



Friedrich-Alexander-Universität  
Research Center for  
Mathematics of Data | MoD

## FAU MoD Lecture Series



### Optimization-based control for large-scale and complex systems: When and why does it work?

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[WWW.MOD.FAU.EU](http://WWW.MOD.FAU.EU)

#FAUMoDLecture

#### WHEN

Tuesday **June 3, 2025**  
15:00H (Berlin time)

#### WHERE

On-site / Online

Friedrich-Alexander-Universität  
Erlangen-Nürnberg (FAU)  
Room **H11**  
Felix-Klein building  
Cauerstraße 11, 91058  
Erlangen. Bavaria, Germany

Live-streaming:

[www.fau.tv/fau-mod-livestream-2025](http://www.fau.tv/fau-mod-livestream-2025)

Model Predictive Control (MPC) and Reinforcement Learning (RL) are two of the most prominent methods for computing control laws based on optimization. In both cases, the resulting controllers approximate infinite-horizon optimal controllers, where the objective of the optimization may range from stabilization of a set-point to energy efficiency to yield maximization. However, for both methods the computational effort may make their application infeasible for large-scale or complex problems. In this talk we explain the basic functioning of both methods and then present situations in which the methods provably work well, by identifying beneficial structures of the solutions of optimal control problems. In the case of MPC we focus on the so-called turnpike property of optimal trajectories, while for Deep RL (i.e., RL with deep neural networks as approximators) we look at the compositional structure of optimal value functions. Examples from academia and a use case from industry illustrate the theoretical findings.