

SEMINAR ANNOUNCEMENT

Thursday November 5th, 2026

Room "Sala Seminari" - Abacus Building (U14)

Speaker Anna Penzkofer

at 10:00 am

From Visual Working Memory to Efficient Computer Vision: A Human-aligned Scene Representation

Abstract

In this talk I will present a neuro-symbolic scene representation that bridges cognitive science and computer vision through two complementary perspectives: a cognitively-plausible Visual Working Memory (VWM) model and a human-aligned scene representation (SSPictR) for efficient computer vision. The VWM model utilizes Spatial Semantic Pointers (SSPs) to replicate human set-size effects and swap errors, revealing that incorporating a memory decay mechanism significantly improves alignment with behavioral data. Introducing a novel VWM modelling task on natural images, namely the Scene Reconstruction (SR) task, we further highlight the versatility of our VWM model and find important attentional effects for VWM in a human study with eye gaze.

Extending this approach to computer vision, the Spatial Semantic Pointer Picture Representation (SSPictR) compresses semantic and spatial information into a single high-dimensional SSP, demonstrating strong correlations with fMRI data from human visual cortex regions, such as the lateral occipital cortex and the occipital place area. Novel results further demonstrate that integrating meaningful object embeddings from language and vision models enhances human alignment, while also enabling open vocabulary probing. Crucially, the strong theoretical grounding of SSPs allows for direct mapping to Spiking Neural Networks, facilitating efficient deployment on neuromorphic hardware for next-generation edge computing.

at 02:00 pm

Introduction to Spiking Neural Networks

Abstract

Spiking neural networks (SNNs) offer a promising path toward energy-efficient AI by replacing high-precision activations with sparse, temporally coded spikes. This tutorial covers spiking neuron models, neural coding strategies and event based sensors, as well as core training challenges including the dead neuron problem and surrogate gradient descent solutions. The tutorial includes hands-on demonstrations using [snnTorch](#) to simulate neurons, encode inputs, and train end-to-end networks on standard benchmarks. The session concludes with current applications in computer vision (e.g. object detection, semantic segmentation) and my experience with deploying SNNs on neuromorphic hardware (SpiNNaker2).

Short Bio

Anna Penzkofer is a final-year PhD student at the University of Stuttgart, affiliated with the Collaborative Artificial Intelligence (CAI) group. Her work bridges cognitive science and machine learning to create efficient visual processing models for robotics and edge devices. Her core areas of expertise are Computer Vision, Machine Learning, Cognitive Modeling, and Reinforcement Learning, where she is interested in building efficient and explainable systems. In her work, Anna has developed and deployed ML models for semantic segmentation, object detection, visual question answering, and reinforcement learning with a focus on efficiency, interpretability, and robustness to out-of-distribution data. These works have been successfully published in top-tier venues (NCAA, ICML, TMLR & CogSci).

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