



# Fachpraktikum Interaktive Systeme (SS 2024) “Computational Theory of Mind and Cognition”

## 1 Introduction

Machine understanding of human behavior and cognition has significant potential for a new generation of intelligent user interfaces that offer human-like collaborative, social, and conversational capabilities. Computational Theory of Mind and Cognition are key for building such intelligent interactive systems.

## 2 Learning outcomes

The goal of this Fachpraktikum is to familiarize students with exciting current research topics at the intersection of machine learning, computational cognitive modelling, and human-computer interaction. After having completed the Fachpraktikum, students will have acquired theoretical knowledge about the most important problems in machine understanding of human behavior and cognition and how to leverage such understanding in the design of intelligent user interfaces. The core competency acquired through this course is the ability to implement latest machine learning methods (e.g. deep and spiking neural networks, transformers etc.) that address the processing and interpretation of human input in computing systems and evaluate them on state-of-the-art datasets.

## 3 Implementation

Students will work in groups of three on projects that explore Computational Theory of Mind and Cognition. In these projects, students will learn how to implement and train models using machine learning libraries in Python, as well as how to validate and evaluate these models on benchmark datasets. Techniques used can include Multi-Modal Deep Learning, Multi-Agent Reinforcement Learning, Mechanistic Interpretability and biologically plausible learning methods like Spiking Neural Networks. In their projects, students will go through the whole development cycle: • Review of existing literature • Exploration of different use cases • Data processing for training • Implementation of a neural network architecture • Model training • Validation and analysis of the trained model • Presentation of methods, experiments, and results • Short paper. **Available space: max 15 students. Language: English.**

## 4 Requirements

This Fachpraktikum is intended for **Master students** in Computer Science, Computational Linguistics, Visual Computing, and INFOTECH. Students need to have a **solid understanding of machine learning**. **Prior attendance of lectures in these areas is required. Experience with Python is highly recommended.**

## 5 Contact

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