Switch gear! Drive the uptake of Open Science within your research team.

Associate Professor, Joost de Winter, and Postdoctoral Researcher, Pavlo Bazilinskyy, share their experience of working together on automated driving projects

Associate Professor, Joost de Winter, works in the Department of Cognitive Robotics. His research team investigates human factors of automated driving, for example, how drivers, pedestrians, cyclists and other road users interact with highly automated vehicles. Their aim is to develop automated vehicles that can understand and adapt to the driver's state and intentions for safer transportation. de Winter advocates Open Science and transparent working within his team to improve the validity and reproducibility of their research.

Postdoctoral researcher, Pavlo Bazilinskyy, has been a valued member of de Winter's team since 2014 when he began his PhD. His doctoral research explored the use of auditory interfaces for human interaction with automated vehicles. Bazilinskyy received several prestigious awards for his doctoral work, including the European Young Researchers Award, MCAA Best Innovator Award and EMA Alumni Award. His current research focuses on how automated vehicles should communicate with human road users.

Both scientists recently joined our vibrant team of Data Champions to drive the uptake of Open Science amongst the research community of TU Delft.

A new avenue

"It was around five years ago when I began to explore the field of Open Science," says de Winter. "I became concerned about the reproducibility crisis which is a serious problem in Psychology and other scientific disciplines." He continues, "I realised the need to be more careful about conducting empirical research and believed that the scientific process could be made more open to improve the reproducibility and credibility of published results."

With this in mind, de Winter has taken positive steps to promote Open Science within his own research team and is enthusiastic to share his wisdom with a wider scientific audience. His recent talk at the Future Forward seminar emphasises the importance of replication studies and offers valuable advice on how researchers can achieve reproducibility. For a summary of his talk, read 'Can I really read your emotions if I look deep into your eyes?'

The 'open' road

With a team of 6 PhD students, 8 Master's students and a cohort of Bachelor's degree students, de Winter understands the value of establishing proper research data management infrastructure for efficient coordination and collaboration. "Since I manage several large research projects which overlap in content, there are usually a number of researchers working together on the same dataset. Therefore, it's imperative that all team members have access to the data repository and that they know how to store and archive their data for effective data sharing." He highlights that this is particularly important for the seamless continuation of research projects when there is a frequent turnover of students.

As part of their data management plan, de Winter obligates that his students adhere to a specific project folder and file structure that can be openly accessed via Dropbox or Google Drive from the start of their project. Postdoctoral researcher, Bazilinskyy, demonstrates how students can organise their work by sharing examples. "I give students access to my past projects so that they learn how to appropriately format and manage their own data." He also introduced Slack, a communication tool that facilitates knowledge exchange amongst team members.

de Winter expects his students to publish their experimental data on the 4TU.ResearchData repository upon project completion. "It's not enough to publish results tables and figures in a publication, researchers must also publish their underlying data." He explains that making data open holds researchers accountable for their work and helps to solve the reproducibility crisis. "Publishing data adds value to a scientific publication. If anyone has questions about the results of an experiment they can examine the raw data, validate it and reuse it." de Winter hopes that open data practice will spread beyond his research group and gain traction within the entire research faculty.

In the driving seat

"Young scientists are the answer to driving a culture change," says de Winter. "New students embrace Open Science. They aren't afraid of adopting contemporary standards; they're proud to take ownership of their independent project and see the value of working openly."

Bazilinskyy is a good example of a modern scientist with an intrinsic desire to drive Open Science. He explains that his passion stems from his long-standing appreciation for open-source software. “Ever since undertaking my Bachelor’s degree in Computer Science, I’ve believed that science should be open. I want to collaborate with others and make my data available to advance scientific progress.”

Accelerating science

As a Marie Curie fellow, Bazilinksyy worked on the Human Factors of Automated Driving (HF Auto) work package, ‘Human-machine interface of the future highly automated vehicle’. He explains the purpose of his PhD research. “When an automated vehicle reaches its operational limits, it must provide a takeover request to alert the driver to resume control. Current human-machine interfaces within automated vehicles provide the driver with instant auditory cues, such as warning sounds or spoken messages. Such binary cues can be problematic, leading to false alarms, distraction, information overload, and can be annoying for the driver.”

Bazilinksyy investigated the use of directional auditory feedback via speakers in the cabin of an automated truck to improve communication with the driver. Using driver simulation experiments, the use of sound was validated in isolation and in a multimodal setting. Hence, Bazilinskyy collaborated with Alexander Eriksson from the University of Southampton and Veronika Petrovych from the Swedish National Road and Transport Institute (VTI) to implement advanced visual cues, and Bastiaan Petermeijer from the Technical University of Munich to implement tactile cues via active inceptors, such as joysticks, the driver’s seat, steering wheel and pedals.

Based on the premise that binary auditory cues are perceived as an annoyance for drivers, Bazilinskyy collaborated with Volvo Trucks in Gothenburg, Sweden, to conduct a naturalistic driving study. In this study continuous auditory feedback was used to inform the driver about various motoring parameters, such as cruise control status, lane deviation and headway time. The continuous auditory cues blend with natural sounds of the cabin (i.e. engine and wind sounds) and keep the driver informed on a continual basis.

Backseat drivers!

As our roads become more populated with automated vehicles, there is concern for the lack of interaction between automated vehicles and human road users. “In current motoring practice it’s common for drivers to communicate with pedestrians and other road users via eye contact or hand gestures. However, in the future of automated driving, drivers will become passengers and are likely to spend their daily commute preoccupied with work, reading, playing games, or even sleeping.”

In order to determine how automated vehicles should interact with other road users, Bazilinskyy devises novel communication methods and conducts crowdsourcing experiments using the Figure Eight Platform to evaluate the efficacy of each method.

An ongoing crowdsourcing experiment uses animations to present different ways to visually communicate the intent of an oncoming automated vehicle. Respondents are asked to watch a series of animations and provide feedback about the effectiveness of each visual stimulus.

Caption: Various ways to display the intent of an oncoming vehicle through the use of visual signs

Bazilinskyy advocates the use of crowdsourcing for Open Science. “For research to be robust, reliable and reproducible, it’s important to use a large and representative sample population. Crowdsourcing draws thousands of respondents from all corners of the globe to give you more powerful scientific results.”

SD-Insights

Aside his academic career, Bazilinskyy is the Director of Data Science Research at SD-Insights, a corporate organisation that aims to improve driver performance, safety and efficiency.

Their main clientele are transportation companies that register their fleet of vehicles for the installation of mobileeye advanced driver assistance systems (e.g. cameras, sensors and tracking devices). Data is collected on approximately 200 driving parameters for each vehicle. Bazilinskyy analyses the data and provides drivers with personalised feedback to help them drive safely.

He believes that SD-Insights can improve profitability for transport companies who register their drivers. “Safe driving reduces company costs through better fuel economy, reduced vehicle maintenance and, ultimately, less road traffic accidents.”

This is a positive example of how data can be shared with drivers to educate and motivate them to adopt safe and efficient driving practice.

Citation

This showcase is a selection from the following publication:
Clare, Connie. (2019). The Real World of Research Data [Book]. Zenodo. http://doi.org/10.5281/zenodo.3584373.