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MetaLab Research Group
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Cluster of Excellence *livMatS*
FIT – Freiburg Center for Interactive Materials and
Bioinspired Technologies,
IMTEK, University of Freiburg

Interlocking metamaterials and their application for 3D structures (HiWi, BSc, MSc)

Many structures surrounding us are not monolithic but instead assembled from small elements/bricks. While it is convenient to connect bricks together using various mechanical joints, glue, or mortar, it is possible to design the elements that will hold together merely due to their interlocking geometry. This type of building blocks might be applied to design robust materials and structures that do not catastrophically fail if one of the elements is damaged. Moreover, due to the discrete nature of such structures, the failure can be localized inside several elements, not allowing cracks to propagate through the whole structure. The aim of this project is to explore and compare the properties of the interlocked metamaterials assembled using unit cells with triangular, square, and hexagonal shapes. The interlocking elements will be fabricated with 3D printing or molding, and the assembled structures will be characterized by impact drop tests. Then, we will build a dome-like structure assembled from the interlocking elements and study their impact resistance as well as their capacity to withhold internal pressure.

The skills that you can acquire during this project:

1. CAD modeling
2. 3D printing
3. Laser cutting
4. Impact testing and data acquisition

Please feel free to contact us if you have any questions.

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