Keynote Talks

Leveraging Vision, Compliance, and Learning for Robust Robotic Manipulation in Unstructured Environments

Berk Calli

Worcester Polytechnic Institute, USA

Abstract

Robotic manipulation is essential for enabling robots to operate in unstructured environments. This talk begins with environmental robotics applications such as shipbreaking and recycling sorting, where real-world complexity demands interdisciplinary approaches that integrate robotics, domain knowledge, and system-level design. These applications expose key challenges in perception and physical interaction. Motivated by these challenges, the talk then focuses on fundamental problems in robotic manipulation, particularly grasping and vision-based control, highlighting how tighter integration of mechanism design, perception and control can improve robustness and adaptability.

Towards Flexible and Efficient Learning

Sebastian Otte

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Abstract

As artificial intelligence systems become deeply embedded in everyday life, their energy consumption has emerged as a critical challenge. Training and deploying large-scale models increasingly require enormous computational resources, in some cases approaching the energy demand of entire cities. At the same time, many real-world applications demand learning systems that operate in dynamic, resource-constrained environments. These pressures raise a fundamental question: how can we design AI models that remain powerful while adapting efficiently, in ways more closely aligned with natural intelligence?

This talk presents a research trajectory aimed at developing learning systems that combine flexibility across time scales and structures with efficiency in computation, energy, and representation. Drawing inspiration from neuroscience and dynamical systems, the talk centers on recurrent architectures as a core computational principle, reflecting the deeply recurrent organization of the brain across spatial and temporal scales. Selected contributions illustrate this perspective, including minimal and scan-compatible recurrent networks, spiking models with oscillatory dynamics, and recent refinements of foundational components such as activation functions. Together, these works form building blocks for a broader vision of flexible, scalable, and more sustainable learning systems grounded in the temporal structure of the world.

Beyond Transformers: Linear Scaling, In-Context Learning, and the xLSTM Paradigm

Sebastian Böck

NXAI, Linz, Austria

Abstract

While Transformers dominate modern AI, their quadratic computational complexity and lack of state-tracking present severe bottlenecks. This keynote explores the architectural shift towards the extended Long Short-Term Memory (xLSTM) paradigm, which integrates novel memory structures to deliver linear-time compute scaling, a constant memory footprint, and highly competitive in-context learning. Highlighting recent milestones, the presentation covers advancements in large language modeling, efficient model distillation, and time series forecasting. The session concludes by outlining the broad applicability of recurrent backbones across diverse domains—including vision, biology, and robotics—and exploring advanced memory concepts for future Agentic AI.