

FE² for Multiscale Modeling

The FE²-method is a multiscale modeling approach used for materials such as additively manufactured lattice metamaterials. This software lab project aims at implementing the FE²-method in an efficient, modular Python package.

Task

- **Literature Research:** Research multiscale modeling and FE²-method
- **FE-Solver:** Implement a simple FE-solver in Python
- **FE²-Solver:** Extend the implementation to encompass the FE²-method
- **Code Efficiency:** Speed up the micro-scale FE computations (e.g. parallelization)
- **Application:** Test the framework on a benchmark problem

Project Characteristics

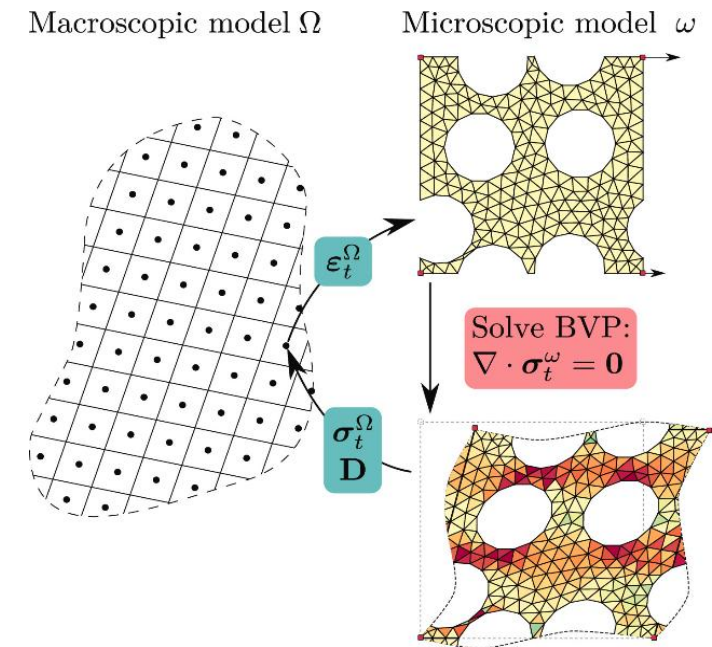
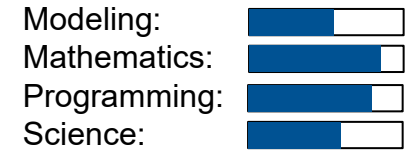


Fig. 1: FE² approach [1]

[1]: J. Storm, I. B. C. M. Rocha, and F. P. Van Der Meer, "A microstructure-based graph neural network for accelerating multiscale simulations", Comput. Methods Appl. Mech. Eng vol. 427, p. 117001, Jul. 2024, doi: 10.1016/j.cma.2024.117001.