Cyber Valley Evening Colloquium on Autonomous Systems

Multi-agent Replicator Reinforcement Learning Dynamics

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Tuesday, April 27, 2021 17:00 s.t.
Online on Webex. For the event link please click here

Abstract

Autonomous multi-agent systems are important for various applications towards a sustainable future. However, without an adequate theoretical foundation, multi-agent learning applications are not only hindered by missing interpretability, their safe and beneficial application for a sustainable future cannot be ensured. In this talk, I will give an overview of my research on the link between evolutionary game theory and reinforcement learning, i.e., replicator reinforcement learning (RRL) dynamics.

RRL is a semi-formal method to study idealised multi-agent learning behaviour for improved interpretability. Focusing on the example of social dilemmas, I will show how the agents' caring for the future parameter alone can turn a tragedy of the commons into a comedy, given a sufficiently severe environmental threat. Regarding the safe and beneficial application of autonomous multi-agent systems, I will show conditions under which an optimisation paradigm is neither sustainable nor safe and reinforcement learning is neither stable nor predictable. I will end with a brief outlook on future work.

Biographical Information

Wolfram Barfuss is a postdoctoral research scientist working on collective learning for a sustainable future. He recently moved to the Tuebingen AI Center (Uni Tuebingen) and holds guest research positions at the Potsdam Institute for Climate Impact Research and Princeton University. Previously, he was a research fellow at the School of Mathematics (Uni Leeds) and the Max Planck Institute for Mathematics in the Sciences, Leipzig. He obtained his PhD from the Humboldt University of Berlin and the Potsdam Institute for Climate Impact Research in 2019.

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