

## Thesis / Project Work

**Title:** Machine learning based prediction of induced body motion by virtual reality training

**Background:** For many elderly patients falling represents a serious risk. Due to old age, patients' body control, balance, and general fitness decrease, which increases the risk of falling. To avoid falling in the first place, patients can be trained in Virtual Reality (VR) which can help to improve their balance and general body control. A downhill skiing scenario (image bottom) has been implemented on the Microsoft Hololens to induce body movement. We want to correlate position data captured by the Hololens to the actual body motion. Thereby, we can monitor and control the patients' body motion without additional external tracking devices.

**Tasks:** The Hololens allows for tracking of the current head position, acceleration and orientation. A machine learning model should be developed to predict the motion of the whole body from the data captured by the Hololens. To generate sufficient training data a simulation of a skeleton model should be implemented of the skiing motion. The pre-trained model can be later fine-tuned and evaluated on actual motion data acquired from a Kinect camera during execution of the skiing application.

Specific tasks include: getting familiar with the experimental setup, simulating skeletal skiing motion, training a machine learning model, fine-tuning and evaluating the model on real motion data.

**Requirements:** Good programming skills (ideally in C# and Python), experience with machine learning, interest in hands-on experimental evaluation, ideally experience with game design (Unity).



**Contact:** Stefan Gerlach ([stefan.gerlach@tuhh.de](mailto:stefan.gerlach@tuhh.de))  
Maximilian Neidhardt ([maximilian.neidhardt@tuhh.de](mailto:maximilian.neidhardt@tuhh.de))

