Karlsruher Institut für Technologie

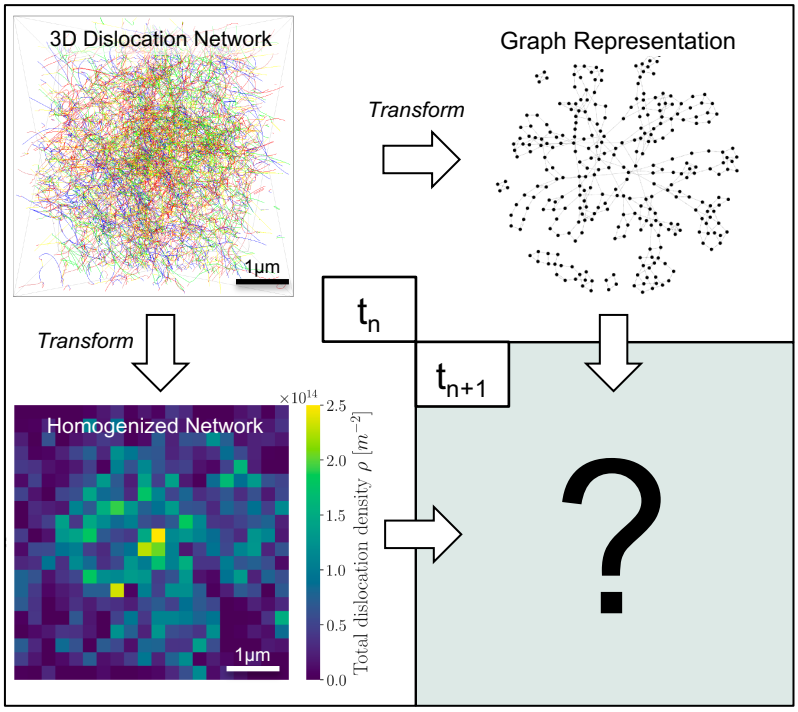
Institut für Angewandte Materialien

BACHELOR-THESIS | MASTER-THESIS

Prediction of microstructure evolution by machine learning

Background:

Micro components have become increasingly important in the context of miniaturisation. In particular, the mechanical behaviour depends on the microstructure of the material. In metals, this microstructure consists of a large number of curved dislocations (line-like lattice defects). During plastic deformation, the dislocation microstructure evolves and forms a complex three-dimensional network. In order to describe the dislocation microstructure evolution in large scale continuum mechanic simulations based on the underlying physics, material models are needed which depict the 3D microstructure evolution. By the application of machine learning, material laws can be derived on a data-driven manner.



Objective:

In this project, microstructure simulation data will be analysed and predicted using statistical methods and machine learning. Classification, regression and forcasting models will be applied to develop physically based surrogate models for the evolution of the microstructure. These models will then be implemented in continuum mechanics simulations.

Requirements:

A basic knowledge of programming (e.g. Python) is required to work on this topic. An interest in materials science, continuum mechanics and numerical modelling/simulation is an advantage, but not necessary.

Contakt:

M.Sc. Balduin Katzer
Institute for Applied Materials –
Reliability und Microstructure (IAM-ZM)
Building 30.48 Room 107
Phone: 0721-60845869,
mail: balduin.katzer@kit.edu

Prof. PD. Dr.-Ing. Katrin Schulz
Institute for Applied Materials –
Reliability und Microstructure (IAM-ZM)
Building 30.48 Room Raum 105
Phone: 0721-60845871,
mail: katrin.schulz@kit.edu