

We are offering a

Master's Thesis on Deep Learning of Probabilistic Virtual Fixtures

at the Chair of Prof. Alin Albu-Schäffer (Sensorbased Robotic Systems and Intelligent Assistance Systems) in the *TUM School of Computation, Information and Technology*.

Deep Learning methods have shown tremendous success in various applications thanks to their expressivity. Virtual Fixtures are, however, still mostly implemented using classical geometric or machine learning approaches. This currently limits their applicability to relatively well-defined environments, making it tedious to adapt them to new scenarios.

Recently, deep learning methods providing a probabilistic output have been developed. Those methods would allow for the integration of uncertain deep learned fixtures into a probabilistic Virtual Fixtures framework. Goal of this thesis is to develop a Virtual Fixtures using deep learning with probabilistic output and to integrate them into an existing framework.

Your tasks:

- Literature research on probabilistic deep learning methods,
- development of a deep learning based Virtual Fixture,
- integration of the approach into the existing teleoperation framework,
- evaluation of the method.

Requirements:

- Master's student in Robotics, Informatics or closely related
- Good knowledge about foundations of robotics (Rigid body transformations, kinematics, etc.)
- Good knowledge of Probabilistic Machine Learning methods
- Strong programming skills in Python 3 and C++
- Familiar with development on Linux operating systems
- Experience with Git, CI/CD pipelines

Helpful Skills:

- Experience with robotic systems
- Knowledge of real-time programming

The thesis will be carried out at the Institute of Robotics and Mechatronics at the German Aerospace Center (DLR).

If you are interested, please send your complete application (CV, letter of motivation, transcript of records) to Maximilian Mühlbauer (maximilian.muehlbauer@tum.de). Please do not hesitate to contact us in case of questions.