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Recap from Innovations in Mobility and Transportation Quarterly Series

McMillan hosted the first quarterly instalment of the speaking series, "Innovations in Mobility and Transportation." Caliber Data Labs and SAE International, the global association setting engineering standards for autonomous vehicles and other related industries, are behind this series. The goal is to share views and insights, and bring together individuals, representing various aspects of this evolving space. With stakeholders ranging from automobile manufacturers and regulators to software engineers, the objective is to create a brain trust supporting innovation and providing a forum for meaningful conversation.

The inaugural event was well attended. It featured a talk from Sven Beiker, founder and managing director of Silicon Valley Mobility and long-time mobility professional and consultant and Yaser Khalighi, founder and CEO of Caliber Data Labs.

Mr. Beiker, whose talk was entitled "How Automation and connectivity will drive the future of mobility and transportation," discussed the future of mobility. He identified four major trends that will lead the way: automated driving, connectivity (and the need to focus on standardization in communication protocols), electrification, and shared mobility. He also noted that any viable solution would need to combine all four of these trends. For example, autonomous vehicles powered by electricity will be used as part of shared fleets, in a more commoditized way than the current model of sales of personalized vehicles.

As part of his presentation, Mr. Beiker explained the six standardized levels of automated driving set out by SAE International. Many of today's vehicles already use some level of automated driving, for example, cruise control or park assist. As the levels increase, control shifts between the driver and AI. Many questions will arise with each step towards greater autonomy in driving systems. For example, when is monitoring or control taken over from the driver? What about a plan B? At what point and in what space of time would a human driver be able to shift over to regain control of the vehicle? Who is monitoring systems, and when are these systems activated — on the highway, while parking only, or in what most understand to be the most challenging situation, city driving? To what extent will society accept standards of safety at a 90% safety rate offered by corporations versus that resulting from human error alone.

Throughout his talk, Mr. Beiker emphasized the importance of connectivity and data. Many computers within automated vehicles are already providing data to other automated vehicles and this data sharing is set to grow. Currently, there is a huge and diverse need for data to program, teach and operate automated vehicles. As AI is somewhat by nature, geared towards a monopoly, it is clear that those with the most data will have a greater advantage in moving ahead and will in turn have more products on the road collecting data. The sifting and programming of data that is needed to teach AI is currently handled by individuals who painstakingly verify categorized data sets (e.g., a car vs a motorcycle vs a bike on a road). Industry will need an infrastructure ecosystem to handle the vast amount of data required. In particular, this infrastructure will need to offer a turnkey solution for safe and efficient processes as data grows. This solution will need to be as automated a process as possible. To advance on the global scale and throughout a diverse set of products, it will also need to incorporate standards to enable data exchange among parties, including for monitoring and compliance.

Looking to the future, Mr. Beiker identified the biggest challenge in moving towards greater automation: merging the current driving reality with automation. He predicts a staged approach. We are at the cusp, for example, of early deployment of automated shuttle

vehicles. Next may be commercial vehicles for shipping and delivery. Following that, we may see infrastructure-based advancement, where certain lanes are blocked off for automated vehicles. It is likely we will see fully automated vehicles long before we are willing and able to deploy them on the road as a travel solution. Tellingly, Mr. Beiker explained that the growth of automation is not linear. While we have introduced park assist and other automated features, these advancements have been the easier, low-hanging fruit. Full implementation will take significantly longer as more difficult milestones are achieved. As the industry ecosystem expands, co-operation among stakeholders will be needed to achieve the greater common good across manufacturing, insurance, data engineering, and other areas.

Mr. Khalighi spoke next and opened, "teaching cars to drive is painful, the enabling software should be magical!" Mr. Khalighi spoke mainly about the data challenges for autonomous vehicles, first explaining that data from autonomous vehicles comes from sensing (in the form of cameras, lenses, linear and GPS) which provides raw data. This raw data moves through a process of perception (image processing, object detection, object tracking and point cloud processing) to create a target list of data for sensor fusion and control, providing signals when activity is actualized in steering, braking and actions taken by power train chassis.

While we are able to collect a significant amount of raw data, not all data is created equal. For example, data of more dangerous driving conditions represents a relatively small amount of data, but it is critical to implementing an autonomous mobility scenario. The treatment of raw data by perception, sensor functions and control sections of the process relies heavily on AI. It takes the processing of vast amounts of raw and response data to effect a decision or action by an autonomous vehicle. Autonomous vehicles generate anywhere between 50-150 terabytes of data per day. Accordingly, an industrial grade solution is needed to store, prepare and use this data in the training of AI models.

The next challenge for data in autonomous vehicles will be data management. At current levels, transfers will be painfully slow, and

storage costs will be through the roof. Mr. Khalighi noted that for a fleet of 100 Autonomous Vehicles at current levels, it would take one year to transfer a single day of data over 100-Mb speed and cost $20 million annually in storage. Data management requires a multi-audience system, including a perception team, controls team, sensor fusion annotations and a QA team.

Beyond data management, is the need for labelling and verification. Currently this is a labour- and cost-intensive process, and due to the nature of AI, it must be iterative. Mr. Khalighi has been working on these systems for clients of his company, Caliber Data Labs, and understands that, ultimately, data management should be provided on a hybrid system of on-premises and in-cloud infrastructure, with sharing capabilities between the two. As he points out, the data discovery process should provide rich query and review interfaces, and the labelling system must be integrated with third-party providers.

The next event in the Innovations in Mobility and Transportation series will take place at McMillan's Vancouver offices on December 11, 2019. It will feature discussions from local mobility experts on previously successful rollouts of shared mobility solutions, and explore the future of autonomous, connected, electric and shared (ACES) mobility. You can register for the event here. We look forward to seeing you there.

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