



Announcement – Bachelor's Thesis

Data-integrated simulation of liquid-filled, fibre-reinforced materials using artificial neural networks

Motivation:



Articular cartilage is the main component of a damped, low-friction joint connection. The mechanical behaviour is modelled using numerical simulations and the obtained knowledge serves as a basis for clinical and also technical applications, e.g. as bio-inspired structures for damping in aerospace. Articular cartilage is a complex multi-phase material which is modelled using the Theory of Porous Media (TPM) and the finite element method (FEM), so that the poroviscoelasticity can be represented. New methods from machine learning, including artificial neural networks (ANNs), open up new possibilities for optimizing these complex calculations.

Tasks:How do changes in the material parameters affect the material response? Is it possible to describe the obtained results by using an ANN?
Can the ANN provide answers for non-tested parameter constellations?

- **Procedure:** With the help of a self-developed parameter study, the influence of different material parameters on the mechanical behaviour of the articular cartilage will be investigated, evaluated and visualised. Next, an ANN will be trained with the help of the acquired data and examined for its generalization ability.
- **Requirements:** Ideally you have first experience with numerical simulations and FEM (Introduction to FEM, Numerics) as well as first programming experience (Fortran, Python).





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Please don't hesitate to contact us for further information.

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