Chair for Carbon Composites
Department of Aerospace and Geodesy
Technical University of Munich

Modeling: ★★★★★
Mathematics: ★★★☆☆
Programming: ★★★☆☆
Science: ★★★☆☆

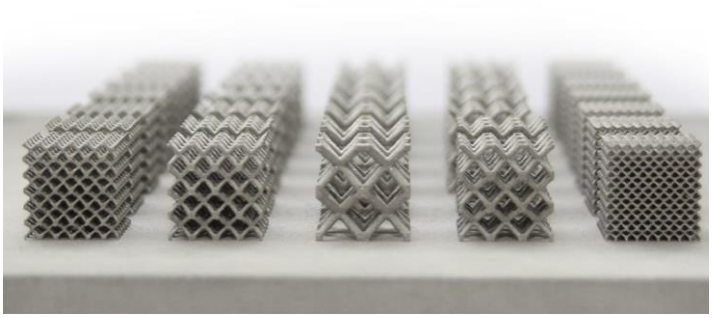
Software Lab:

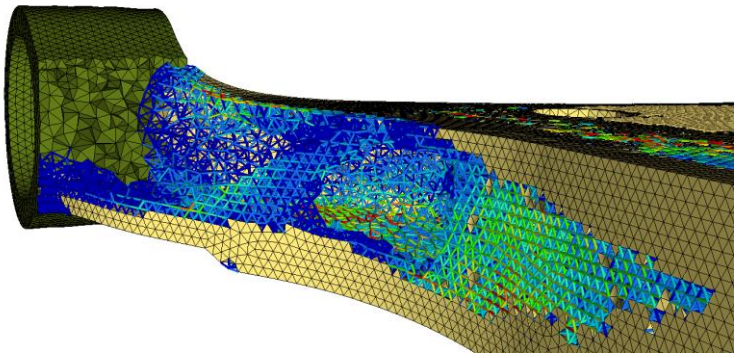
Modeling of 3D Printed Lattice Structure

Setting

Additive manufacturing by Fused Filament Fabrication (FFF) – also known as 3D printing – uses thermoplastic polymers to create complex structures layer by layer. The high flexibility of this process enables to manufacture innovative structures in terms of performance optimization.

The project aims at the development of lattice structures for applications in the automotive industry. However, their behavior is complex and must be investigated thoroughly before components based on this technology can be integrated in vehicles. In that sense, simulation approaches are developed at the institute in order to study the mechanical behavior of 3D printed lattice structures.





Task

Possible topics:

- Development of advanced (anisotropic, non-linear) material model for thermoplastic, considering effects of additive manufacturing
- Derivation of equivalent properties of 2D and 3D periodic lattice unitcells with analytical or FEM approach
- Implementation of homogenization framework for arbitrary lattice topology
- Development of optimization algorithm to access the best lattice design for different objectives such as stiffness, strength or energy absorption

During the project work commercial software (Abaqus) can be used to perform calculations.

Supervisors

Oliver Schwahofer, Chair of Carbon Composites, oliver.schwahofer@tum.de
David Colin, Chair of Carbon Composites, david.colin@tum.de

References

[1] 3dprinting.com
[2] altair.com