Machine Learning of System Biological Processes

Bachelor-/Master thesis

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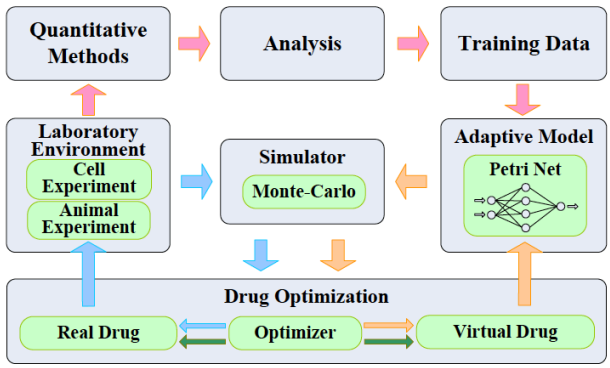
Motivation

Use Case

Sepsis is a life-threatening disease with high morbidity and mortality. Although novel therapeutics are urgently needed, the development of new drugs reveals a time and cost intensive worldwide challenge. The past few years have seen a profound development of machine learning techniques applied in diverse fields. This knowledge offers a new component in the drug design process, which may revolutionize the way we develop drugs. Thus, we wish to investigate a novel holistic approach for a machine learning driven development of of sepsis therapeutics using Petri nets.

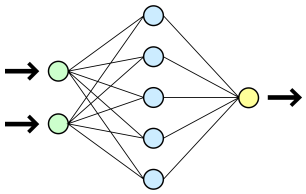
Methodology



Methods

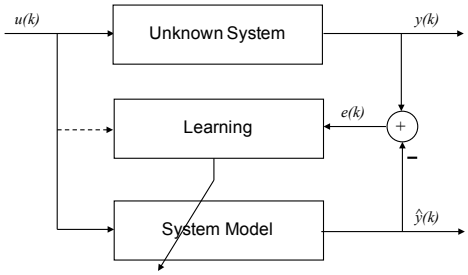
Petri Nets

In contrast to neural networks Petri nets have a unique ability to model the interaction between discrete models and continuous dynamic processes, which can be described with the help of differential equations. This allows complex dynamic relationships to be graphically modeled. This makes Petri nets particularly suitable for this research project in both multi-level modeling and simulation.



Machine Learning and Optimization

- System and control theory
- Machine Learning for model adaption
- Discrete and continuous optimization



Tasks

Research Questions

1. Modelling of a simple example use case
2. Identification of training data for learning
3. Development of a methodology to adapt a Petri net based on training data

Requirements

Students

- Information technology
- Computer Science

Cooperation Partners

- University Hospital Aachen, OIM
- RWTH Aachen University, ICE & TI
- Trier University of Applied Sciences

Trier University of Applied Sciences | HOCHSCHULE TRIER

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