Physics-informed Training of Neural Networks for Control of a Bioreactor

Master's Thesis

Control of bioreactors can become a difficult task to accomplish, since biological processes are uncertain by nature. A way of dealing with these uncertainties is to incorporate machine learning algorithms like neural networks. However, to achieve good performance neural networks usually require larger data sets for training, which are mostly not available for bioprocesses. Physics-informed training of neural networks can be an advantage, if large data sets are not available. Additionally, physics-informed training can yield better accuracy, faster training or an improved generalization.


Your tasks will be:

1. Literature review on methods for physics-informed training of neural networks
2. Implementation of physics-informed training of neural networks as part of a previously released toolbox
3. Study neural networks trained with the newly implemented method in simulations using a model of a bioreactor as an example

Experience with / knowledge about:	Artificial neural networks, model predictive control
Programming skills:	Python (good to very good skills required)
Language:	English
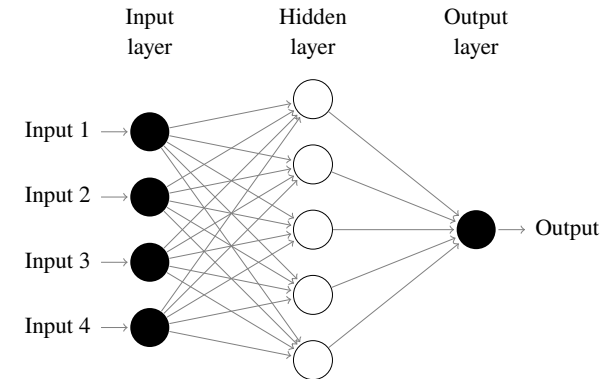
Johannes Pohlodek

Room: S3|10 510
Phone: +49 6151 16-25186
E-mail: johannes.pohlodek@iat.tu-darmstadt.de
Web: https://www.ccps.tu-darmstadt.de

Sebastián Espinel Ríos

Room:
Phone:
E-mail: espinelrios@mpi-magdeburg.mpg.de
Web: https://www.ccps.tu-darmstadt.de

CCPS
Control and Cyber-Physical Systems