Head:	Dr. A. Kouvelas / Dr. M. Makridis
Topic:	**Applying Reinforcement Learning Algorithm to Anticipate Road Network Disturbances**
Assistant:	Linghang Sun
Registration:	www.ivt.ethz.ch/en/studies/downloads/assignments.html#registration

Description:

Data-driven machine learning algorithms have been proven to be very powerful in multiple application scenarios in various disciplines. And for sure the same trend is also taking place in the field of transportation. The advantages of machine learning algorithms lie in their model-agonistic characteristic and great flexibility to deal with nonlinearity under complex environments. For example, traffic networks are susceptible to disturbances and uncertainties. While some traditional control-based methods are able to yield accurate results under no disturbances, they may fail hard with their precisely optimized results when things start to change and are off expectation. Learning based algorithm has the potential to overcome this gap by learning from disturbances.

Reinforcement learning (RL) is a type of advanced machine learning technique, which involves training agent(s) to perform or implement control under a predefined environment. The agents interact with the environment to gain experience and learn from it. Decentralized control has the benefits of being efficient and thus suitable for real-time fast-response control, making multiagent RL models ideal for the control of complex traffic networks. Given different degrees of information sharing between the agents, the overall performance may also be greatly affected.

This assignment aims to design and test RL-based methods when disturbances are taking place in a multiregional urban network and observe whether the trained agents would be capable of making the smart choices, which lead to more resilient or even antifragile networks.

Links:	-
Additional remarks:	Individual work recommended
Minimum credits:	20 ECTS for master thesis (24 ECTS for students following the previous program regulations)
Recommended lectures:	101-0437-00L Traffic Engineering 103-0849-00L Multivariate Statistik und Machine Learning
Additional information:	Programming skills in Python are required Understanding of transportation models and metrics is needed Knowledge of reinforcement learning is highly recommended Interested students may contact linghang.sun@ivt.baug.ethz.ch