



## Searching for students

MetaLab Research Group  
<https://slesarenko-lab.com/>

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

### **Bioinspired 3D printed wheel with a variable friction coefficient** (HiWi, BSc, MSc)

Current and future space missions explore Moon and Mars using autonomous rovers. Moreover, similar vehicles can also be used here on Earth to map locations that are not easily accessible. The cross-country performance of such vehicles significantly depends on the design of their wheels. For some conditions, stiff and rigid frame wheels are the top pick enabling high speed and good maneuverability, while sand dunes can be conquered using soft wheels with specific tire treads. Therefore, the wheel's ability to adapt its performance for a wide range of different surfaces is exceptionally beneficial for autonomous rovers. This project aims to develop a fully 3D printed wheel that integrates soft and stiff components. This particular design is inspired by the microstructure of the natural nacre that includes elongated stiff platelets connected by soft interfaces. By connecting the edges of the flat nacre-inspired sheet, the overall circular shape can be maintained. By decreasing the wheels' diameter even slightly, the spike angles will increase following the deformation of the soft elements. Therefore, it is expected that vehicle will be able to clear more complex terrain. In the framework of this project, we plan to design and print such wheels, install them on the toy model cars and then perform corresponding tests for different soil types.

The skills that you can acquire during this project:

1. CAD modeling
2. 3D printing (Polyjet)

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

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Living, Adaptive and Energy-autonomous Materials Systems