



## Applications of ML methods in biomedical sciences

The research of my team is focused on the development and use of computer models of biological processes, more specifically in the area of regenerative medicine. Computer modeling and simulation can be used in the context of tissue engineering to help quantify and optimize the products and processes and can help in predicting or interpreting the biological response after implantation. We have developed a suite of models that capture various aspects of the tissue engineering life cycle. From gene regulatory network models describing culture strategies over data-driven models for biomaterial optimization and mechanistic models for bioreactor control, to in silico clinical trials of treatment strategies for pediatric orphan indications. Every model that has been developed goes through its own model development: model establishment and selection, parameter optimization, sensitivity analysis, model adaptation. The methods that are chosen depend on the question that needs to be answered, the knowledge and/or data that is available and the context in which the model will be used. We often combine machine learning techniques with more mechanistic modeling techniques. Intertwined with this process is the establishment of model credibility with the verification, validation and uncertainty quantification. The establishment of guidelines and standards is a crucial step in the transition of models from bench to bedside. In this talk I will address, by means of various examples from the bone tissue engineering field, the different model development steps as well as different approaches to (start) establishing model credibility. Finally, I will give an overview of the ongoing efforts within the in silico medicine community, including the Virtual Physiological Human Institute, the Avicenna Alliance and the FDA, to establish the aforementioned guidelines and standards.

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