Artificial Intelligence

Resources

- www.elaspix.de/Lehre/AI
- Requirement for 10% bonus in the exam
  - After 50% of all exercises have been voted
  - Exercises consist of
    - Pen and Paper questions (Variants are also used in the exam)
    - Programming exercises (use your knowledge and create automatic systems that can learn)
- Programming language
 - Matlab & Java/Eclipse

Course Overview

Introduction

- What is AI and Machine Learning

- Importance of AI/ML in industry and research, the most famous apps

    - Identification

    - Recommendation

    - Prediction

- How has AI evolved historically

How Learning works

- The field structure of ML, dealing with different kinds of numbers and problems

- Problem formulation

- Data & experience driven learning

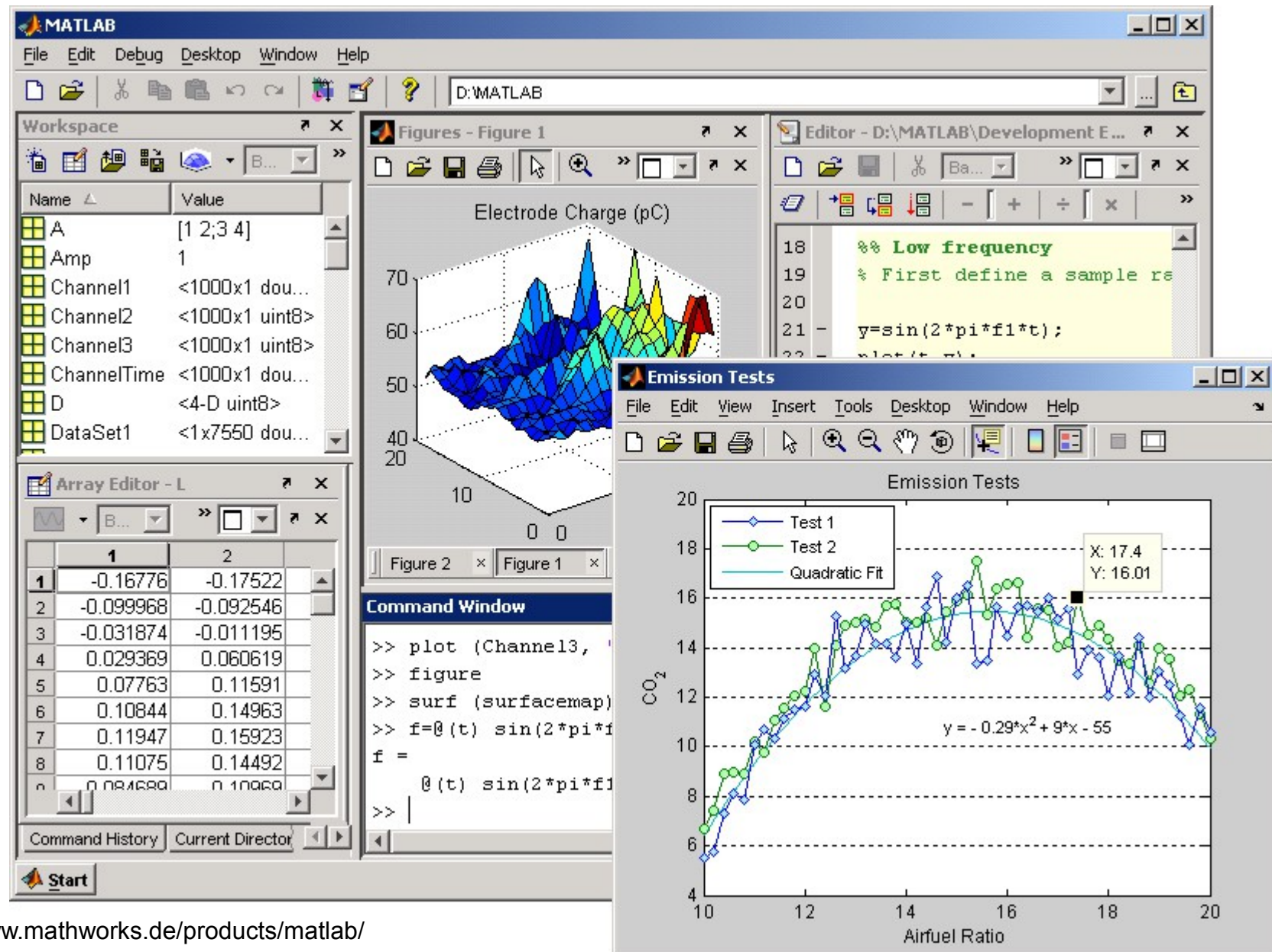 - Supervised and unsupervised learning

  - Prediction with KNN

events in the original space
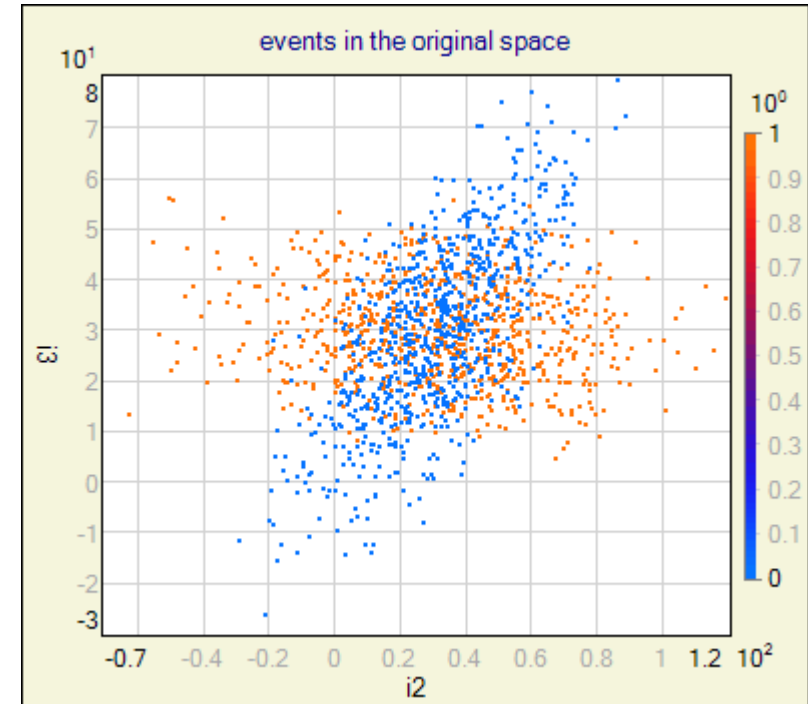
http://www.ire.pw.edu.pl/~rsulej/NetMaker/manual/e05_svd_ica/svd_ica_3d_i2-i3.gif

How Learning works

- Who learns? The computer or its user?

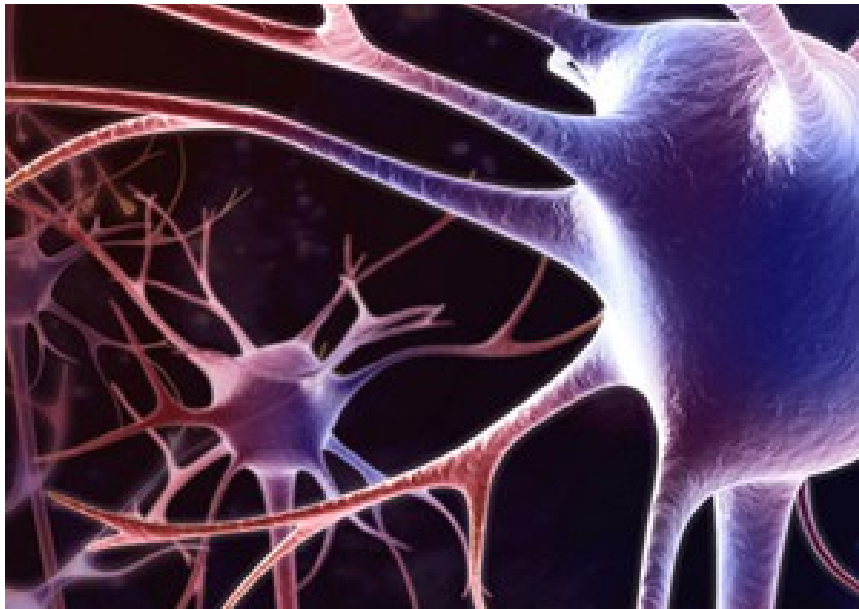- Second Derivative

- Gradient descent
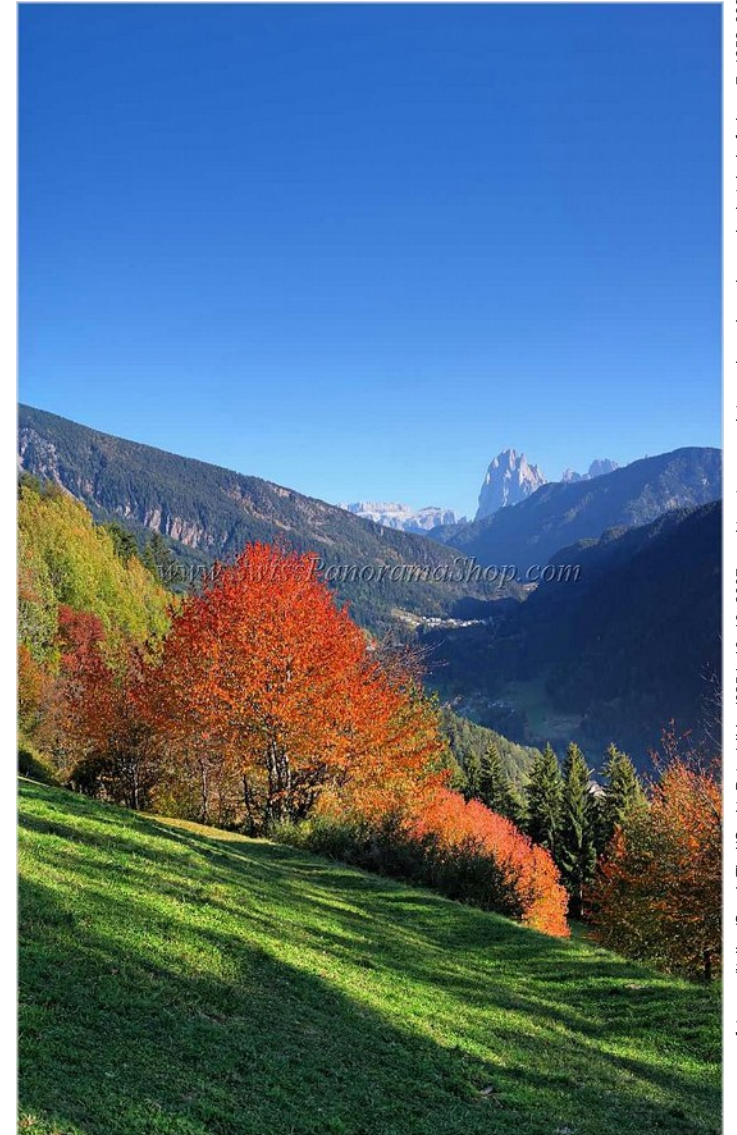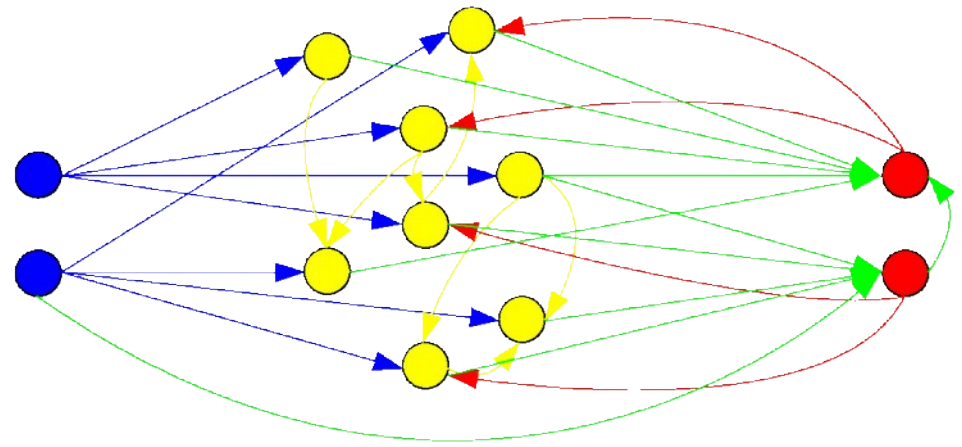
Introduction to Matlab / Octave

Inspired by biology NN I

- How does the human brain process information (from visual input to scene understanding)

- Types of neural processing decision making and parallelism, perceptrons & backpropagation
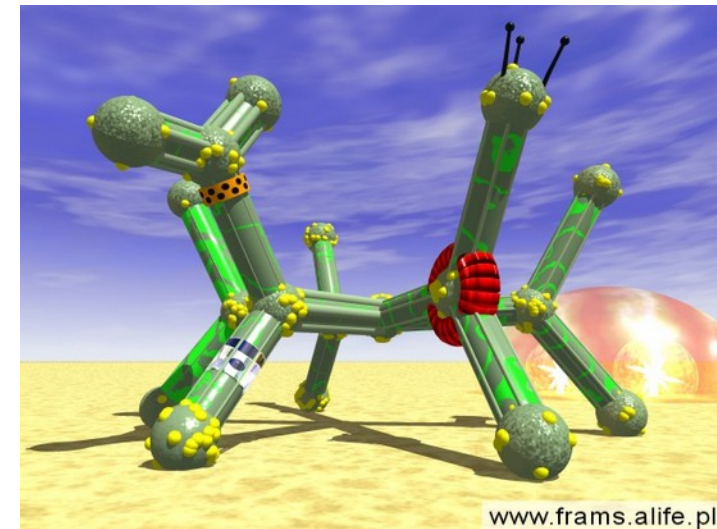

www.3dscience.com;

T.Guenther Implementation eines Echo-State-Networks

Evolutionary Algorithms

- Evolution & what we can translate into algorithms

- Genetic algorithms in computer science

- Artificial Life

Decision Trees ID3

- Information Entropy

- Building a tree from training data

- Prediction using trees

- pruning

http://www.liederkranz-eltershofen.de/Eiche.jpeg

AI and Robotics

- Challenges of AI in robotics

- Applications of ML

  - Path finding and navigation (DARPA Ralley)

  - Robocup simulation league

- Famous ML algorithms in Robotics

  - Expectation Maximization

- Navigation in Computer Games

- Practice

  - Robot navigation using potential Maps

http://evolutions.typepad.com/theroborama/
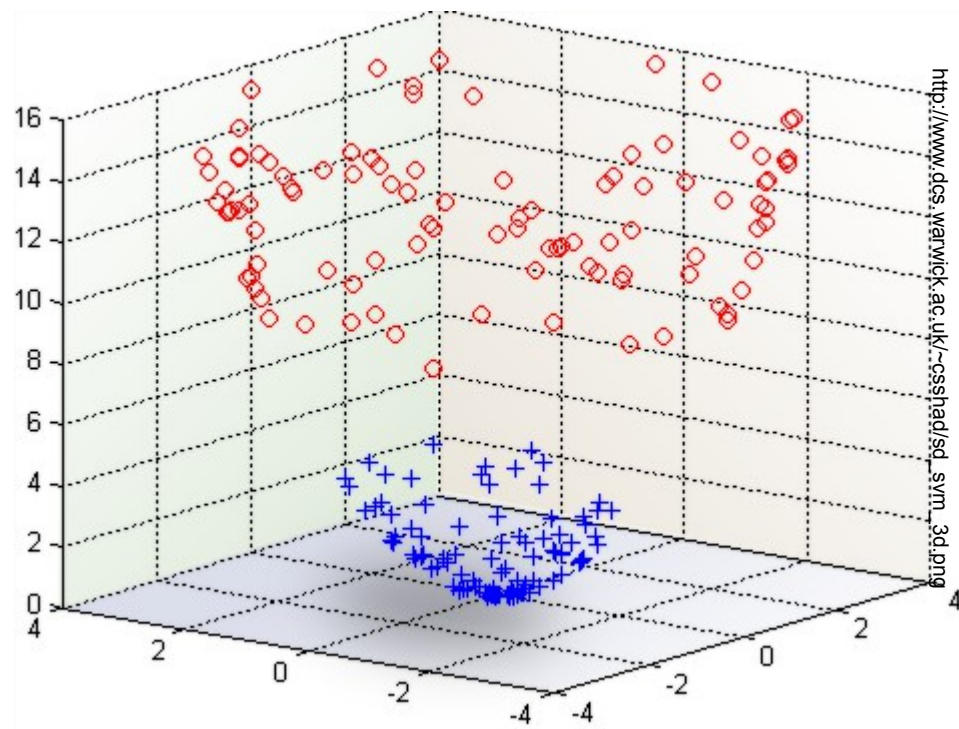images/robot13.jpg

Naive Bayes Algorithm

- Statistical Independence
- Bayes law
- Prediction with categorical scales
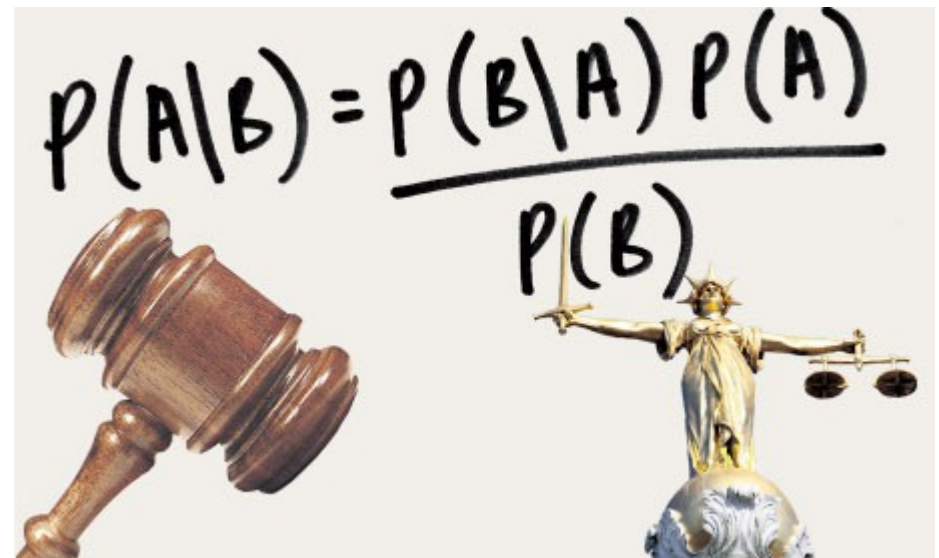
The beginning of evrythng: Features

- Features selection, Redundancy
- Feature Compilation and dimension reduction
  - e.g. for the domain of image processing
- Correlation analysis

Visualization

- Charts and statistical features
  - Bad and good examples of data visualization
- Clustering with kmeans
- Self-Organizing Map

Colored input space

Attribute 2

Attribute 1