Learning from the Past: with Scikit-Learn

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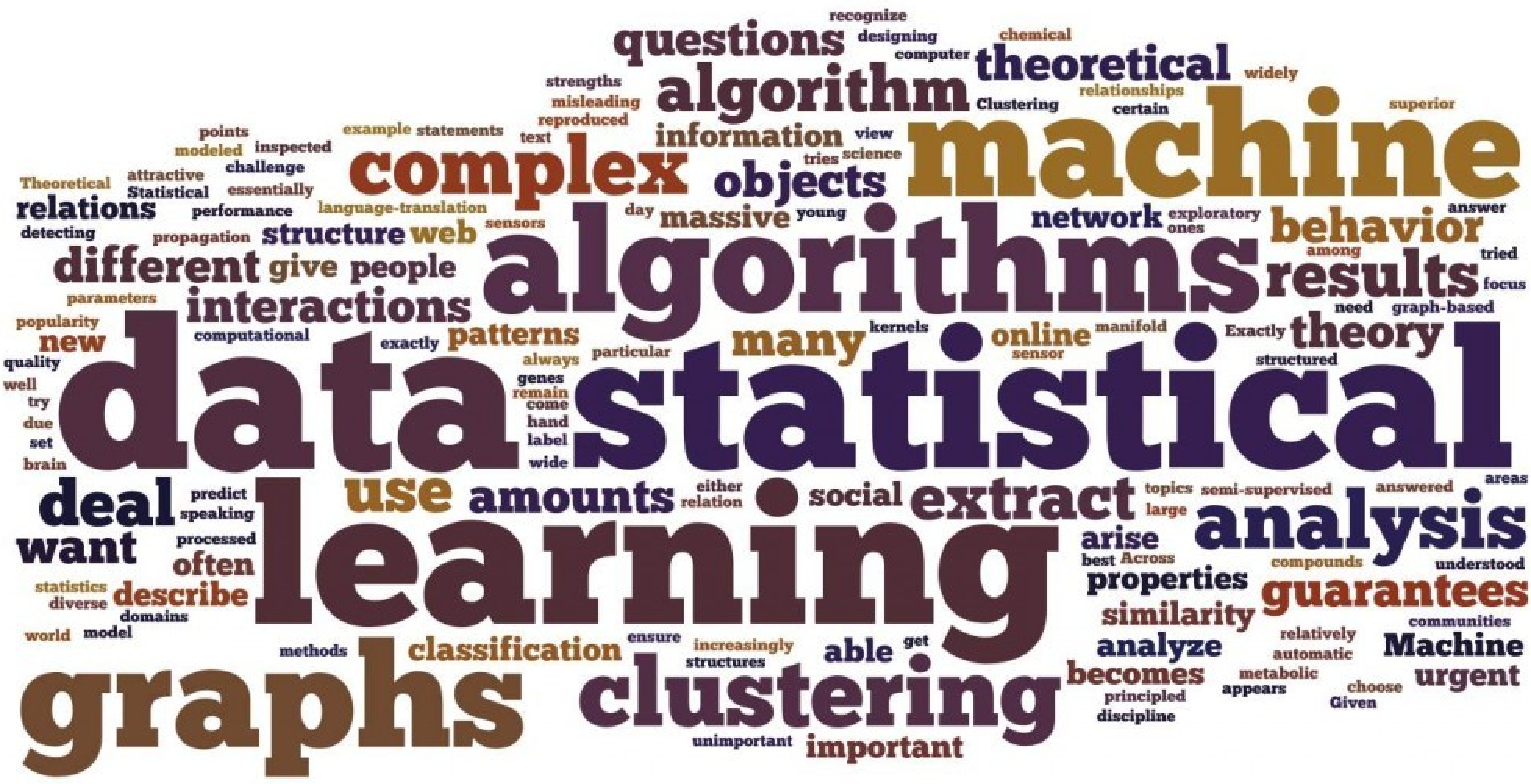
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Agenda

- Basics of Machine Learning
- Introduction some common techniques
- Let you know scikit-learn exists
- Some inspiration on using machine learning in daily life scenarios and live projects.

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How to draw a snake?

and ...

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How to draw a snake?

This is WEIRD!

and ...

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Introduction

A lot of Data!

What to do???

Introduction

What is

Machine Learning

(Data Mining)?

(in plain english)

Machine Learning

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E"

Tom M. Mitchell

Machine Learning

- Supervised Learning - model.fit(X, y)
- Unsupervised Learning - model.fit(X)

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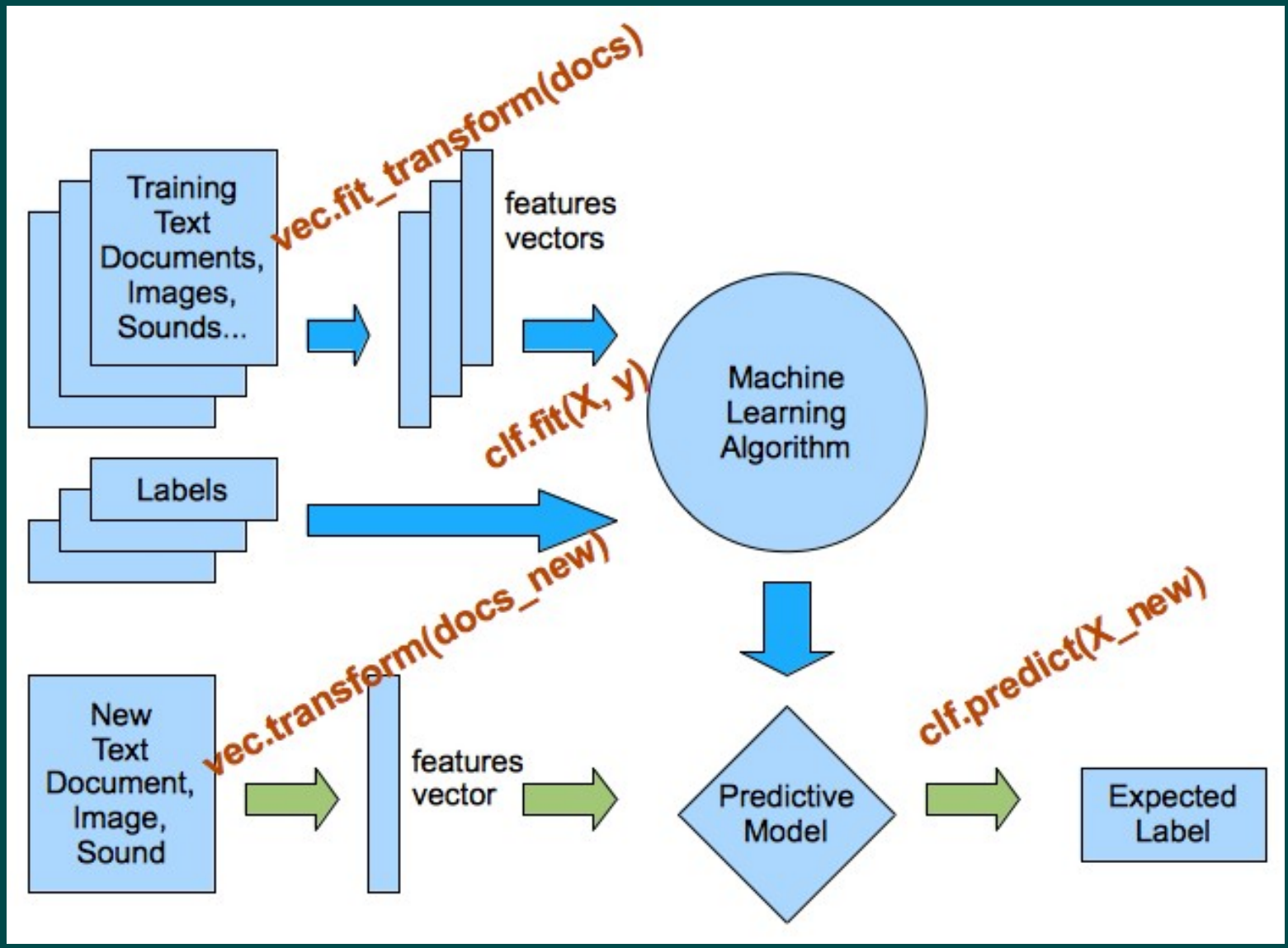
Supervised Learning



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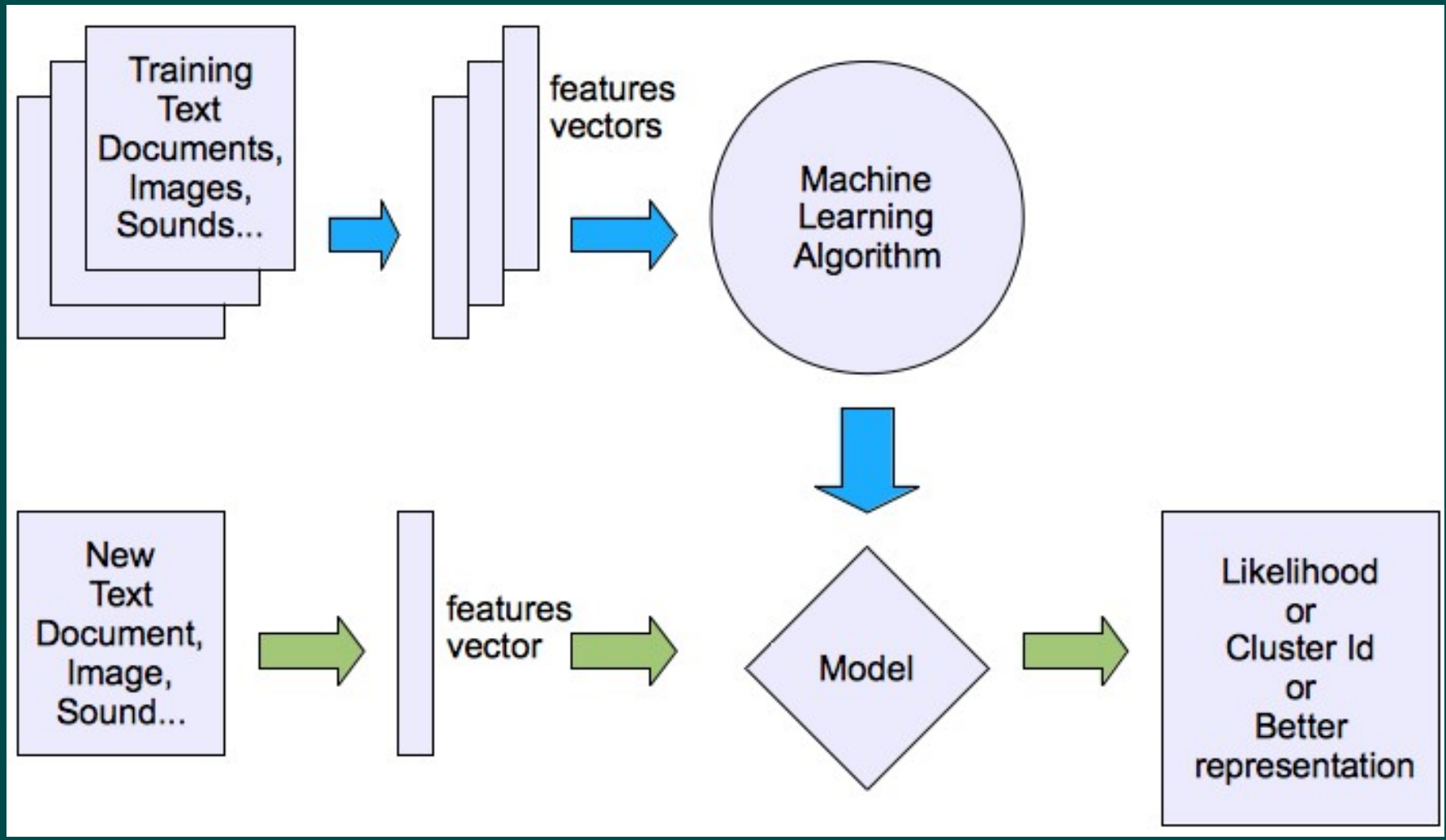
For example ...

```
from sklearn.linear_model import Ridge as RidgeRegression
from sklearn import datasets
from matplotlib import pyplot as plt

boston = datasets.load_boston()
X = boston.data
y = boston.target
clf = RidgeRegression()
clf.fit(X, y)
clf.predict(X)
```

Unsupervised Learning



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For example ...

```
from sklearn.cluster import KMeans
from numpy.random import RandomState
rng = RandomState(42)
k_means = KMeans(3, random_state=rng)
k_means.fit(X)
```

What can Scikit-learn do?

Clustering
Classification
Regression

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Terminology

- **Model** the collection of parameters you are trying to fit
- **Data** what you are using to fit the model
- **Target** the value you are trying to predict with your model
- **Features** attributes of your data that will be used in prediction
- **Methods** algorithms that will use your data to fit a model

Steps for Analysis

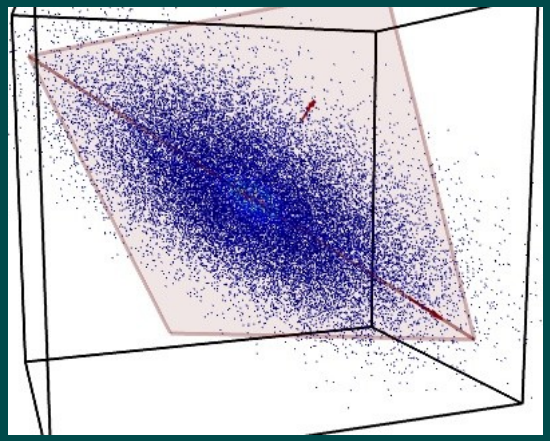
- Understand the task. See how to measure the performance.
- Choose the source of training experience.
- Decide what will be input and output.
- Choose a set of models to the output function.
- Choose a learning algorithm.

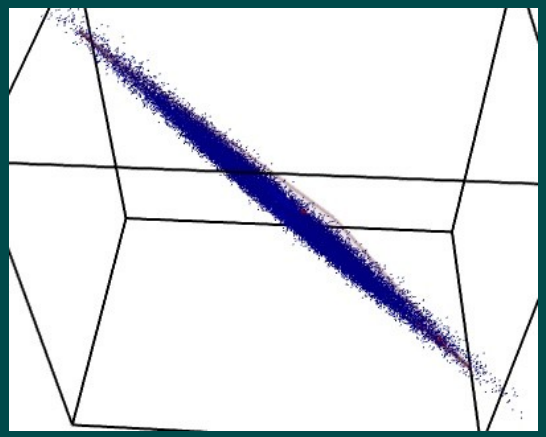
Steps for Analysis

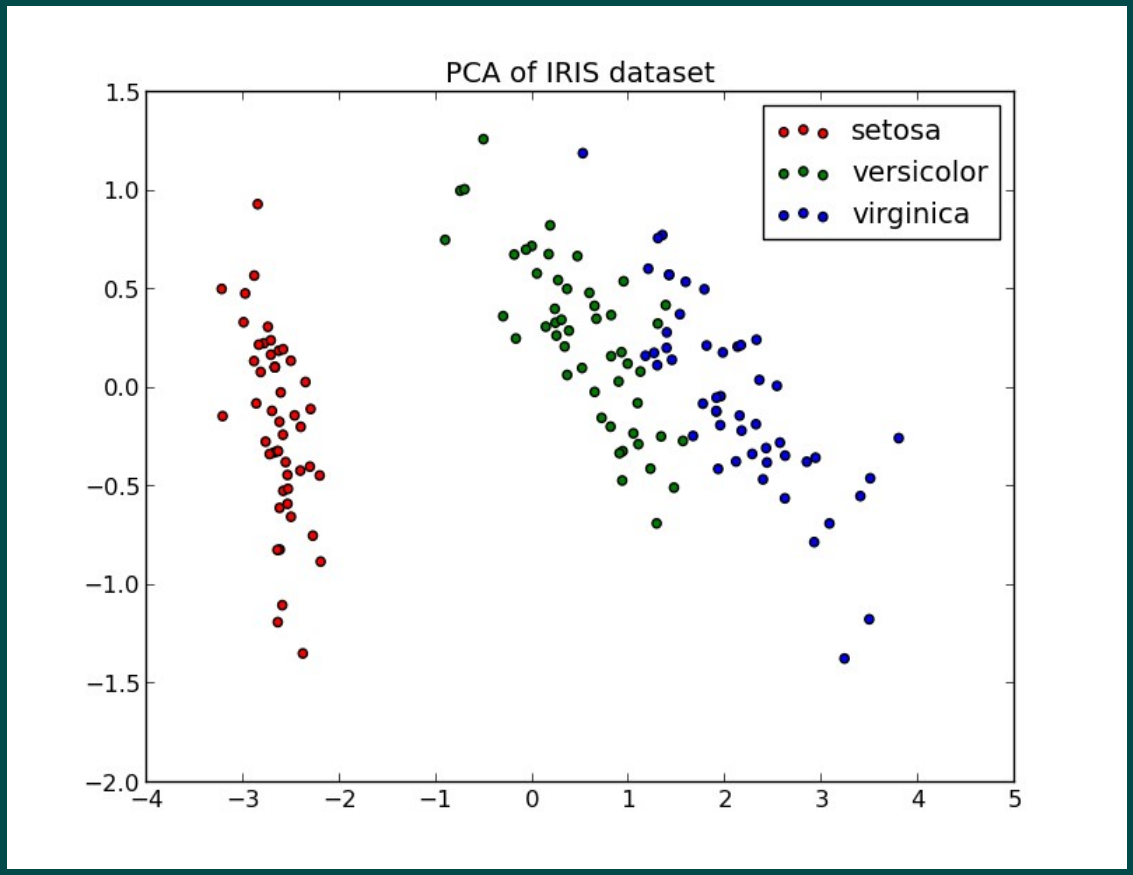
- Understand the task. See how to measure the performance. Find the right question to ask.
- Choose the source of training experience.
  - Keep training and testing dataset separate. Beware of *overfitting* !
- Decide what will be input and expected output.
- Choose a set of models to approximate the output function. (use dimensinality reduction)
- Choose a learning algorithm. Try different ones ;)

Some Common Algorithms

Principal Component Analysis







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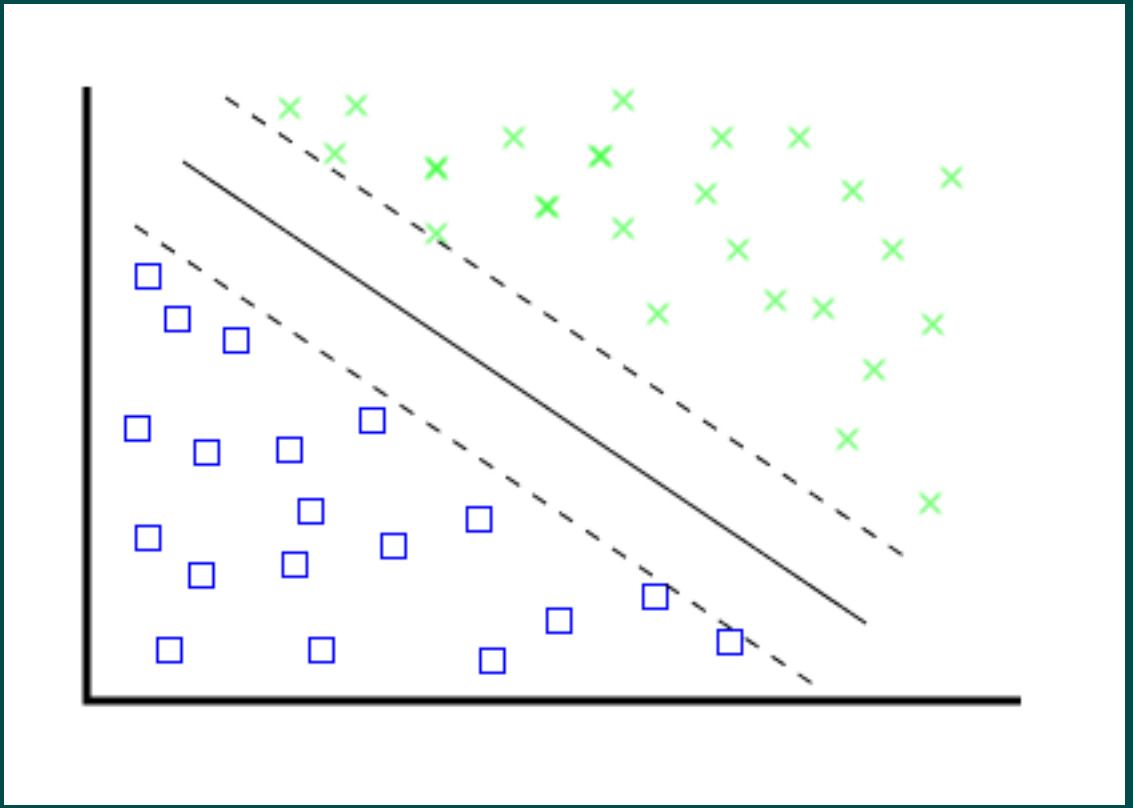
Some Common Algorithms

- Support Vector Machine



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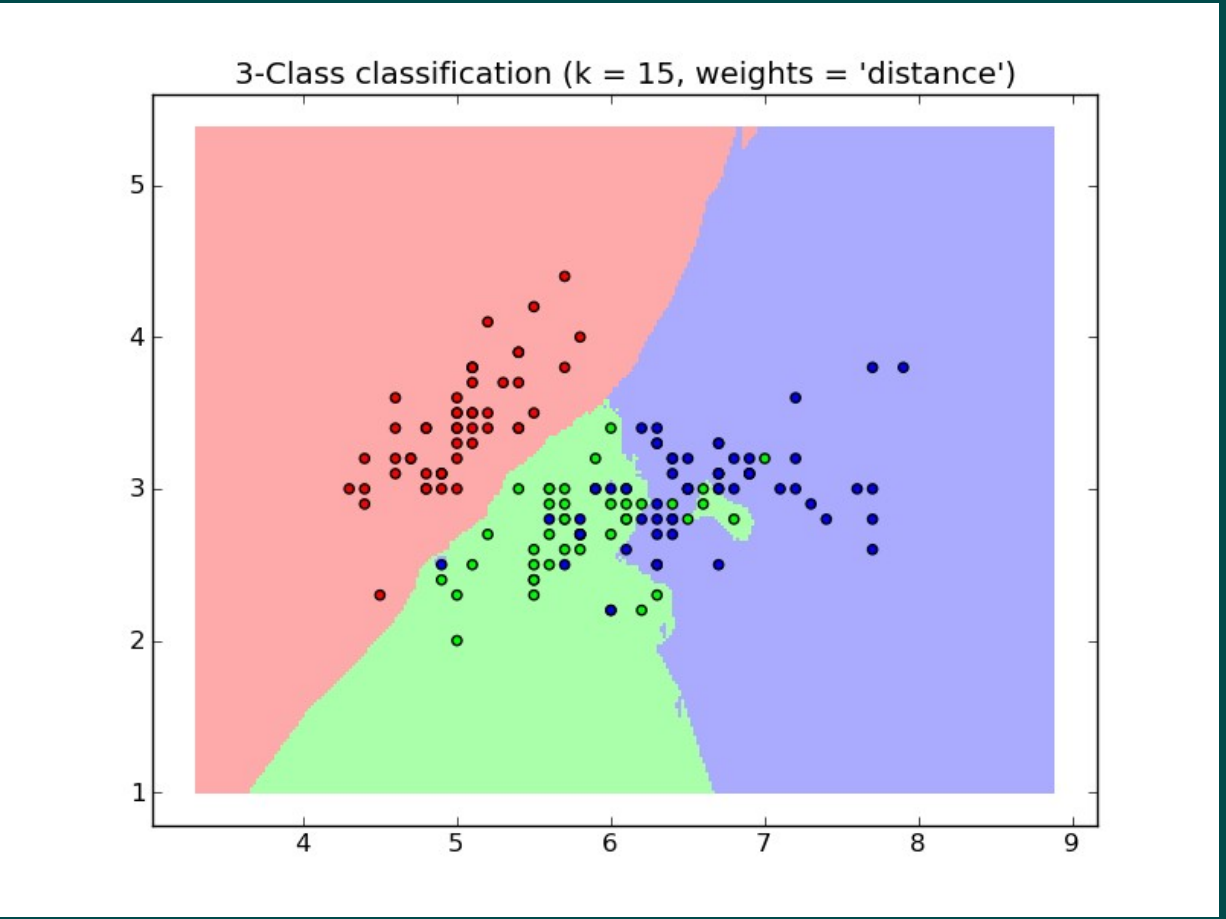
Some Common Algorithms

- Nearest Neighbour Classifier



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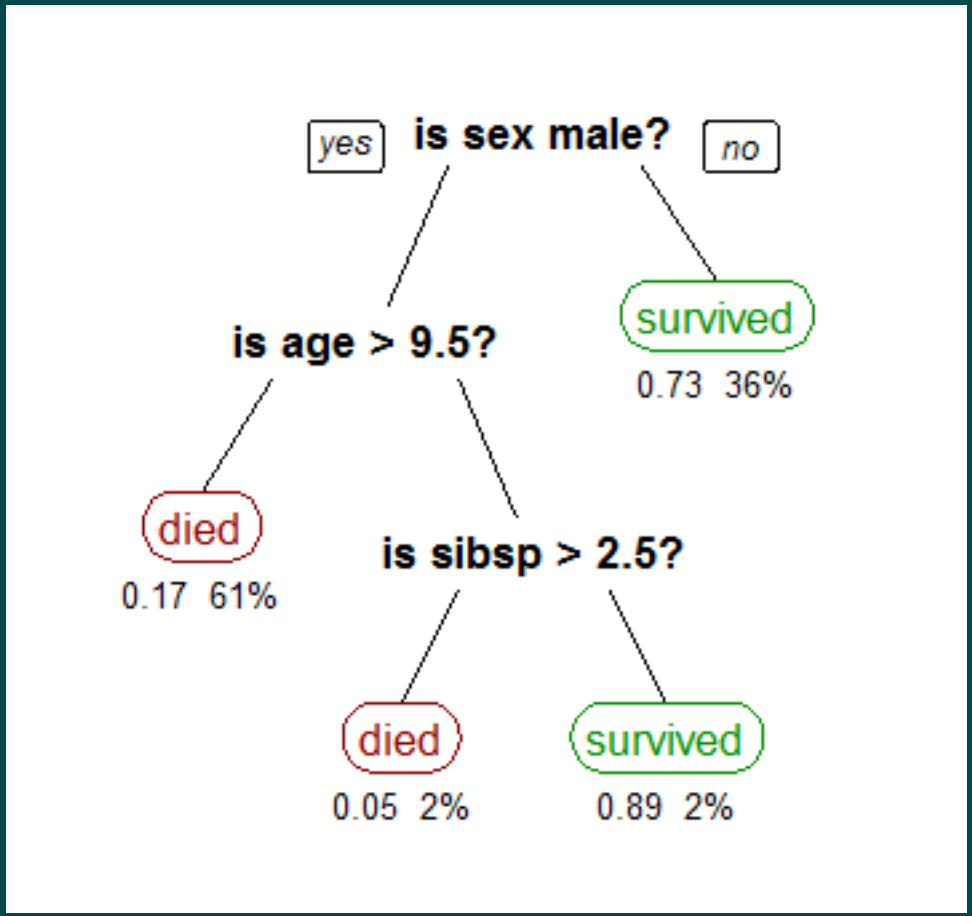
Some Common Algorithms

- Decision Tree Learning



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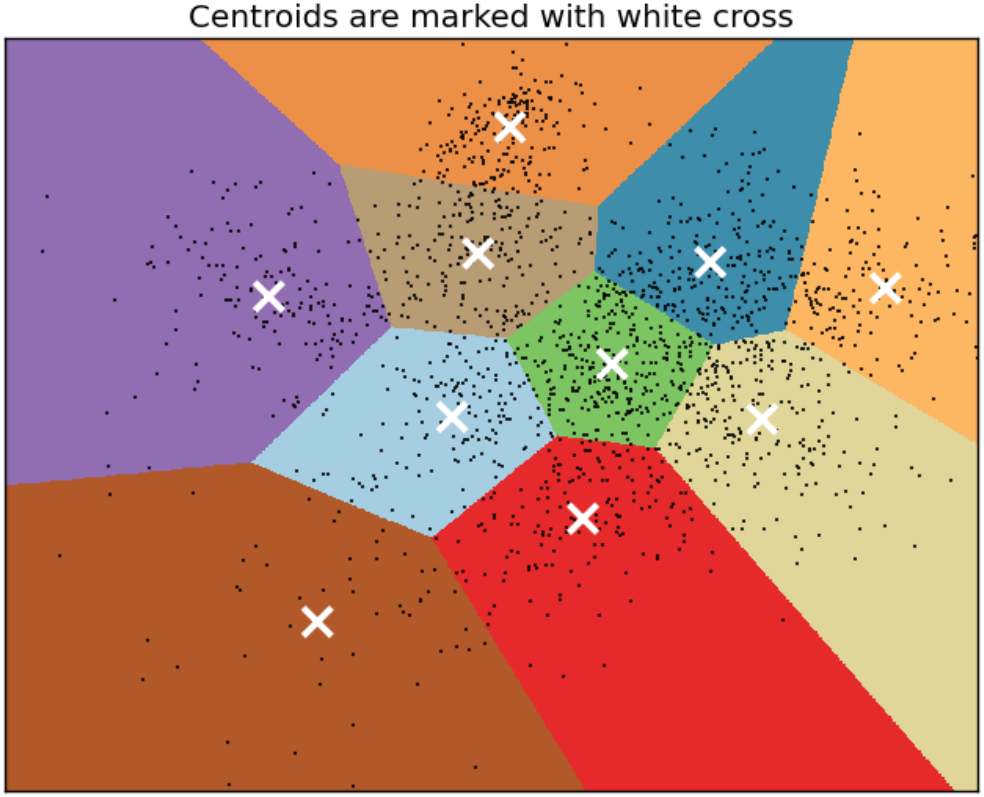
Some Common Algorithms

k-means clustering



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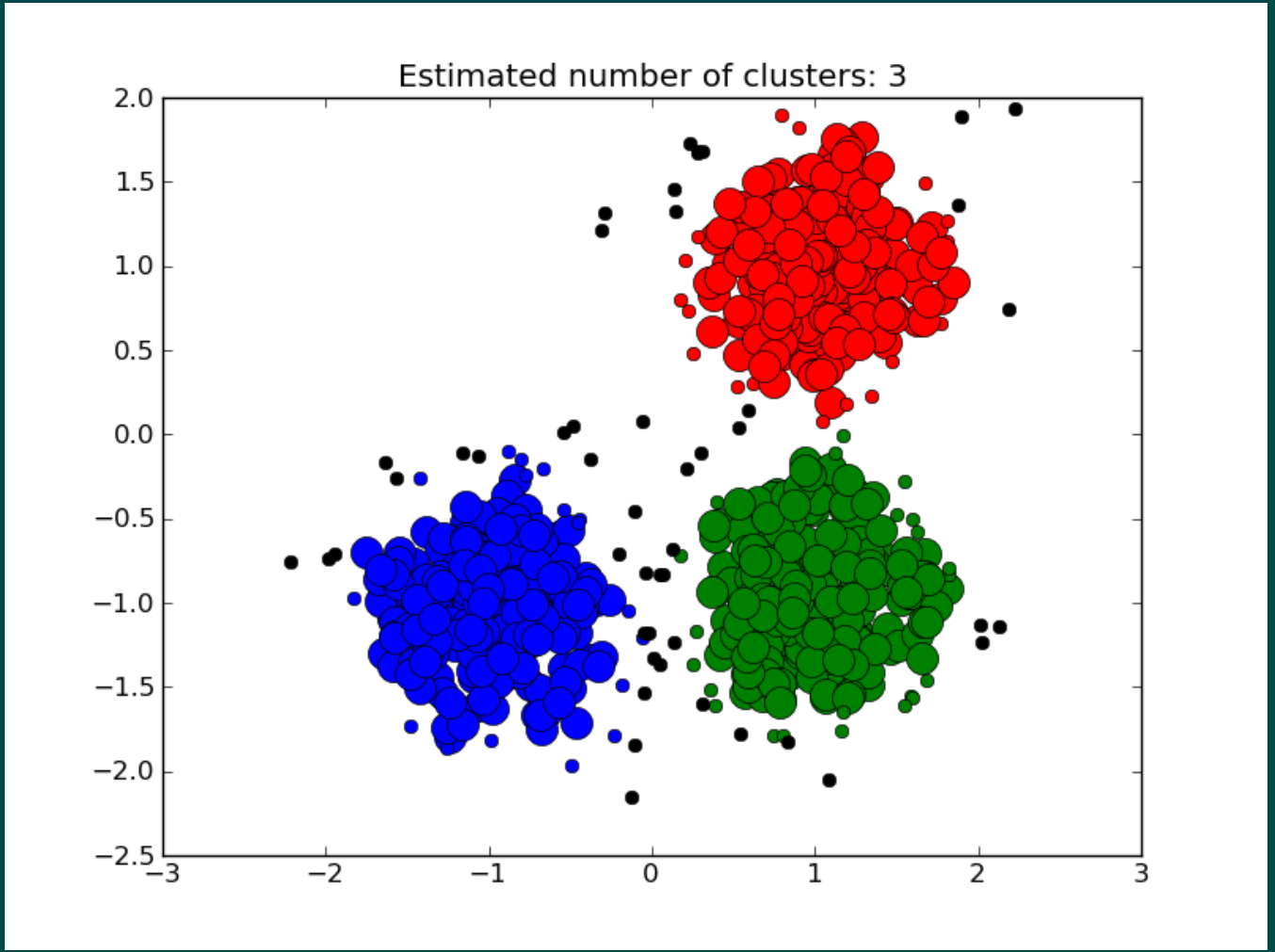
Some Common Algorithms

DB SCAN Clustering



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Some Example Usecases

- Log file analysis
- Outlier dectection
- Fraud Dectection
- Forcasting
- User patterns

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A few comments

- nltk is a good(better) for text processing
- scikit-learn is for medium size problems
- for humongous projects, think of mahout
- matplotlib can be used for visualization
- visualize it in browser using d3.js
- have a look at pandas for numerical analysis

Conclusion

- This is just the tip of an iceberg.
- Scikit-learn is really cool to hack with.
- A lot of examples

(http://scikit-learn.org/stable/auto_examples/index.html)

Final words

pip install scikit-learn

Its all in the internet.

Happy Hacking!