

Can machine learning improve road safety and traffic management?

Sanral's Technical Innovation Hub (TIH) is currently exploring how machine learning can be used to improve road safety, reduce congestion and inform infrastructure development.



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Drawing from extensive research into industry best practise and collaborations with various stakeholders in the road safety arena, both nationally and abroad, the TIH aims to harness technology to inform, improve and expedite road safety across the South African road network.

Ruan van Breda, mechatronic engineer in the TIH explains: “Machine learning can be used to detect and segment objects within a camera frame (each frame of a video is analysed as a still image). These objects can then be classified based on pre-trained image classifiers. Within the road environment, this allows one to detect and classify different types of vehicles, pedestrians, different types of animals, cyclists, etc.”

The possibilities are infinite, based on what training data is available. Currently there is already ample data available for the above-mentioned classification types. However, Van Breda explains that these genres can be further expanded through the creation of custom data sets and training classifiers, to be able to distinguish, for example, between slow moving traffic and a road traffic crash. This can also be used to create new classification classes based on unique experiences, or the requirements of the road authority, eg. fire or protest detection, foreign objects such as rocks, tyre detection, etc. This information can then be used to activate the appropriate response through the Road Incident Management System (RIMS), remedy the situation and inform road users – in real time.



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“One can also look at how these different objects interact with one another, eg. to detect unusual vehicle behaviour, like a vehicle stopping on the freeway. One is furthermore able to infer information about the interaction between multiple elements such as cars and pedestrians. If a vehicle is detected moving to the side of the road and coming to a standstill and pedestrians are detected moving towards the vehicle and enter the vehicle, this can be classified as an informal pick-up. As more and more data is collected, these trends can either aid road authorities with infrastructure planning such as drop-off / pick-up points or aid law enforcement to stop illegal pick-ups if it is considered a safety risk,” continued Van Breda.

Technology of this nature also comes with significant risks. However, all efforts are being made to understand how to effectively use the technology while maintaining strict compliance with legislation as it relates to the privacy of road users. Some of the ways to mitigate these potential privacy risks, are to use strict security and access controls. Data can also be anonymous at the point of capture. After all, the intention is not to observe individuals, but rather to identify trends and incidents to inform appropriate response and interventions.

“While this technology is still in the exploratory phase in South Africa, it already has tongues wagging in countries like China, where they use machine learning to incorporate facial recognition for law enforcement. They are able to identify the driver of a vehicle and instantly issue fines, if that driver does not have a valid driver’s license. Fines can also be issued automatically for individuals who jay-walk or gain access to restricted areas. As with any technological advances, there are pros and cons and in a complex society like South Africa, for now, let’s look and learn,” concluded Van Breda.

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