



NEWS RELEASE

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NTU Singapore team wins two awards at Google's Waymo autonomous driving competition

A team of roboticists from **Nanyang Technological University, Singapore (NTU Singapore)** has clinched two top awards at an autonomous driving competition organised by Waymo, the autonomous-vehicle subsidiary of Google.

In **Google's 2021 Waymo Open Dataset Challenges**, which saw more than 70 international teams take part virtually, the NTU team won 1st place under the Interaction Prediction category and 2nd place under the Motion Prediction category.

In the two challenges, participants had to develop software algorithms to analyse 574 hours of real-world traffic data collected by Waymo – consisting of road users such as vehicles, pedestrians and cyclists, as well as infrastructure such as traffic lights.

In the Motion Prediction challenge, the algorithms must be able to predict where these road users will be eight seconds later, based on the trajectories of their paths over the last one second.

The Interaction Prediction challenge is more complicated as the algorithms must be able to predict the future position of a selected road user as well as two other road users that it interacted with, based on their previous trajectories.

Predicting the motion of traffic and how any vehicle interacts and affects other vehicles, cyclists and pedestrians around them, are among the most challenging problems in autonomous driving, due to the complexity of the real-world environment.

Being able to do motion and interaction prediction accurately will enable a self-driving vehicle to better plan its driving route and behaviour well in advance, as well as to perform any defensive driving manoeuvres to avoid potential collisions with other traffic.

The competition's results were unveiled last month at the *2021 Conference on Computer Vision and Pattern Recognition (CVPR)*. Both the conference and

competition were held online this year due to the COVID-19 pandemic and were attended by top industry and academia who are working on Artificial Intelligence and related-technologies for self-driving vehicles.

Nanyang Assistant Professor Lyu Chen together with his **PhD students Mr Mo Xiaoyu and Mr Huang Zhiyu** from **NTU's School of Mechanical and Aerospace Engineering**, had emerged ahead of teams from around the world such as the United States, Russia, Germany and China, with their innovative solutions.

The competition saw participation from top teams from industry and academia, such as automotive AI firm Horizon Robotics, US tech company Xilinx, Chinese automobile manufacturer Leapmotor, transport giant DiDi, and universities including University of California, Berkeley, Carnegie Mellon University, Technical University of Munich, ETH Zürich and Tsinghua University.

In the Interaction Predication challenge, NTU was the only named winner with no other runner ups, unlike the other challenges which had the top three teams named, while in the Motion Predication challenge, it is placed 2nd after Tsinghua University, and ahead of the 3rd place winner – a joint team from Skolkovo Institute of Science and Technology, Heidelberg University, and Novosibirsk State University.

Using a combination of deep learning, neural networks and custom algorithms to analyse and learn over 570 hours of unique driving data in different urban environments from drivers, cyclists and pedestrians, the interdisciplinary team from NTU was able to accurately predict a specified vehicle's position eight seconds in the future, as well as two other road users that it interacted with.

The team also achieved high accuracy in their prediction, given that the predicted position was only 30 centimetres away from the actual position in the real-world data.

“Our team has deep expertise working on autonomous vehicles and machine learning algorithms, which has allowed us to successfully build software solutions that are able to accurately predict the motion of traffic and how each vehicle is interacting with other road users,” explains **Asst Prof Lyu**, who is also **Cluster Director of Future Mobility Solutions** at the **Energy Research Institute @ NTU (ERI@N)**.

“We have proven our solutions in both simulations and in self-driving robots and will now be looking to integrate and test them on the full-sized autonomous electric bus, which is jointly developed by NTU and Volvo on the NTU Smart Campus. They will also be useful for smart city traffic management systems, where congestion and accidents can be anticipated in advance.”

NTU Senior Vice President (Research) Professor Lam Khin Yong said the achievements by Asst Prof Lyu's team in the Waymo Open Dataset Challenges are

testament of the university's strong research capabilities and its proven track record in research output, especially in the fields of in autonomous driving and future transportation.

“In the past few years, NTU has developed technologies for autonomous cars, buses, utility vehicles, and mobile robots, for applications ranging from transport, logistics, disaster relief amongst others. Artificial intelligence that powers fleet management and route optimisation, and test bedding of various self-driving vehicles have been carried out on the **NTU Smart Campus**; and certification of these solutions has been led by the Centre of Excellence for Testing & Research of Autonomous Vehicles – NTU (CETRAN). Such advances demonstrated by Asst Prof Lyu Chen's team in smart mobility will help pave the way towards better and safer autonomous mobility solutions.”

Currently, Prof Lyu and his team of seven researchers are developing various autonomous driving technologies that are being tested on a small four-wheeled robot, as well as on a virtual driving simulator in the NTU Robotics Research Centre.

In near future, they will integrate, test and trial their autonomous vehicle solutions on larger vehicles at the CETRAN autonomous vehicle test facility, which aims to assess self-driving vehicles in a simulated tropical urban environment.

Developing future mobility solutions is part of the **NTU 2025 Strategic Plan** that seeks to address technology's impact on humanity through high impact research. These future mobility technologies are developed and tested on the NTU Smart Campus, a living testbed of innovative digital and tech-enabled solutions that support better learning and living experiences.

Notes to Editor:

See NTU's **YouTube video** of the research [here](#).

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Media contact:

Lester Kok
Assistant Director
Corporate Communications Office
Nanyang Technological University
Email: lesterkok@ntu.edu.sg

About Nanyang Technological University, Singapore

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the Engineering, Business, Science, Humanities, Arts, & Social Sciences, and Graduate colleges. It also has a medical school, the Lee Kong Chian School of Medicine, established jointly with Imperial College London.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies, Earth Observatory of Singapore, and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Nanyang Environment & Water Research Institute (NEWRI) and Energy Research Institute @ NTU (ERI@N).

Ranked amongst the world's top universities by QS, NTU has also been named the world's top young university for the last seven years. The University's main campus is frequently listed among the Top 15 most beautiful university campuses in the world and it has 57 Green Mark-certified (equivalent to LEED-certified) building projects, of which 95% are certified Green Mark Platinum. Apart from its main campus, NTU also has a campus in Singapore's healthcare district.

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources.

For more information, visit www.ntu.edu.sg