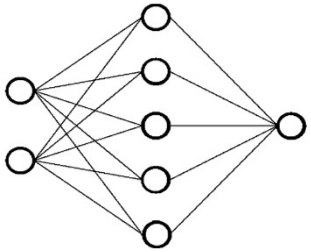
Model Identification and Control for Robotic Manipulators using Physics-Informed Neural Networks

TECHNISCHE UNIVERSITÄT DARMSTADT

Projektseminar (2-4 Personen, Homeoffice)



Control and analysis of robotic manipulators can often benefit from quantative models. These models can be determined using standard system identification approaches, modeling and fitting of first principles models, or by utilizing purely data-driven approaches such as neural networks.

Physics-informed neural networks present a compromise between these techniques. They allow the use of a general function approximator while accounting for the dynamical structure of the physical model. This type of neural network is promising for the model identification of complex systems such as robotic manipulators, which are usually derived modelling complex mechanics.

Requirements:

- Basic knowledge NN, Python (tensorflow), (model predictive control)

Your tasks will be:

- to inform yourself about robotic manipulators and the control there of
- to identify a dynamical model of a robotic manipulator using a physics-informed neural net as in [1]
- test the identified model in a nonlinear model predictive controller
- evalute, compare and present the results

[1] Physics-Informed Neural Nets for Control of Dynamical Systems https://arxiv.org/abs/2104.02556

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CCPS Control and Cyber-Physical Systems