

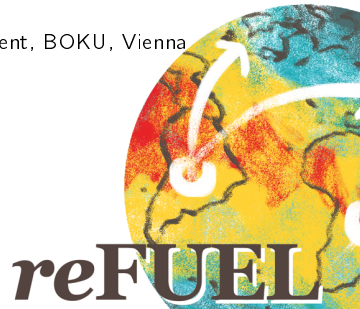
Don't believe the hype? A hands-on introduction to machine-learning in Python

Open Workshops on Computer Based Systems Modelling

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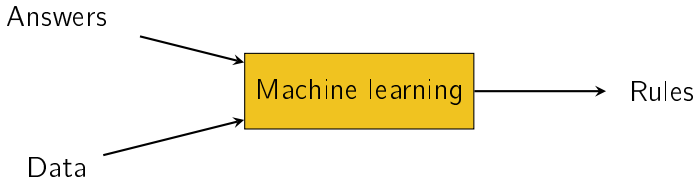
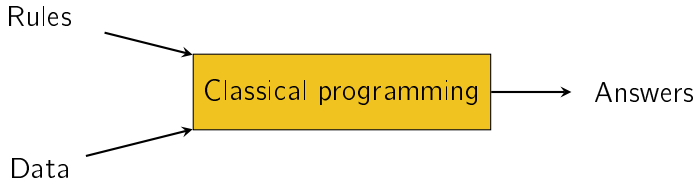
Contents - Workshop

- ▶ Day 1: Introduction to Machine Learning
- ▶ Day 2: Understanding backpropagation and Neural Networks in Python
- ▶ Day 3: An example of a practical application of Neural Networks for image recognition in Python and Reinforcement learning in Python
- ▶ Day 4: Bring your own data!

Contents - Today

- ▶ The basic concept of machine learning
- ▶ Some examples of machine learning
- ▶ Supervised, unsupervised, reinforcement learning: practical exercises
- ▶ An introduction to neural networks
 - ▶ Basic concepts and terminology
 - ▶ Backpropagation algorithm and its computational complexity
 - ▶ Regression and Classification with neural networks vs. linear models
 - ▶ Under- and overfitting of neural networks
 - ▶ Practical aspects of machine learning

The basic concept of machine learning



Why is this cool?

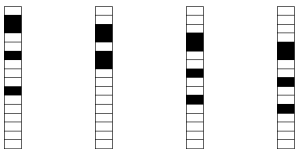
- ▶ Image recognition with captionbot.ai
(deep learning)
- ▶ Computer plays atari computer games
(deep learning for pattern recognition, deep reinforcement learning)
- ▶ The moment alphaGo wins against Lee Sedol
(supervised learning and deep reinforcement learning)
- ▶ This person does not exist
(Generative adversarial network)
- ▶ Predicting where crime occurs
(Regression model)
- ▶ Supervising Oktoberfest waiters

A typology of machine learning

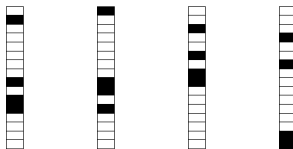
- ▶ Supervised learning: Given inputs and outputs, find the rules that link the two
- ▶ Unsupervised learning: Find structure in data
- ▶ Reinforcement learning: learning by doing.

Supervised learning - Exercise (I)

Positives



Negatives



Positive or Negative?

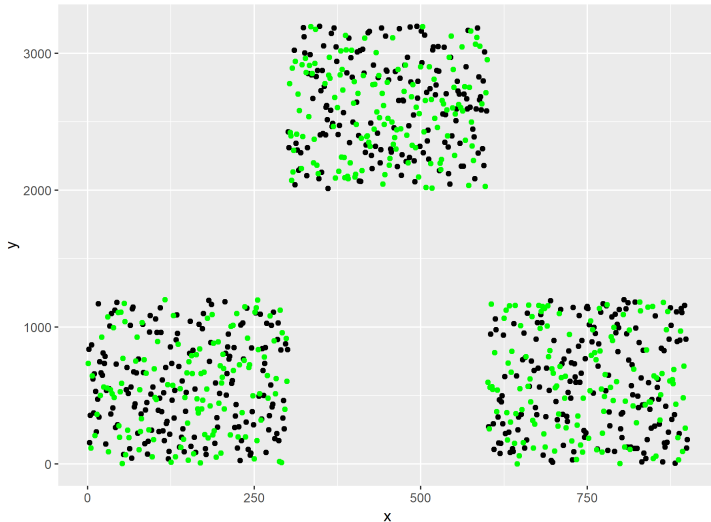


Supervised learning needs labeled datasets

- ▶ Classification. Input features: Photos of people. Labels: smiling or not.
- ▶ Classification. Photos of waiters carrying plates and glasses. Output: number of plates and glasses.
- ▶ Classification. Input: German text. Output: English text.
- ▶ Regression. Input: wind speeds. Output: measured wind power generation.
- ▶ Therefore: Inmates in Finland are training AI as part of prison labor

Unsupervised learning - Exercise

Which data points belong to each other?



Unsupervised learning - Find structure in data

- ▶ Clustering (which data belongs together?)
- ▶ Anomaly detection (which data is somehow strange?)
- ▶ Generative adversarial networks (Generate photos, sounds, and text, also involves supervised learning)

Thank you!

For updates on the project, check **refuel.world**

For source-code, check

github.com/joph/MachineLearningCourse

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