



Yann Bachelot

Email: yann.bachelot@leibniz-hki.de

Machine Learning Supported Multi-Model Simulator for Infection Research (MuMoSim)

The goal of this project is to advance modeling in infection research to the next level of development in terms of a quantitative and predictive simulation tool. While in recent years the advancement of bio-mathematical modeling has focused primarily on the implementation of spatiotemporal multi-scale models, the computational framework to be developed in this project opens up a novel dimension of simulating biomedical systems supported by modern machine learning techniques: A multi-model approach will be pursued to self-consistently combine various modeling approaches, which are associated with different complexity levels of the biomedical system, in one computational framework. This will allow to model complex biomedical systems in a bottom-up fashion, i.e. by starting with a modeling approach that enables the quantitative description of available experimental data and then progressing to higher-level models to generate quantitative predictions that can be tested in a next round of experiments. The Multi-Model Simulator will also enable the gradual integration of various types of experimental data, such as time-resolved data from flow cytometry, survival assays, gene expression and microscopic imaging. While implemented for being generally applicable to interacting systems of cells and molecules in biomedicine, the focus of this project will be on the quantitative and predictive modeling of bloodstream infections by microbial pathogens based on experimental data obtained from human whole-blood infection assays.

Supervisor

[Marc Thilo Figge](#)

Co-Supervisors

[Oliver Kurzai](#)

Start of PhD

February 14, 2022