

## Master Thesis Work: Modelling driver behaviour in conflict intersection scenarios

<i>Thesis title</i> Modelling driver behaviour in conflict intersection scenarios	
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<i>Keywords</i> Virtual simulations, vehicle automation, driver models, simulation platform	
<i>Who are you?</i> One or two Master's students at Chalmers about to do a Master Thesis.	
<i>Requested experience</i> <ul style="list-style-type: none"> <li>• Experience in using Matlab/Simulink to comprehend an existing implementation</li> <li>• Programming skills in Python</li> </ul>	
<i>Affiliations</i> This is a Master's thesis work at Chalmers University of Technology, and the Safety Evaluation group within the research area Crash Analysis and Prevention, at the division of Vehicle Safety. The thesis will be conducted as an activity parallel to an industry/academia project.	
<i>Thesis aim</i> <ul style="list-style-type: none"> <li>• Implement, test and enhance (parameter optimization, adding a warning, quantify brake and steering reaction) an existing driver behaviour model in the Virtual Test Drive virtual simulation tool</li> </ul>	
<i>Thesis objectives</i> <ol style="list-style-type: none"> <li>a) Generate intersection scenarios in VTD</li> <li>b) Convert an existing driver response model from Matlab/Simulink to Python</li> <li>c) Make the interface between the model and the VTD virtual environment</li> <li>d) Implement and test a feature for replaying existing data</li> <li>e) Propose and come up with model improvements</li> <li>f) Test and evaluate model behaviour with actual driver behaviour from existing data</li> <li>g) Writing up the work in a Master Thesis report</li> </ol>	
<i>Highlights</i> <ul style="list-style-type: none"> <li>• Possibility to work on a real-world problem (with data based on a simulator study with actual human drivers)</li> <li>• Application of a modelling approach and contributing in the improvement of vehicle safety</li> </ul>	
<i>Number of students</i> 1-2	<i>Scholarship provided to the student(s)</i> -

## Background

Virtual simulations for safety assessment are a method that is used to estimate the safety impact of traffic safety prospectively. That is, computer simulations where combinations of vehicle models, sensors, models, driver models, and scenarios are conducted to assess what impact specific technologies (e.g., automated vehicle functionality) and driver behaviors (e.g., glance behavior or expectations) has on safety. Driver models in particular help to understand how in conflict situations systems should be designed to assist the driver and prevent or mitigate crashes.

We at Chalmers (at the Safety Evaluation group in the Crash Analysis and Prevention unit) recently started using the [Virtual Test Drive](#) (VTD) virtual simulation environment. This allows us to simulate developed driver response models in a virtual traffic environment with existing vehicle models and easy to use scenario builder. Our work focuses on the improvement of these driver models to point out weaknesses in the response towards conflicting situations and consequently where future assistance systems can make a positive impact. Evaluating and quantifying the impact and benefit is also part of our work.

## Thesis work

You are to implement virtual simulations for a specific intersection scenario (with conflict) in the [Virtual Test Drive](#) (VTD) virtual environment, including generating a set of parameterized straight across path conflict scenarios, and implementing an existing driver response model in the external model engine (Python). Once the scenario is set up and the model is implemented, a replay mode of existing data is required to compare the model with actual data.

The work will require you to program in Python and you will need to learn the VTD internal scripting language and the tools/methods to work with that environment. You will also need to understand and comprehend an existing response model written in Matlab/Simulink and implement the API to the VTD virtual environment. Note that VTD is a tool we at the Safety Evaluation group are just getting, to be able to do these types of simulations. Your work will be one of the first working with VTD. Experience in virtual simulations is a sought-after competence in the automotive industry.