Introduction to Machine Learning

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Outline

Types of machine learning

Supervised learning

Learning using examples which have both features and the desired target.

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Evolutionary learning

Learning where a solution is evolved from some starting population based on a fitness function.

Problem types

Regression

- The target is a continuous number

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Classification

- Target is a discrete set of classes

Short List of Algorithms

Supervised learning algorithms

- **Naive Bayes**
- **Support Vector Machines (SVM)**
- **k-Nearest Neighbors**
- Decision trees (C4.5)
- Random forests
- Logistic regression
- Stochastic Gradient Descent
- Artificial Neural networks

Unsupervised learning algorithms

- k-means clustering
- Artificial neural networks
- Self-organizing maps
- Hierarchical clustering
- Mean shift clustering
- Affinity propagation

Languages and libraries

Java

- Apache Mahout
- Weka

Python

- Scikit-learn
- PyBrain
- Natural Language Toolkit (NLTK)
- PyML

C#

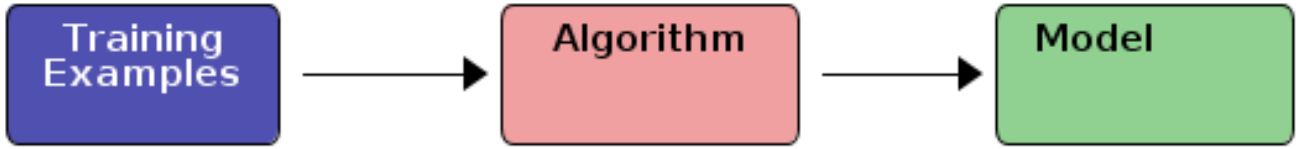
- IKVM & Weka
- AForge.NET & Accord.NET

Others

- R stats package w/various add-ons
- libsvm, libFANN (C/C++)
- Incanter (Clojure)

Workflow

- Training the model



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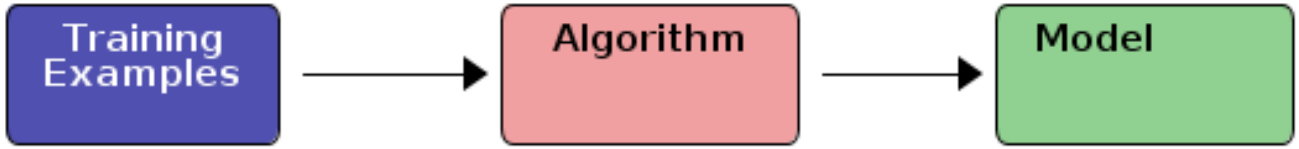

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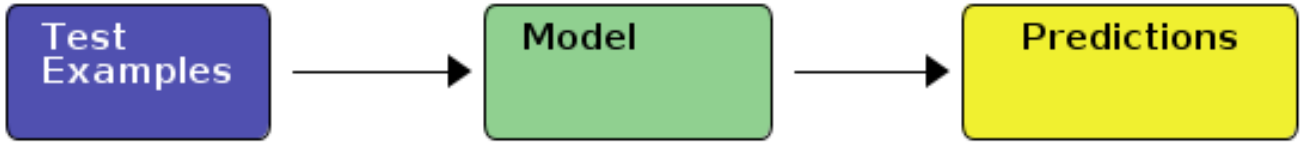

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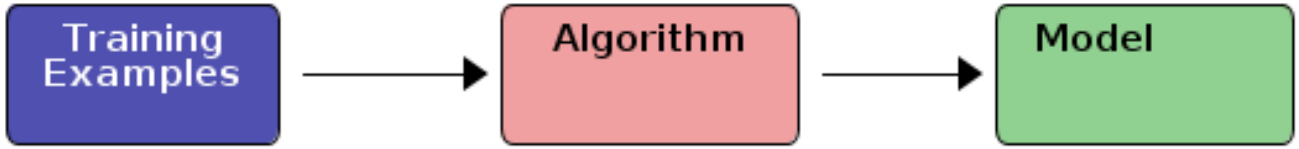

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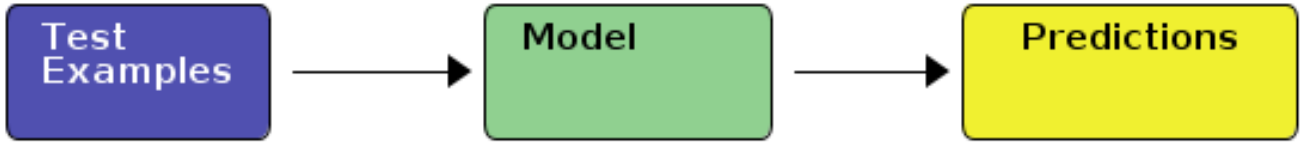
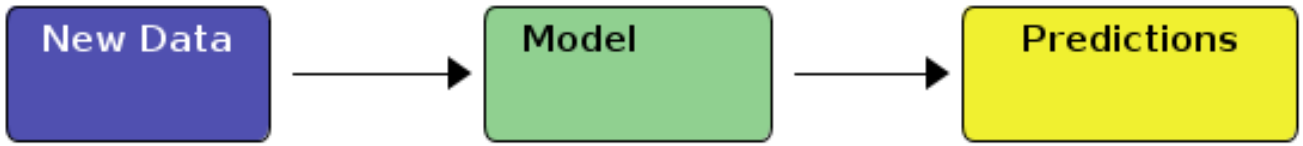


- Using the model



Species classifier

Example (Species Classifier Example)

- Features: Name, class, sex, age, weight, color, state
- Target: Species

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Code used

- Python with the Scikit-Learn library

Species Classifier: Load the data

```
import csv

inputfile = open("species.csv")

for i in range(5):
    print i
```

Algorithms: Naive Bayes

High level description of the Naive Bayes algorithm

Species Classifier: Naive Bayes: Train the model

Species Classifier: Naive Bayes: Test the model

Species Classifier: Naive Bayes: Measure the accuracy

Algorithms: k-Nearest Neighbors

High level description of the k-Nearest Neighbors algorithm

Species Classifier: kNN: Train the model

Species Classifier: KNN: Test the model

Species Classifier: kNN: Measure the accuracy

Algorithms: Support Vector Machine

High level description of the Support Vector Machine algorithm

Species Classifier: SVM: Train the model

Species Classifier: SVM: Test the model

Species Classifier: SVM: Measure the accuracy

Testing sandbox