UNIVERSITÄT BERN

Faculty of Human Sciences
Institute of Sport Science

Kolloquium „Berner Gespräche zur Sportwissenschaft“

Monday, 04/12/2023

4.15pm - 5.45pm

University of Bern, ZSSw building C, room C001, Bremgartenstr. 145, 3012 Bern

Inductive Biases for Robot Reinforcement Learning

Prof. Dr. Jan Peters

Autonomous robots that can assist humans in situations of daily life have been a long standing vision of robotics, artificial intelligence, and cognitive sciences. A first step towards this goal is to create robots that can learn tasks triggered by environmental context or higher level instruction. However, learning techniques have yet to live up to this promise as only few methods manage to scale to high-dimensional manipulators or humanoid robots.

In this talk, we investigate a general framework suitable for learning motor skills in robotics which is based on the principles behind many analytical robotics approaches. To accomplish robot reinforcement learning from just few trials, the learning system can no longer explore all learnable solutions but has to prioritize one solution over others – independent of the observed data. Such prioritization requires explicit or implicit assumptions, often called ‘induction biases’ in machine learning. Extrapolation to new robot learning tasks requires induction biases deeply rooted in general principles and domain knowledge from robotics, physics and control.

Empirical evaluations on several robot systems illustrate the effectiveness and applicability to learning control. These robot motor skills range from toy examples (e.g., paddling a ball, ball-in-a-cup) to playing robot table tennis, juggling and manipulation of various objects.

Jan Peters is a full professor for Intelligent Autonomous Systems at the Computer Science Department of the TU Darmstadt, head of the research department on Systems AI for Robot Learning at the German Research Center for Artificial Intelligence and founding research faculty member of the Hessian Center for Artificial Intelligence. Besides numerous grants and awards, he was appointed IEEE Fellow in 2019, ELLIS fellow in 2020 and AAIA fellow in 2021.