

# Hauptseminar: Machine Learning and/or Simulation

Prof. Miriam Schulte,  
Amin Totounferoush,  
Raphael Leiteritz  
IPVS, SC/SGS  
Briefing: t.b.a.

This seminar is aimed at students who are interested in using machine learning (specifically Artificial Neural Networks - ANN) to aid classical numerical simulation.

Deep neural networks have been proven to be capable of learning complex paradigms within data. This capability has been used in various fields to make predictions based on existing measured/gathered data. So far, numerical simulations have been carried out using the derived mathematical models. The purpose of using neural networks for numerical simulation is to learn the relationship between physical properties of different time steps just by using existing data instead of solving mathematical equations.

This introduces many challenges ranging from choosing the best-suited network architectures for specific problems to designing and implementing regularization strategies to increase the accuracy of predictions. There is a lot of research going on in this field which we want to cover in this seminar.

## Conditions:

- Fundamental understanding of numerical simulation
- Python programming skill (as most useful ANN packages are in python, e.g. Tensorflow, Pytorch and Theano)
- Active contribution to the discussions after the lectures

## Procedure

- Preliminary discussion with topic assignment
- Submission of papers before the end of the lecture period
- Review process in the group and incorporation of the reviews
- Final handover of the revised draft
- Topic presentations