Machine Learning with Python

Machine Learning

- Machine Learning is a discipline involving algorithms designed to find patterns in and make predictions about data.
- It is nearly ubiquitous in our world today, and used in everything from web searches to financial forecasts to studies of the nature of the Universe.
- This workshop will cover an introduction to scikit-learn, a python machine learning package, and to the central concepts of Machine Learning.

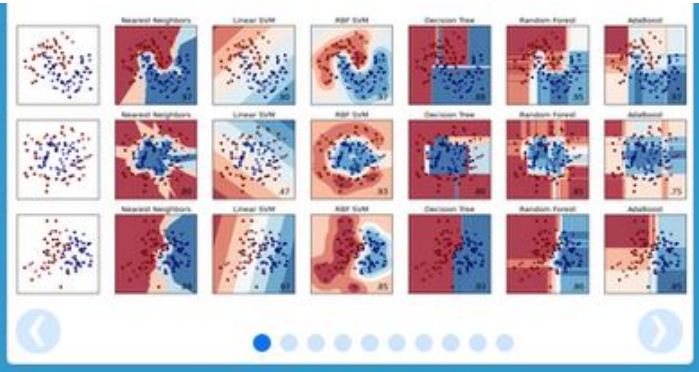
Machine Learning

We will introduce the basic categories of learning problems and how to implement them using scikit-learn.

- Regression : Predicting Numeric Values
- Classification : Predicting Categories
- Clustering : assigning instances to groups.

Getting ready The datasets in scikit-learn are contained within the datasets module. Use the following command to import these datasets:

```
>>> from sklearn import datasets
>>> import numpy as np
```



scikit-learn

Machine Learning in Python

- Simple and efficient tools for data mining and data analysis
- Accessible to everybody, and reusable in various contexts
- Built on NumPy, SciPy, and matplotlib
- Open source, commercially usable - BSD license

Classification

Identifying to which category an object belongs to.

Applications: Spam detection, Image recognition.
Algorithms: *SVM, nearest neighbors, random forest, ...* — *Examples*

Regression

Predicting a continuous-valued attribute associated with an object.

Applications: Drug response, Stock prices.
Algorithms: *SVR, ridge regression, Lasso, ...* — *Examples*

Clustering

Automatic grouping of similar objects in

Applications: Customer segmentation, Grouping experiment outcomes
Algorithms: *k-Means, spectral clusteri mean-shift, ...* — *E*

Dimensionality reduction

Reducing the number of random variables to consider.

Applications: Visualization, Increased efficiency
Algorithms: *PCA, feature selection, non-negative matrix factorization.* — *Examples*

Model selection

Comparing, validating and choosing parameters and models.

Goal: Improved accuracy via parameter tuning
Modules: *grid search, cross validation, metrics.* — *Examples*

Preprocessing

Feature extraction and normalization.

Application: Transforming input data s text for use with machine learning algor
Modules: *preprocessing, feature extra* — *E*

Classification

- **Description:** Identifying to which category an object belongs to.
- **Applications:** Spam detection, Image recognition.
- **Algorithms:** SVM, nearest neighbors, random forest,

Regression

- **Description:** Predicting a continuous-valued attribute associated with an object.
- **Applications:** Drug response, Stock prices.
- **Algorithms:** SVR, ridge regression, Lasso,

Clustering

Automatic grouping of similar objects into sets.

Applications: Customer segmentation, Grouping experiment outcomes

Algorithms: k-Means, spectral clustering, mean-shift, ...

Dimensionality Reduction

- **Description:** Reducing the number of random variables to consider.
- **Applications:** Visualization, Increased efficiency
- **Algorithms:** PCA, feature selection, non-negative matrix factorization.

Model selection

- **Description:** Comparing, validating and choosing parameters and models.
- **Goal:** Improved accuracy via parameter tuning
- **Modules:** grid search, cross validation, metrics

Preprocessing

- **Description:** Feature extraction and normalization.
- **Application:** Transforming input data such as text for use with machine learning algorithms.
- **Modules:** preprocessing, feature extraction.