

Predictive Modelling with Python

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Introduction to scikit-learn

Artificial data sets, illustration of basic regression and classification techniques



Regression & Classification

Individual work: data preparation, Visualization, Modelling, Feature selection, Evaluation

Installation



The most elegant way to install the required software is by installing [Conda](#).
You can either install:

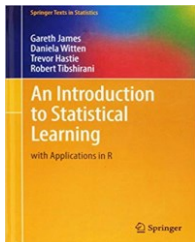
- the entire set of packages in [Anaconda](#), or
- install [Miniconda](#) first, and manually add packages
scikit-learn, pandas and matplotlib:

```
conda install -c intel scikit-learn
```

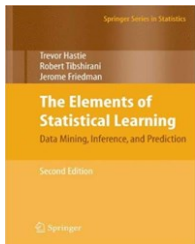
```
conda install pandas matplotlib
```

Github sources: [jurezabkar/fri-ds-python-ml](#)

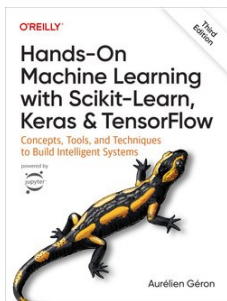
References



James G, Witten D, Hastie T, Tibshirani R (2013)
An introduction to statistical learning, Springer.



Hastie T, Tibshirani R, Friedman J (2017)
The Elements of Statistical Learning, 2nd Ed., Springer.



Géron, A (2022)
Hands-on machine learning with Scikit-Learn, Keras and TensorFlow, O'Reilly.

What will you learn?

- How to import the data
- Data preprocessing & visualization
- Computing basic data set statistics
- Basic regression and classification with sklearn
- How to tune the parameters of ML algorithms
- Proper evaluation



ParkinsonCheck™

- A smartphone app for (early) detection of motoric signs of Parkinson's disease and some other tremors
- Freely available in Slovenia
- A built-in expert system enables users to use it in their home environment
- Fully standalone, no need to communicate with an outside server or sensor
- Based on spirometry, but enhanced with other sensors, e.g. accelerometry

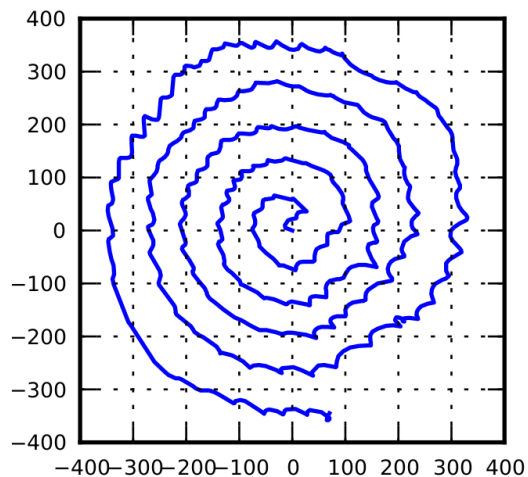


<http://www.parkinsoncheck.net/>

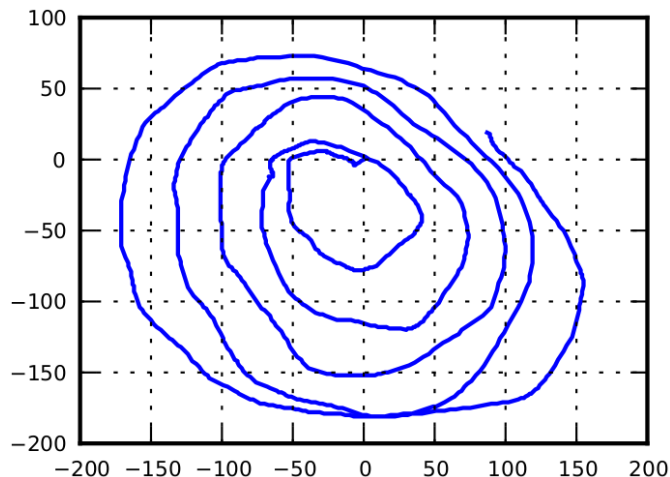
Early detection,
Patient monitoring



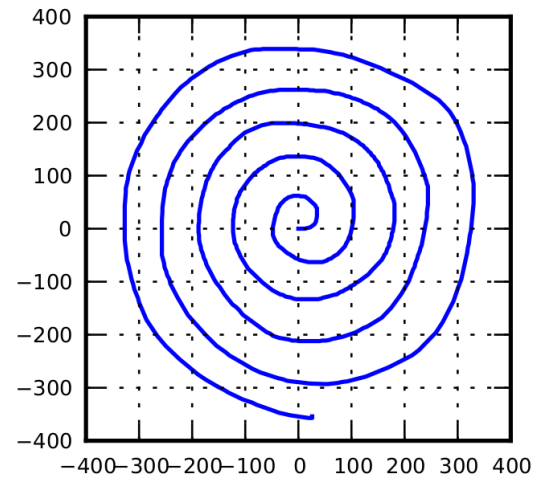
Esencialni tremor



Parkinsonski tremor



Zdrava oseba



Classification: Iris dataset

3 types of Iris:

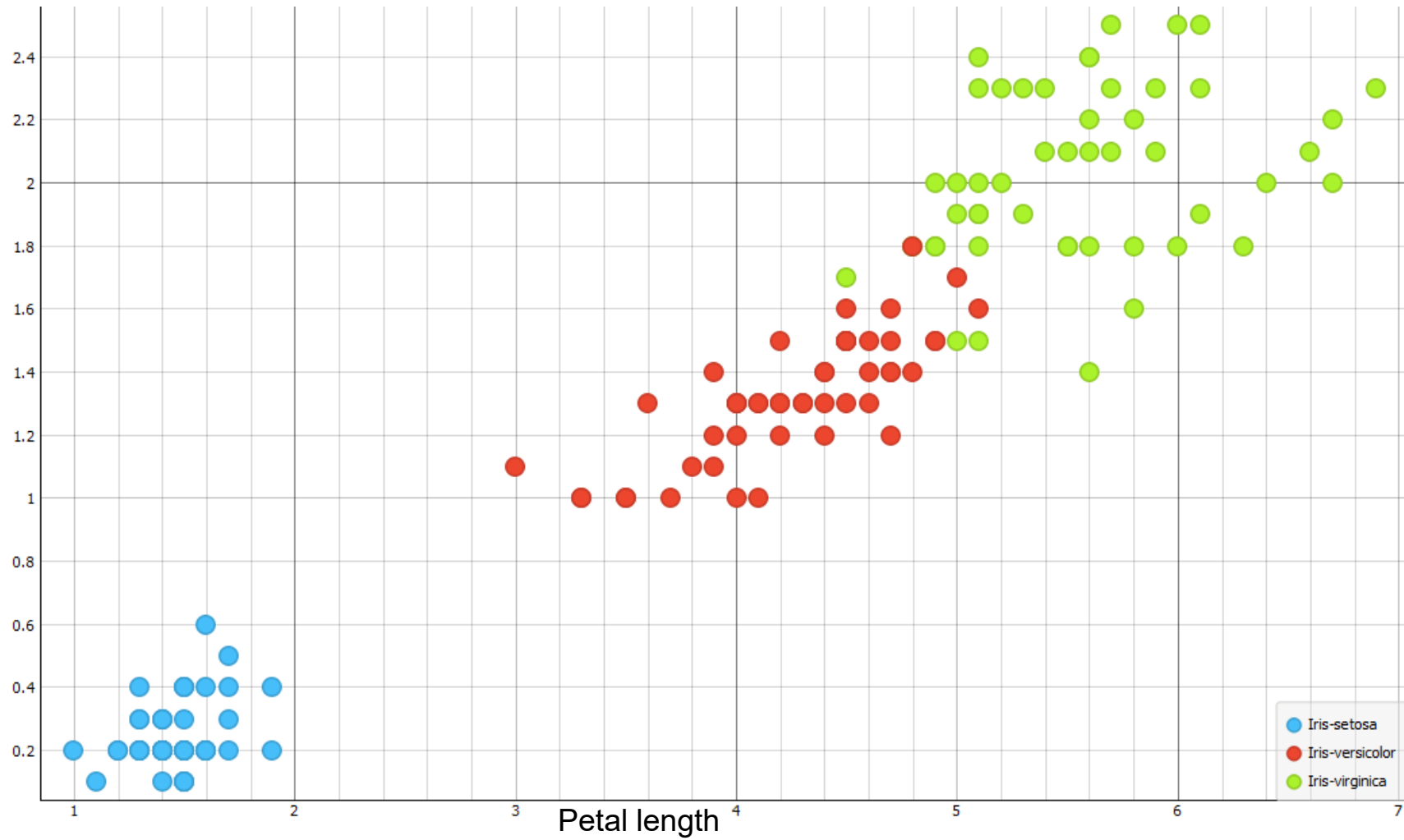
- Setosa
- Virginica
- Versicolor



iris	sepal length	sepal width	petal length	petal width
Iris-setosa	5.1	3.5	1.4	0.2
Iris-setosa	4.9	3.0	1.4	0.2
Iris-setosa	4.7	3.2	1.3	0.2
Iris-setosa	4.6	3.1	1.5	0.2
Iris-setosa	5.0	3.6	1.4	0.2
Iris-setosa	5.4	3.9	1.7	0.4
Iris-setosa	4.6	3.4	1.4	0.3

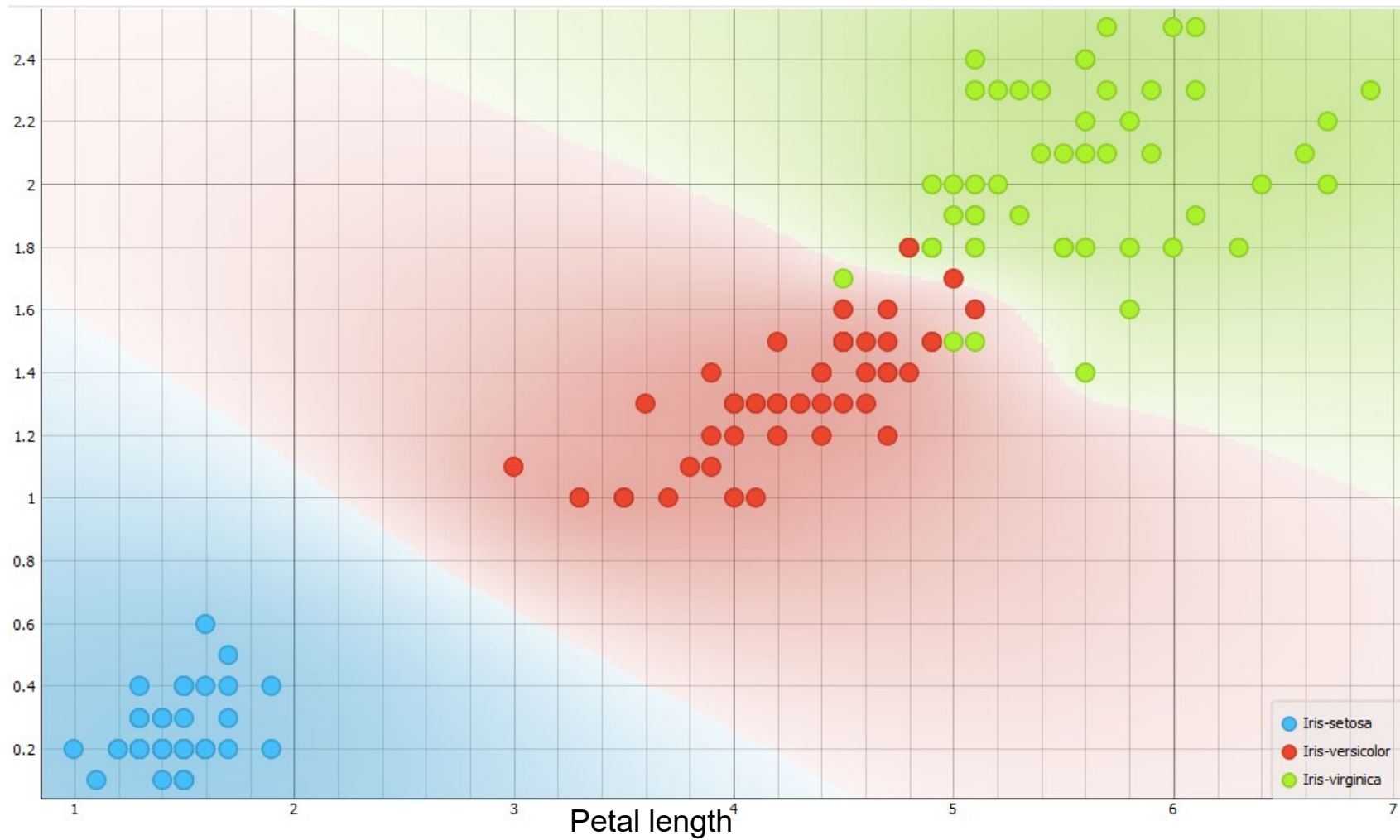
Iris

Petal width



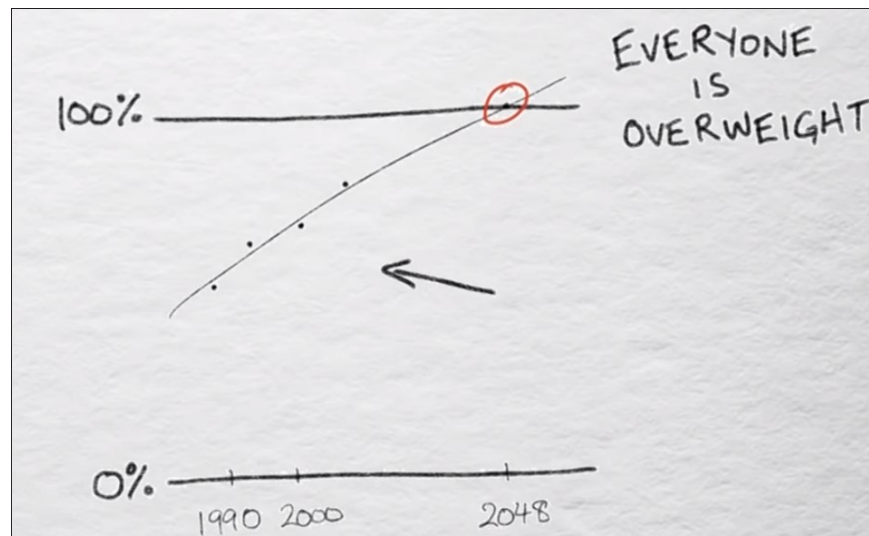
Iris

Petal width



Regression: Obesity apocalypse

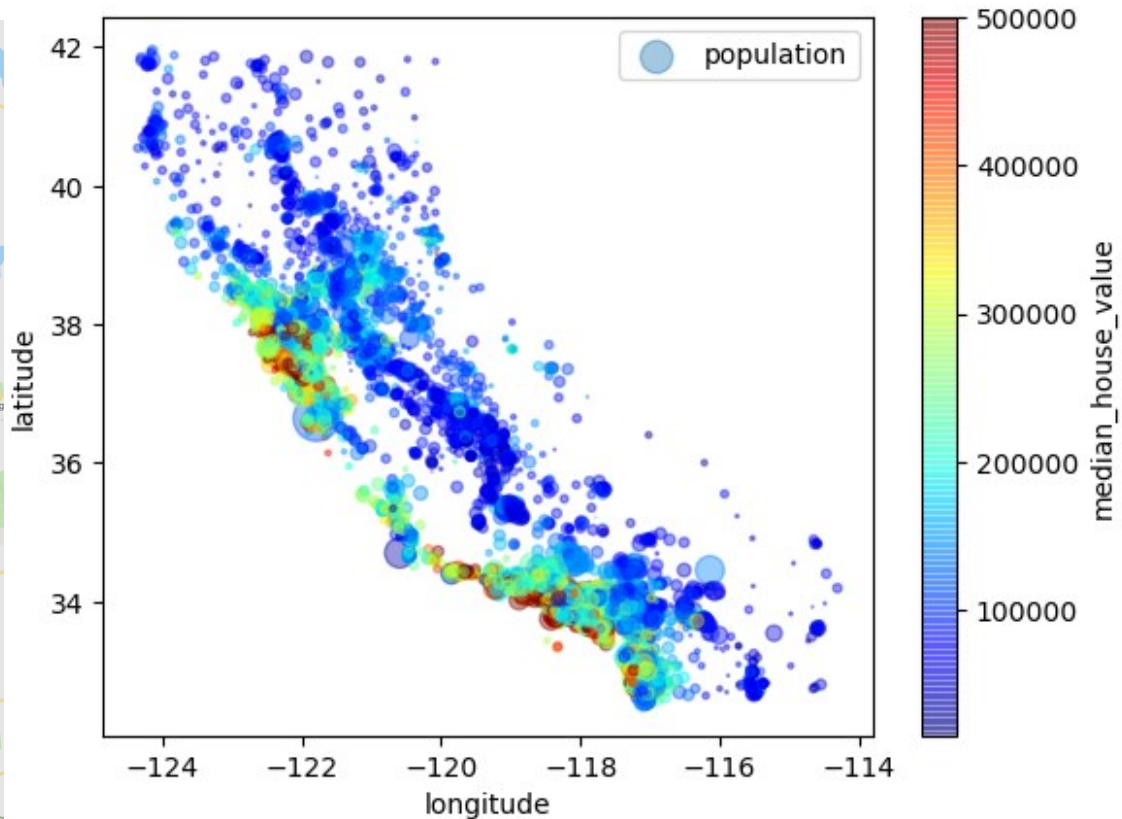
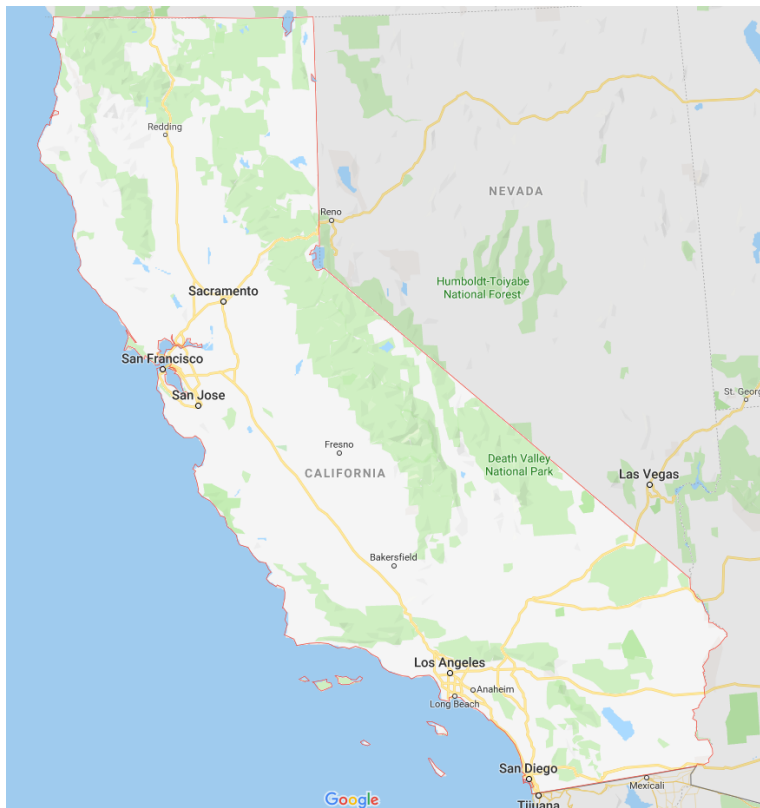
abcNEWS: "By 2048, all American adults would become overweight or obese."



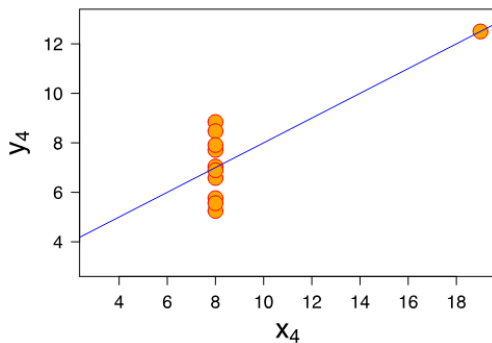
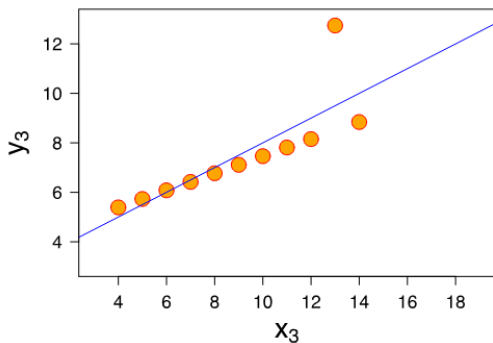
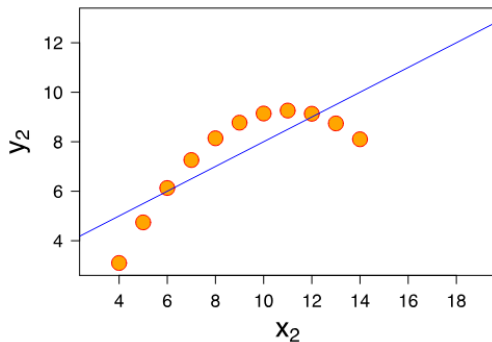
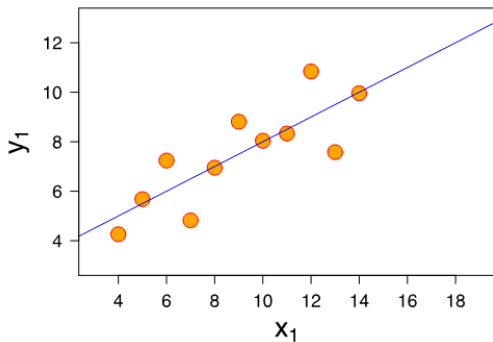
<https://abcnews.go.com/Health/Fitness/story?id=5499878&page=1>



California housing



Visualize your data



4 data sets

Nearly identical statistics

Very different plots

source:

https://en.wikipedia.org/wiki/Anscombe%27s_quartet

California housing: **tasks**

- Import & visualize the data (datasets/housing.csv)
- Split the data set to a training set and a test set (stratified, 70:30)
- Compute/visualize correlations ("median_house_value", "median_income", "total_rooms", "housing_median_age")
- Prepare the training set for ML algorithms:
 - Add new features
 - Impute features with missing values
 - Scale the data
- Learning:
 - Choose appropriate algorithms
 - Use internal cross-validation to tune the parameters
 - Evaluate on training set
- Evaluate on test set