

## Topic for student research / diploma / master project

### **Vacuum gripper with tactile sensing and active adaptation**

The automation of as many manual tasks as possible using robots is currently a central focus in both scientific and commercial domains worldwide. However, there remains a trade-off between powerful actuators, fast and precise movements, and the need for safe interaction between the robot and the workpiece. Vacuum-based grippers such as suction cups are particularly well-suited for handling delicate objects and complex geometries. By integrating stretchable, matrix-structured sensors into the suction cup, tactile sensing and adaptive, sensor-based gripping strategies become possible.

As part of this thesis, a vacuum-based gripper with integrated tactile sensing will be developed based on existing stretchable tactile sensors. The sensor-integrated suction cup will be designed, fabricated, and evaluated in various gripping tasks. Furthermore, the gripping behavior with different objects will be characterized, and the gripper will be integrated into an existing robotic system.



### **Focus of work**

- Literature review on the state of the art in the field of stretchable electronics and vacuum grippers, with a particular focus on vacuum grippers with integrated sensors
- Design and fabrication of the sensor-integrated suction cup
- Integration of the sensor-integrated suction cup into a robotic arm
- Implementation of robot control for targeted object detection and gripping
- Iterative optimization of the sensor based on experimental results
- Documentation and graphical presentation of the results

### **Contact person**

Dipl.-Ing. Junhao Ni  
junhao.ni@tu-dresden.de  
N67, B102  
+49 351 463-36440

Dr.-Ing. E.-F. Markus Vorrath  
markus.vorrath@tu-dresden.de  
N67, B210  
+49 351 463-39962