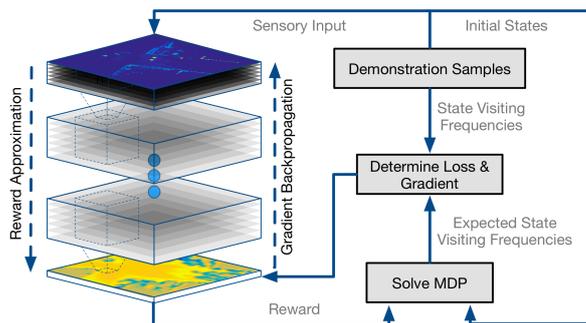


Master Thesis / Bachelor Thesis

## Deep Inverse Reinforcement Learning for Lane Changes on Highways

In this thesis, inverse reinforcement learning (IRL) should be used to investigate which criteria are relevant for lane changing behavior on highways. IRL tries to infer the reward function that an expert optimizes from demonstrations. Therefore, trajectories are to be generated using a simulation environment. IRL is then used to learn the underlying reward function from these trajectories.



Deep learning architecture used for IRL [1]

To learn nonlinear rewards, deep neural networks can be used to represent the reward function [1]. Possible options include convolutional neural networks and generative adversarial networks [2]. Existing approaches from the literature should be further developed and applied to the given scenario.

This sounds exciting? Then apply to us! Methods and scope of the thesis can be adapted to your interests and previous knowledge. The proposed thesis consists of the following parts:

- + Literature research about deep inverse reinforcement learning
- + Generation of expert trajectories in a simulation environment
- + Selection of applicable network architectures and implementation of the algorithms
- + Evaluation of the implemented methods

I am happy to answer any questions you might have. Feel free to ask for an appointment or directly ask at my office!

### References

- [1] Wulfmeier, Wang und Posner, "Watch This: Scalable Cost-Function Learning for Path Planning in Urban Environments", 2016
- [2] Finn u. a., "A Connection between Generative Adversarial Networks, Inverse Reinforcement Learning, and Energy-Based Models", 2016

**Institute of Measurement and Control Systems (MRT)**  
Prof. Dr.-Ing. Christoph Stiller

**Betreuer:**

Johannes Fischer, M.Sc.

**Programming language(s)<sup>1</sup>:**

Python advanced

**System, Framework(s):**

Linux, Tensorflow

**Required skills:**

- Solid mathematical foundations
- Work on your own

**Language(s):**

German, English

For more information please contact:

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Or directly send in your application including your current grades as well as our questionnaire!



<sup>1</sup> **skill levels:**

*beginner* < 500 lines of code (LOC)

*advanced* 500 – 5000 LOC

*proficient* > 5000 LOC