Capgemini

Intelligent Industry. Powered by data

THE ROAD TO AUTONOMOUS CAR DEVELOPMENT

For years, automotive companies have been working towards realizing a longstanding dream, in which self-driving cars travel without interruption on public roads, carrying their passengers in comfort and safety to their destinations.

There have been great strides towards this new reality. Many automotive companies are already embedding software with varying levels of autonomous capability into their vehicles, although only a handful currently have made such features accessible to the driver.

Progress towards this end is not necessarily slowed by the availability of the technology used in autonomous cars – it's already in many cars currently on the road – but more significantly by the regulation and interoperability of the technologies.

It's well known that some companies that have made autonomous driving functionality accessible have run into serious trouble, with injuries and even fatalities among drivers and pedestrians. Terrible outcomes such as these further complicate the legal issues surrounding the development and deployment of the technology, potentially setting back the rate of development by years.

So how do we safely accelerate towards the autonomous driving future?

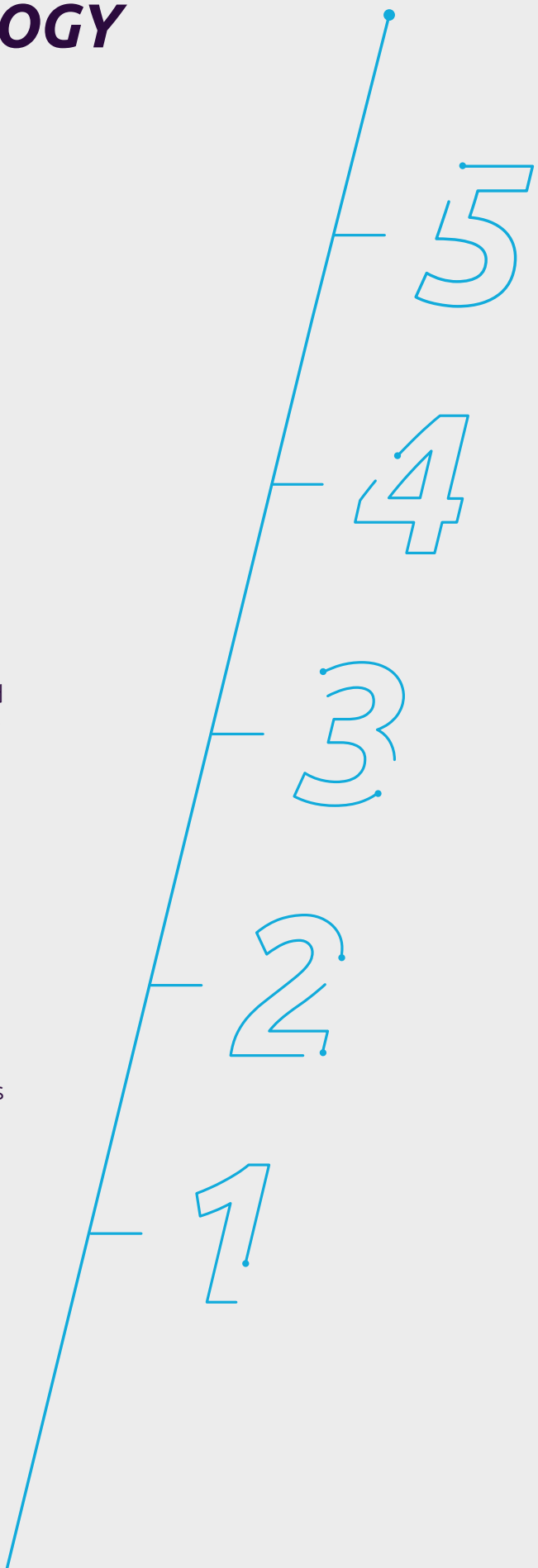
FIVE STEPS TO AUTONOMOUS DRIVING TECHNOLOGY

There are five levels of autonomous driving technology, with level one representing some automatic features, such as collision detection or lane departure warnings, and level five representing full automation, where no driver is needed.

Higher levels of automation depend on a vehicle's sensors perceiving external obstacles and factoring in driver judgment based on distance and time, just as a human driver would. So it is essential for vehicles to be equipped with intelligence based on crowdsourced and validated driver "truths" or data, as well as further secondary high-quality sensors and secondary camera systems to enable 2D or 3D outer labelling and scenario extraction.

To make this intelligence equipping and scenario extraction happen, manual work such as labelling and enriching data is needed – until now, this has been a significant effort. But artificial intelligence makes it significantly easier by creating what are, essentially, automated, crowdsourced truths.

Human engineers are not able to process such massive data pools efficiently . So, to ensure vehicles are equipped with accurate scenario intelligence free of redundancies, **automation is critical.**

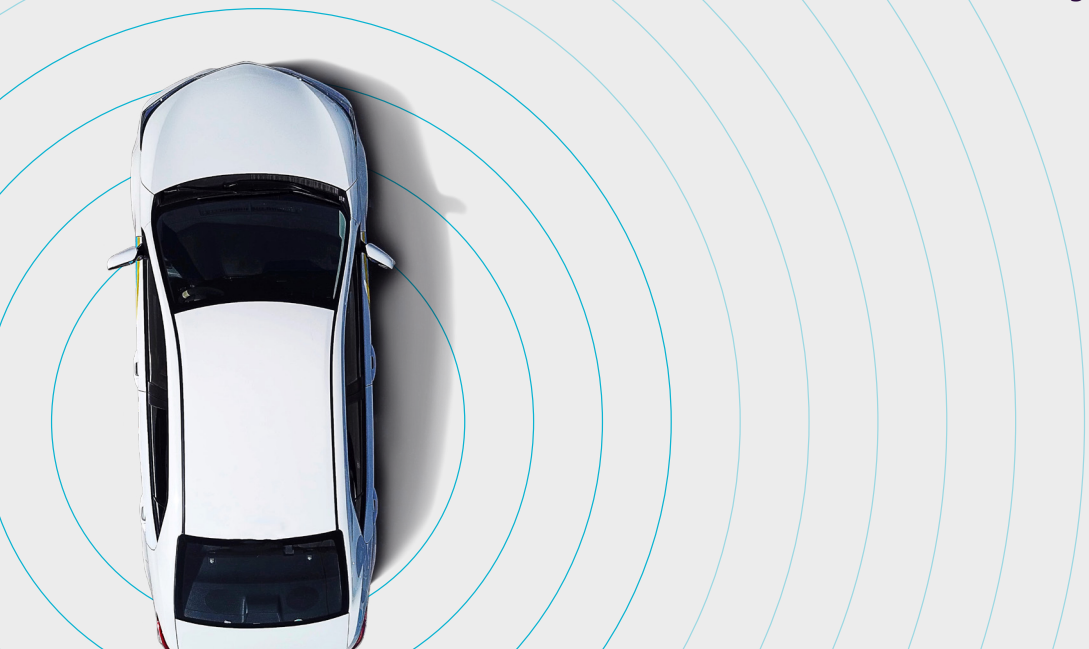


IMPLEMENTING THE TECHNOLOGY USED IN AUTONOMOUS CARS

Currently, even the market leaders are only at level three, and features no higher than level two are legal for use on public roads. For example, "autopilot" mode still requires the driver to be awake and alert, ready to manually intervene by steering and braking when required.

This in itself requires hugely sophisticated technology, not just with the vehicle outwardly sensing conditions and events on the road, but also monitoring what the driver is doing, even when they have switched to autopilot and handed control to the processors.

Advanced Driver Assistance Systems (ADAS) are a foundational piece in the jigsaw, especially in moving through the levels of autonomy. Level three, of course, is where things get complicated. Not only is the technology exponentially more complex, but every technology component at every step needs to be developed so that it can behave correctly in every situation, and then it needs to be independently validated and assured for its effective and safe use.



For some newer automotive companies, technology testing and deployment has been in their DNA from the outset, with the vision of autonomous driving a clearly identified goal in their purpose. But for longer-established companies and original equipment manufacturers (OEMs), the journey towards autonomous car technology is arguably more challenging. These companies cannot simply wipe the slate clean and redesign their development processes from scratch – unless it's through a completely new experimental spinoff unhindered by legacy processes. Even in that situation, as ADAS technology becomes more mainstream there will be an expectation from consumers that new cars come fitted with level one and two ADAS features as standard. And this means that the manufacturer will need to retrofit these new technologies into existing vehicle ranges, and therefore new elements will need to be added in to existing design, testing and manufacturing processes.

Very few companies have the resources or time to conduct their own experiments and develop new ADAS-implementing processes. Buying in and implementing a working proofofconcept could slash the development time and budget and free them from some of the regulatory burdens they face.

THE DATA BEHIND THE DRIVE

ADAS and autonomous driving have another fundamental element beyond technology and legality, and that is data.

Higher levels of autonomous driving functionality require more situations and decisions to compute and execute decisions on. No vehicle could travel enough kilometers on public roads to experience every possible eventuality, so virtual modeling becomes a critical part of testing – and this means big data being generated and processed.

Digitization also plays a fundamental role in the validation of data, especially when necessary feature and software updates must be made. Over-the-air updates that require software and UI updates are much more convenient with software and feature release management processes in place instead of the traditional methods that relied on hardware-based updates.

In addition, automatic vehicle-to-vehicle (V2V) communications and interactions with devices and assets that are, for example part of the new smart infrastructure on roads (vehicle-to-everything or V2X communications), also demand the transfer of massive volumes of data, including across new 5G networks.

But more than this, all the data a vehicle produces and processes has to be stored, annotated, visualized, analyzed, and then made available to all the different stakeholders in the development.

EXPERIENCE AND INSIGHT FOR THE FUTURE

According to the Capgemini Research Insitute's recent AI in Automotive report large automotive OEMs can boost their operating profits by up to 16% by deploying AI at scale. The report also highlights where auto manufacturers should focus their AI investments.

Capgemini works with automotive industry clients to validate, verify and standardize the intelligence used across all levels of autonomy, and bring organizations working proofs of concept and constantly updated data sets to their existing design and development processes.

5G is one of the core technologies that will enable autonomous driving on public roads. This new cellular standard accelerates connection speed and reduces latency, and enables vehicles to communicate with each other and a huge number of connected on-road assets and infrastructure almost instantly.

Capgemini has extensive experience in the rollout of autonomous driving 5G, from building the infrastructure, to designing and manufacturing vehicles with 5G technology embedded in them. And with Capgemini Engineering we are the only global firm with both the depth of product engineering and breadth of ability to master data, and deploy technology at scale, that underpins the progression of Intelligent Industry.

Above all, we can co-develop autonomous systems and technologies, and validate and verify the relevant responsibilities for their safety so that advanced and autonomous vehicles can be on the road safely, sooner.

LARGE AUTOMOTIVE OEMS CAN BOOST THEIR OPERATING PROFITS BY UP TO

16%

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Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of 270,000 team members in nearly 50 countries. With its strong 50 year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fuelled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2020 global revenues of €16 billion.

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Authors:

Oussama Ben Moussa
Head/Chief Technical Officer
Autonomous Mobility Expertise Center
Capgemini Engineering

Jean Baptiste Bonnet
Global ADAS / Autonomous driving Offer leader

For more details contact:
engineering@capgemini.com