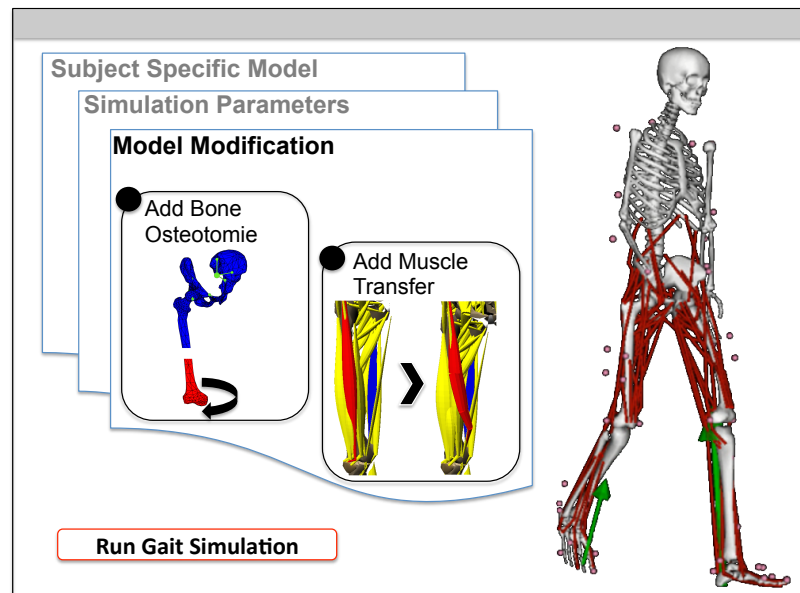


## Masterarbeit Informatik/Mathematik/Physik

### “Predicting surgical outcomes in orthopedics using muscle synergies and pre-post operation data“

#### Background:

The clinical treatment of neuromuscular gait disorders is a complex and tedious process that requires a lot of effort from the patient and the medical professional. Often, there is no one clear choice of treatment that is obviously better than all others. In the case of orthopedic surgeries, computational modeling and predictive simulations can help in making these choices. In recent research, neuro-musculo-skeletal models have been developed that approximate the dynamics of some aspects of the human motor system. These models derive inspiration from neuroscience and biomechanics, and belong to a highly interdisciplinary and challenging class of research work.



#### Project:

In this project we would like to combine neuromusculoskeletal models with predictive simulations based on optimal control. This topic will also explore the concept of “muscle synergies”, a low dimensional set of control signals, that comes from research in human motor control. The predictive power of the simulations will be tested against pre and post operation data provided by our clinical collaborators. To provide a running start, the student working on this topic will have access to the muscle models and dynamics code already developed in the ORB group.

#### Requirements:

This is a challenging thesis topic available to an exceptional and motivated student.

- You should be confident with your knowledge in mechanics (multi-body dynamics) and programming (C++, Matlab). Additional experience in numerical optimization and/or basic neuromuscular physiology would be beneficial.
- Above all, you should be open about learning new concepts and ideas from various research fields, and engaging with researchers in the ORB group and beyond.
- The thesis is expected to be written in English.

#### Kontakt:

Manish Sreenivasa, manish.sreenivasa@iwr.uni-heidelberg.de  
Prof. Dr. Katja Mombaur, katja.mombaur@iwr.uni-heidelberg.de  
www.orb.uni-hd.de