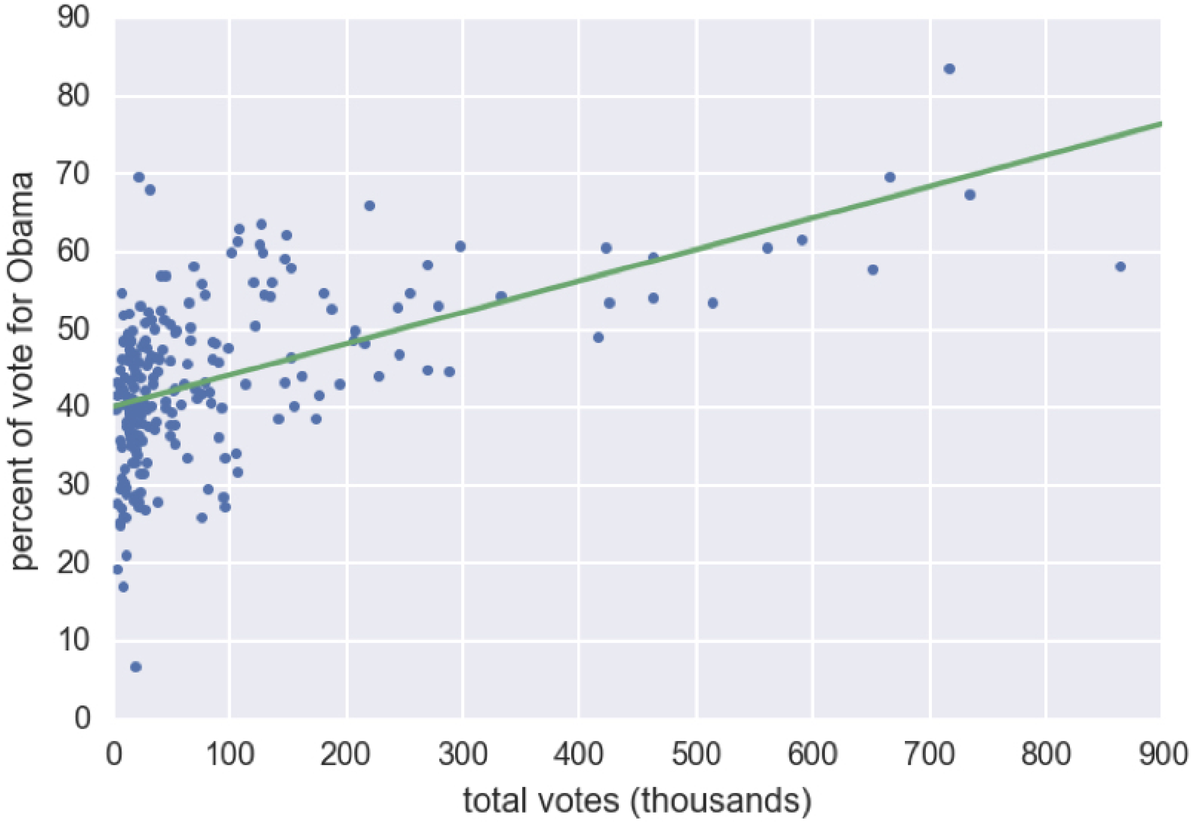
Lecturer at the California Institute of Technology

2008 US swing state election results



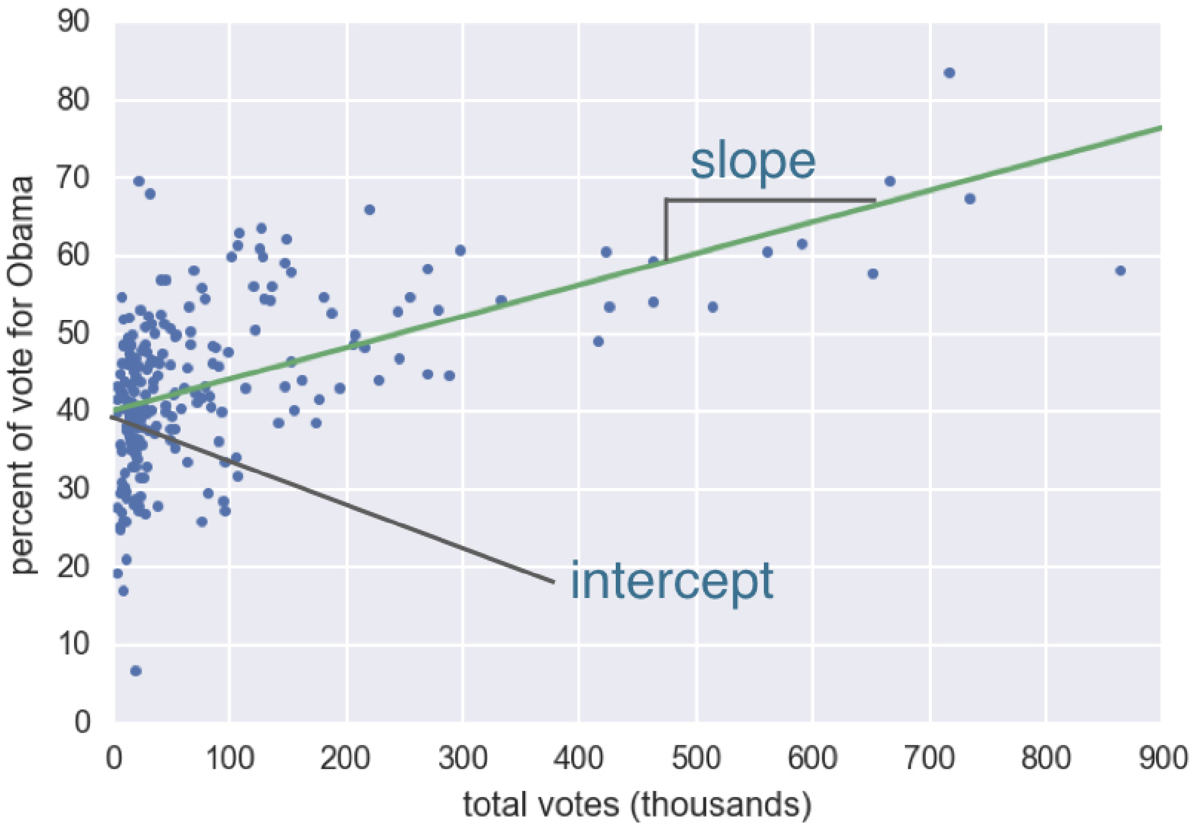
[1] Data retrieved from Data.gov (https://www.data.gov/)

2008 US swing state election results



[1] Data retrieved from Data.gov (https://www.data.gov/)

2008 US swing state election results



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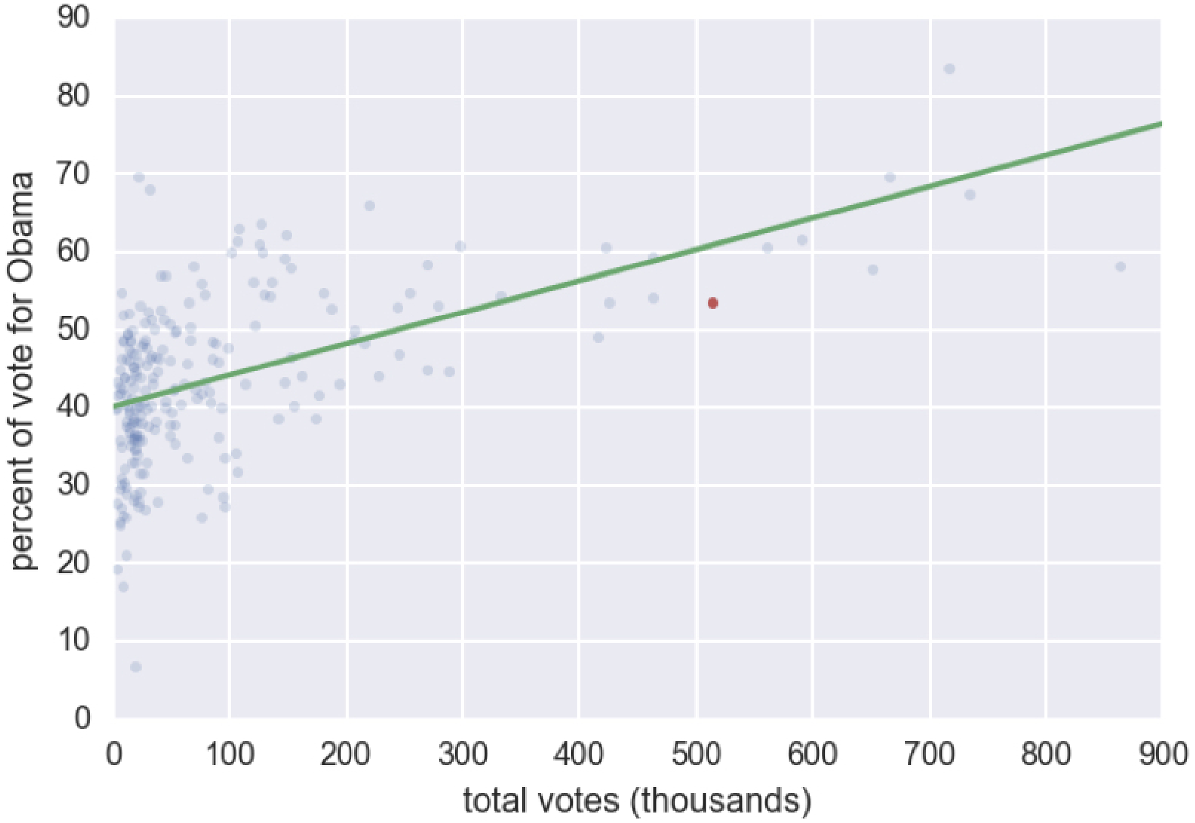
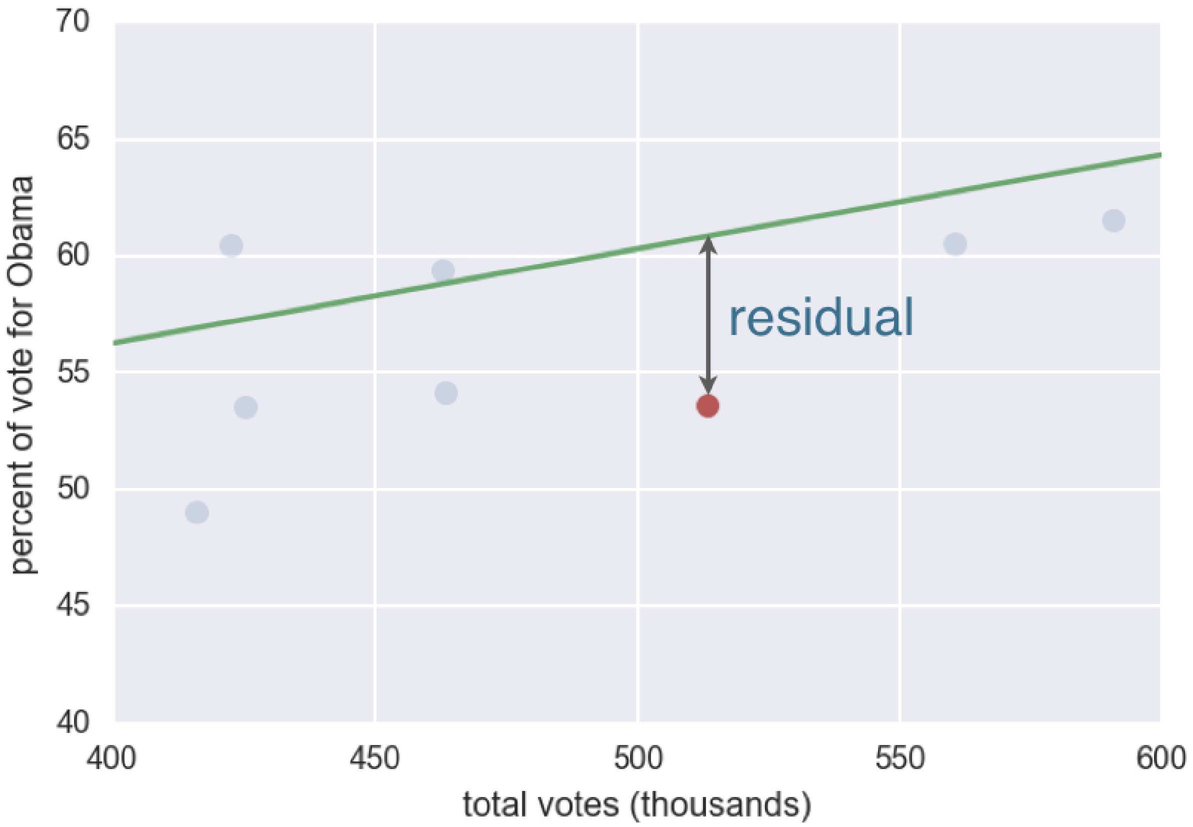


[1] Data retrieved from Data.gov (https://www.data.gov/)

Residuals



[1] Data retrieved from Data.gov (https://www.data.gov/)

Least squares

- The process of finding the parameters for which the sum of the squares of the residuals is minimal

Least squares with np.polyfit()

```
slope, intercept = np.polyfit(total_votes,
                              dem_share, 1)
slope
```

```
4.037071700946555e-05
```

```
intercept
```

```
40.113911968641744
```

Let's practice!

STATISTICAL THINKING IN PYTHON (PART 2)

The importance of EDA: Anscombe's quartet

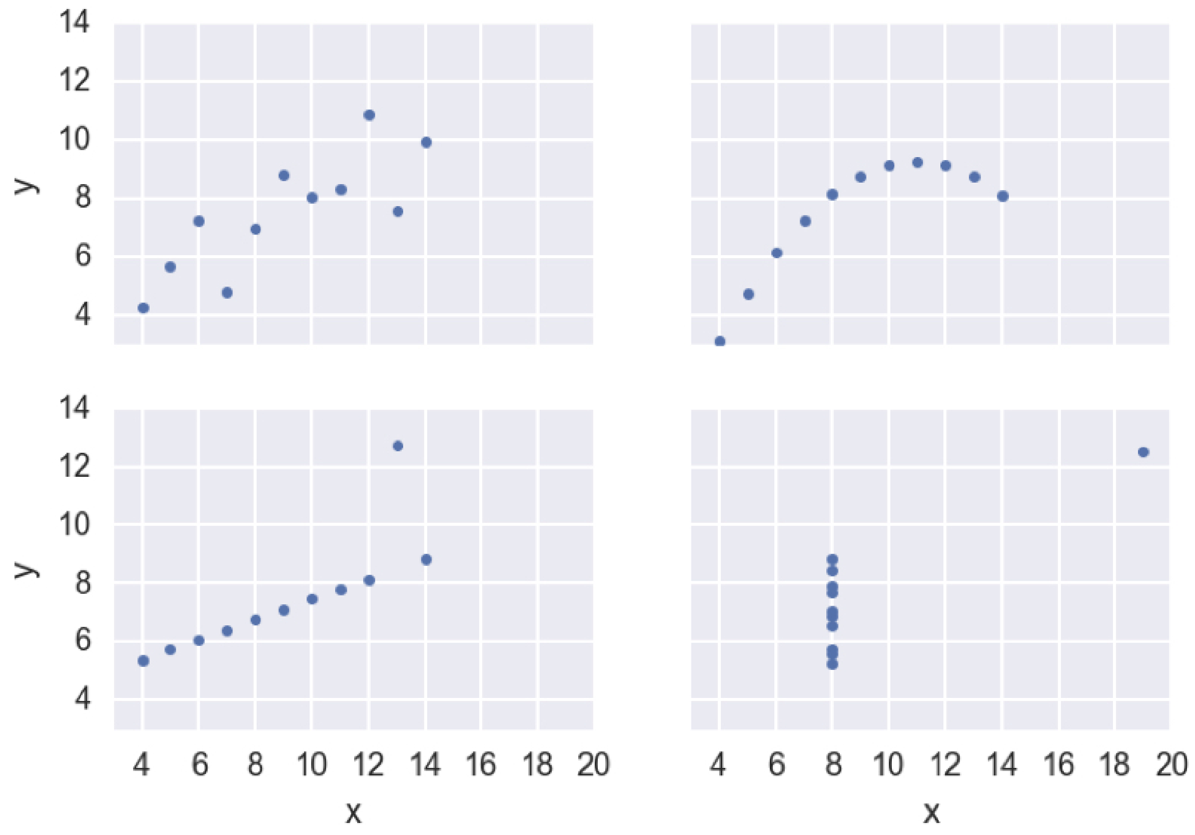
STATISTICAL THINKING IN PYTHON (PART 2)

Justin Bois

Lecturer at the California Institute of Technology

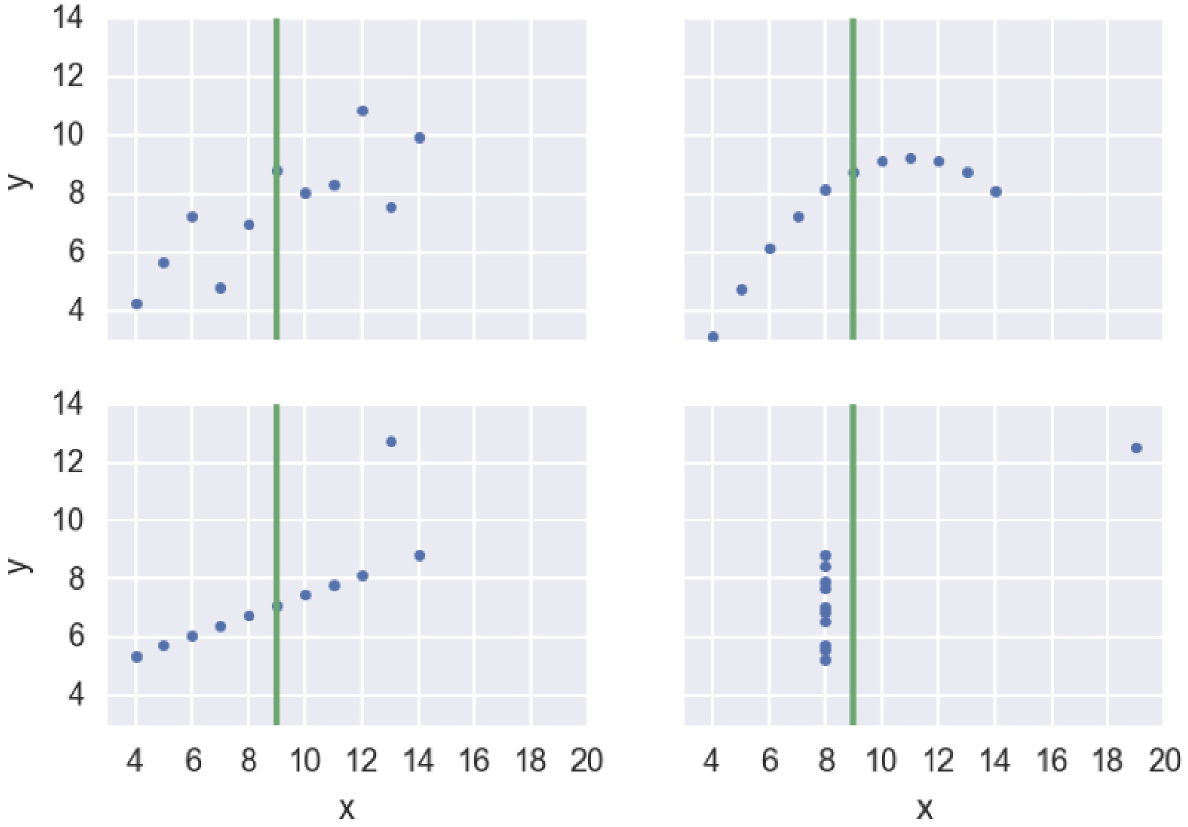
datacamp

Anscombe's quartet



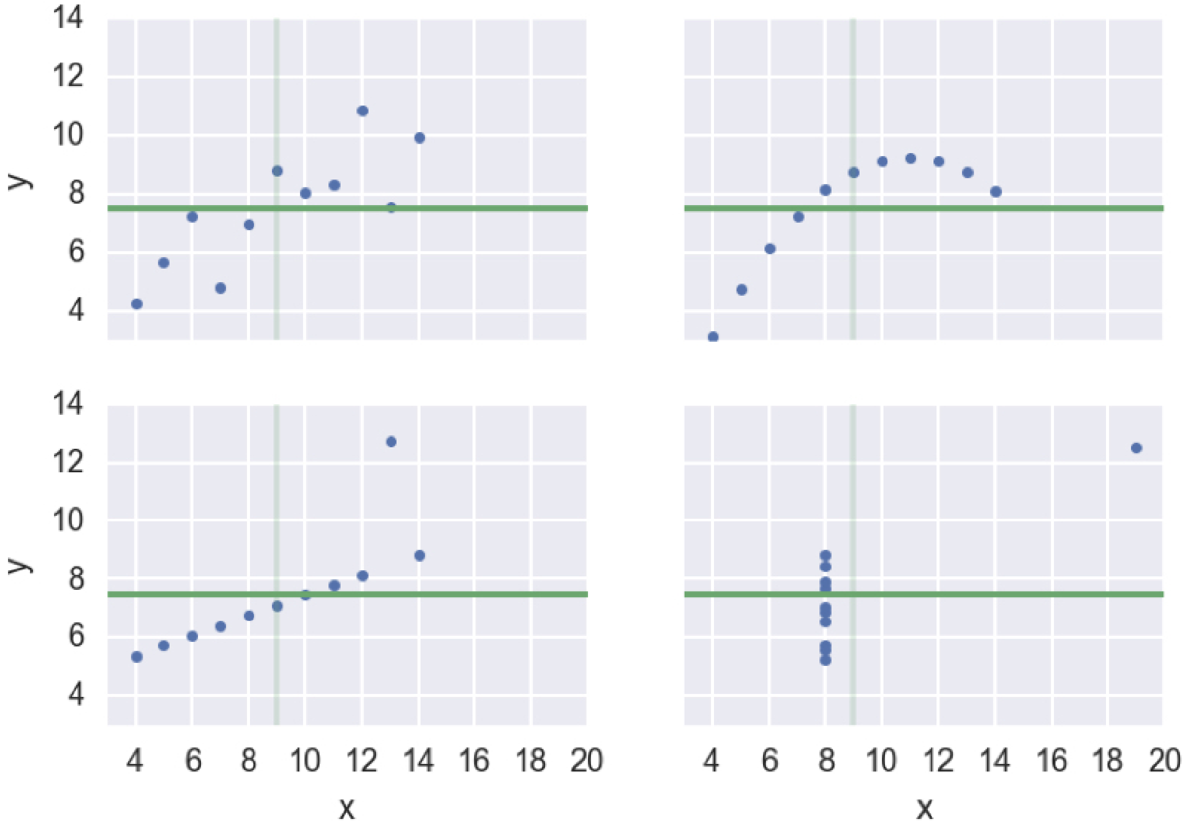
[1] Data: Anscombe, The American Statistician, 1973

Anscombe's quartet



[1] Data: Anscombe, The American Statistician, 1973

Anscombe's quartet



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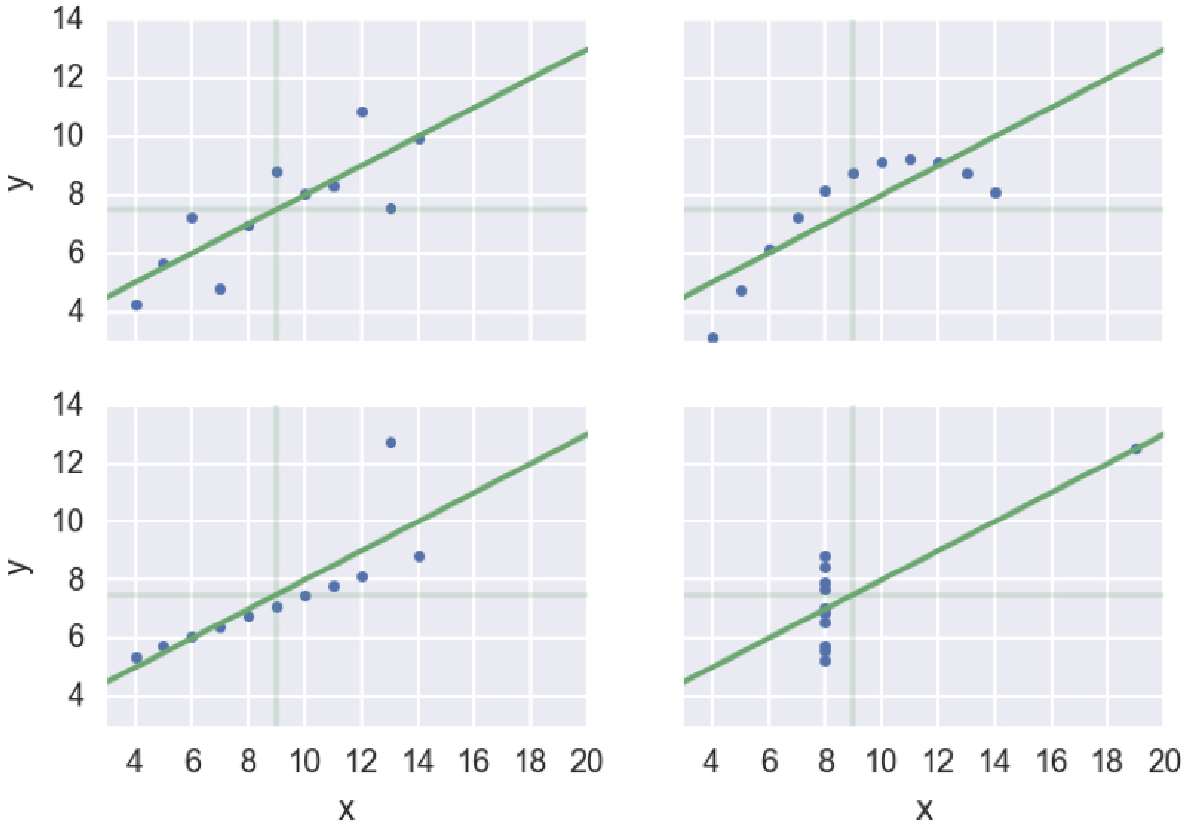
Anscombe's quartet



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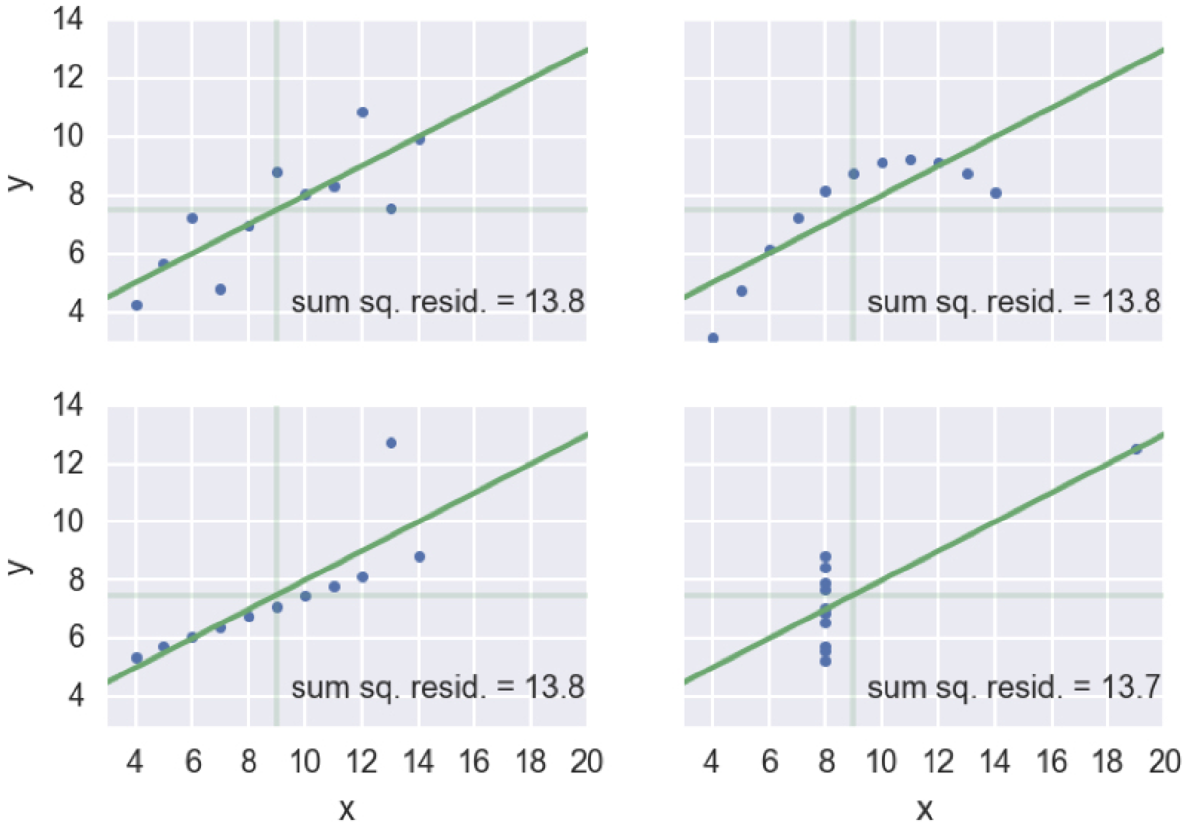
Anscombe's quartet

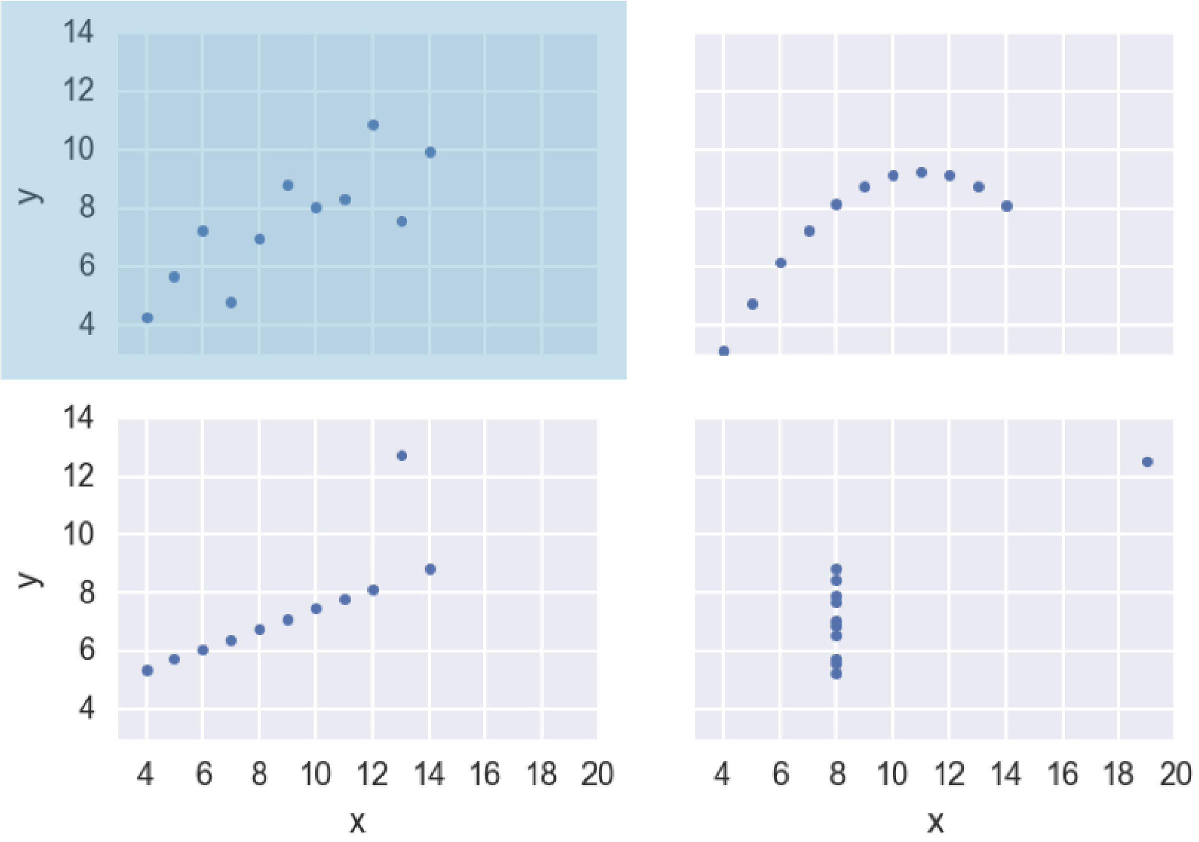


[1] Data: Anscombe, The American Statistician, 1973

Look before you leap!

- Do graphical EDA first

Anscombe's quartet



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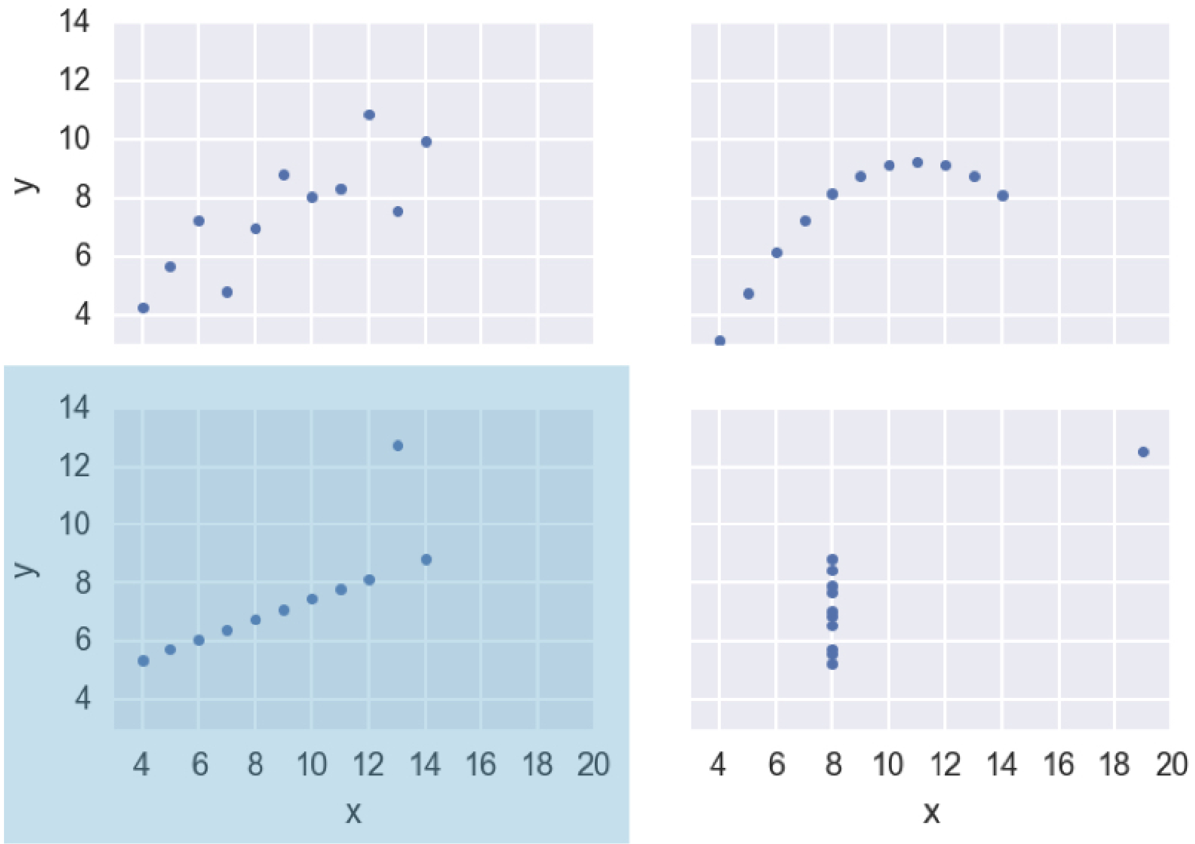
Anscombe's quartet



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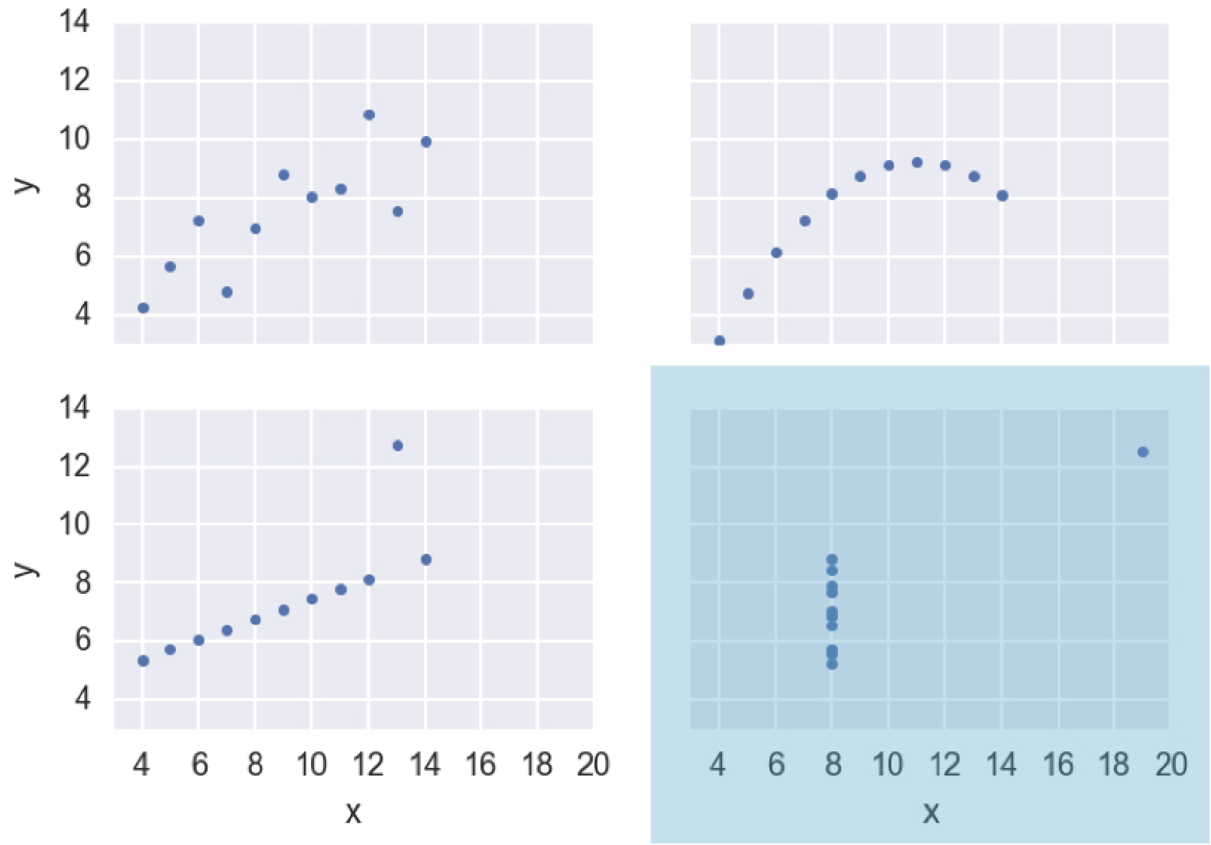
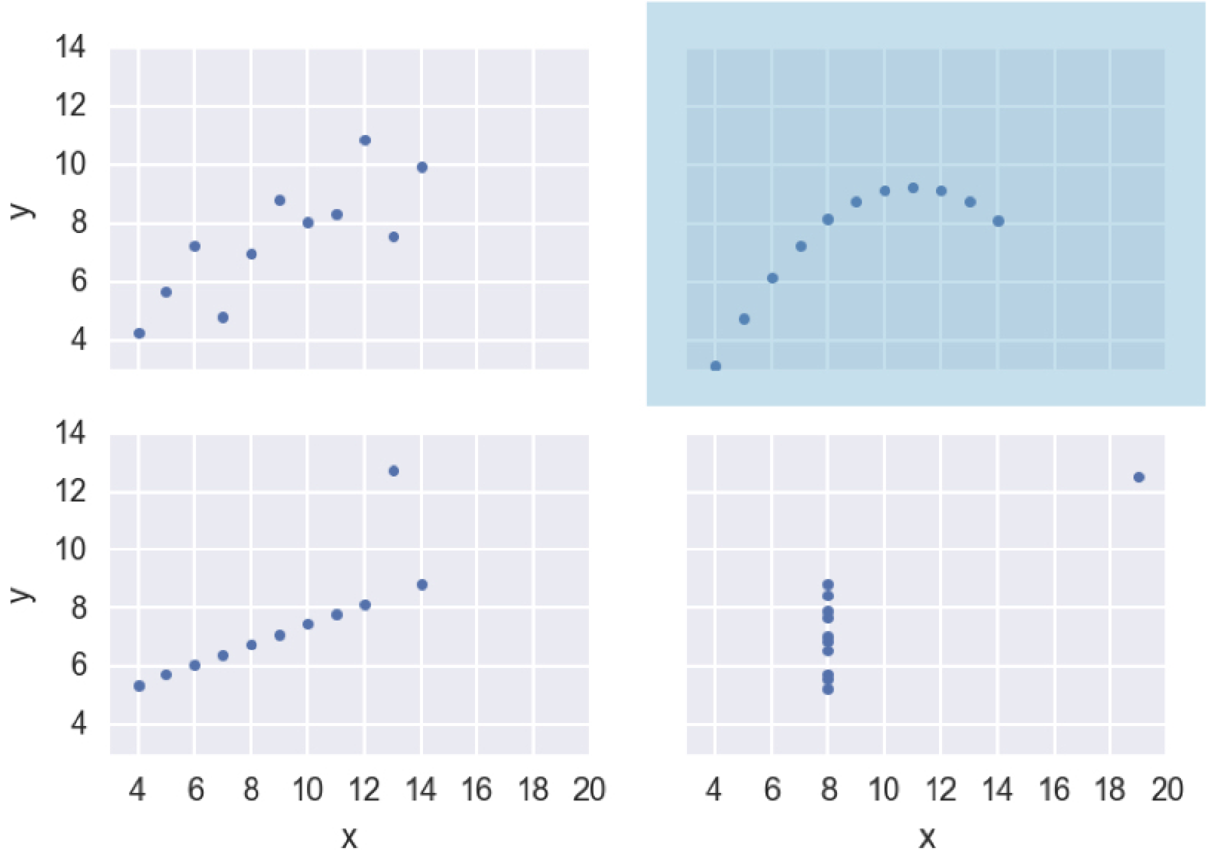
Anscombe's quartet



[1] Data: Anscombe, The American Statistician, 1973

Anscombe's quartet



[1] Data: Anscombe, The American Statistician, 1973

Let's practice!

STATISTICAL THINKING IN PYTHON (PART 2)