

MSc. Thesis Project

What Makes a Good Driver?

Learning and Inference in Traffic



Problem description

How do drivers decide when to accelerate, brake, or keep their distance? Traditional traffic models describe this using fixed rules, but real driving involves uncertainty, anticipation, and adaptation. Recent advances in **Active Inference** offer a new perspective: drivers as intelligent agents that form beliefs about their surroundings and act based on predictions of what will happen next. This project explores a central question: **Can we model drivers as adaptive, belief-driven agents, and what does this mean for traffic flow?**

Assignment

In this project, you will explore how different assumptions about driver behaviour shape traffic dynamics. You will work with a Python-based microscopic traffic simulation and:

- Build and experiment with different driver models (from rule-based to inference-based)
- Design how a driver perceives, predicts, and reacts to its environment
- Simulate interactions between vehicles under different scenarios

Rather than focusing on one fixed model, you are encouraged to **explore design choices**, test ideas, and evaluate their impact. You will analyze how different driver behaviours influence traffic patterns such as stability, safety, and flow efficiency, and reflect on what makes a “good” driving model.

Candidate

- Experience with Python programming
- Interest in AI, modelling, and simulation
- Curious about human behaviour, decision-making, or intelligent systems

Research group

AiMTT Project, DAIMoND Lab at TU Delft’s Department of Transport & Planning

Contact

Xue Yao
x.yao-3@tudelft.nl

Yanan Xin
yanan.xin@tudelft

Serge Hoogendoorn
s.p.hoogendoorn@tudelft.nl