

Fachpraktikum Interaktive Systeme: Machine Learning and Computer Vision for HCI

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1 Introduction

We are currently witnessing the third wave of machine learning. In contrast to the previous waves, current machine learning research demonstrated impressive performance for a very wide range of tasks. Recent success in machine learning was mainly enabled by combining new training algorithms, new network architectures and moving the training on graphic cards. Combined, these three aspects enable to train models that not only outperform previous approaches but also enabled new application areas. Machine learning models are on par with humans or even demonstrate super-human performance for a number of tasks, including playing Go, playing Atari games, classifying images or generating realistic data like images and text. The human-computer interaction (HCI) community used machine learning for a very wide range of use cases. Amongst others, this includes authentication/security, mental modeling, gaze assisted systems, chatbots and in general systems, that better understand, interact and communicate with humans. Training and using advanced machine learning models recently became much easier due to a variety of open libraries, including PyTorch, TensorFlow and Keras. These libraries are not only used and developed by researchers from academia and industry but are also accessible for practitioners. With increasing processing power, it became possible to train increasingly complex machine learning models. In this course, students will learn the basic steps of machine learning, develop neural networks and train them using machine learning libraries. They will apply the gained knowledge in practical group-projects that they will work over the term.

2 Content

The students will work on projects with different (multi-)modalities like images, natural language or gaze for HCI relevant tasks. We will teach how to train a model using machine learning libraries and Python. We will further focus on all necessary steps to validate and evaluate a trained model. In the projects, students will go through the whole development cycle:

- Exploration of different use cases
- Process data to train machine learning models
- Development of a neural network architecture
- Training the models using the processed data
- Validating and analyzing the trained model
- Present your approach, experiments and results
- Write a short paper summarizing your Project

3 Learning goals

Students learn the basics of applied machine learning for interactive and cognitive systems. They are able to make informed decisions when deciding for a machine learning architecture. They understand the process of using machine learning for such systems from preparing a data set, using it for training and validating the trained model.

4 Requirements

Knowledge of Python and very good knowledge of programming is required to take part in the course. Students must have an understanding of machine learning.

5 Expected Date & Time

t.b.a

Available space: max. 20 students