DVN
Lidar

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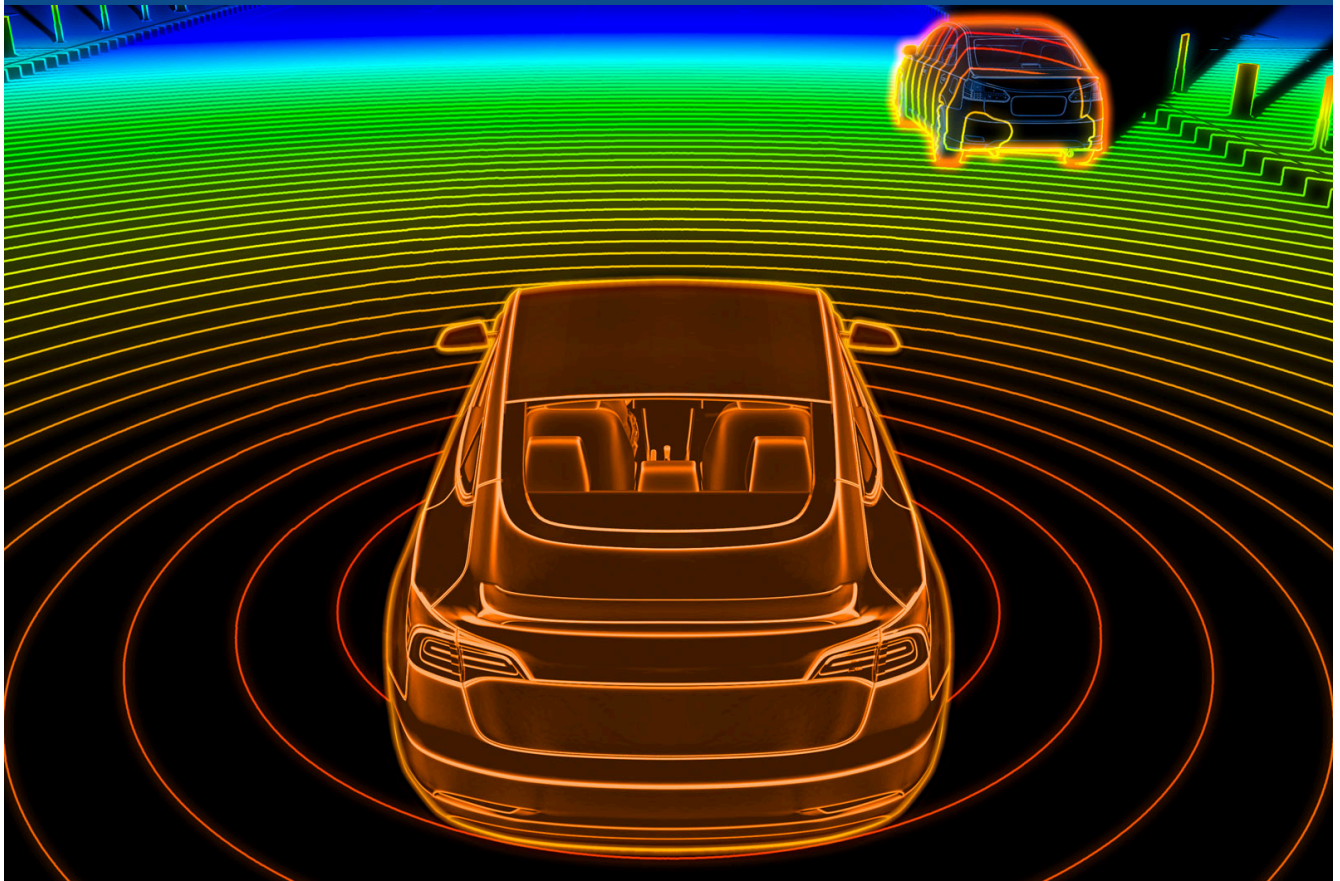
Will Robotaxis Be an Emerging Market Soon?

Waymo is scaling up; they've closed a USD $5.6bn investment round, led by Alphabet. This funding aims to accelerate the growth of Waymo One ride-hailing services and improve the Waymo Driver. Waymo is still very cautious with its expansion, but things look as though they could become profitable perhaps in the next 2-3 years.

Every month the number of customer rides is increasing. At the end of October this past, the figure reached 150,000 rides per week, half again as much as in September (when there were 100,000 per week). JD Power just released a study showing that consumer confidence is growing among those who have ridden in a robotaxi. So in this issue of your DVN-Lidar Newsletter you'll find broad, deep coverage of the effect of robotaxis on lidar market growth.

You'll also find production data from Robosense and HIMA (Huawei's 'smar't driving & lidar activity) which show lidar is still ramping up in China for NOA applications. And there's the finalized docket for the Lidar Conference coming in about two weeks' time.

Upcoming DVN-Lidar Events 2024-25:

- <u>Lidar Conference</u> (Wiesbaden)   18-19 November
- Lidar Deep Dive II (Stuttgart)   8-9 April
- Lidar Tech Expo (Hangzhou)   4-6 June (DVN co-hosts with Enmore)
- Lidar Deep Dive III (Detroit)   9-10 September (combined with DVN Lighting Workshop)

We're ever so glad you're here with us in the DVN-Lidar community. Enjoy this 32nd newsletter!

All best,

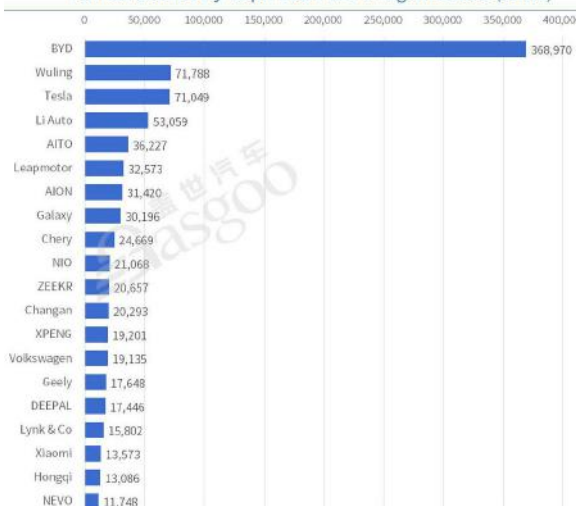**Alain Servel**

DVN LIDAR ADVISOR

Lidar Business Newsbites

China's monthly registrations of locally-made NEPVs (units)

TOP 20 brands by Sept. 2024 NEPV registrations (units)

China New-Energy Passenger Vehicle Registrations: Up and Up!

1,106,772 Chinese-made new energy passenger vehicles (NEPVs) were registered in mainland China this past September, a 61-per-cent increase over September '23. BEV models held the largest share at 57 per cent, followed by PHEVs at 32 per cent and range-extended electric vehicles (REEV) at 11 per cent.

China's indigenous brands dominated the top 20, except for Tesla (3rd) and Volkswagen (14th).

In September 2024, Huawei's Harmony Intelligent Mobility Alliance (HIMA), delivered 39,931 vehicles—six models from their three main brands Aito, Luxeed, and Stelato. All were equipped with Huawei Lidar.

Xiaomi EV, with just one model on the market, achieved 13,573 unit registrations, ranking 18th.

RoboSense Lidar Sales Up in Q3-24

By the end of September 2024, RoboSense's lidar sales for the year had reached approximately 381,900 units, of which 365,800 were automotive lidar products and the other 16,100 were for robotics and other industries.

Hesai, SAIC-VW Sign Cooperation Intent Pact

SAIC Volkswagen has signed a cooperation intent agreement with Hesai Technology. This partnership recognizes Hesai's advanced lidar products and technologies. The company specializes in optics, mechanics, and electronics, holding over 1,700 patents worldwide. By Q2-24, Hesai had delivered more than 470,000 lidar sets.

Hesai to Supply Lidar for New Leapmotor Platform

Hesai Technology has entered an exclusive lidar supply agreement with Leapmotor. Hesai will be the only provider of lidar products for several models on Leapmotor's new platform. This partnership strengthens their strategic collaboration in intelligent driving, demonstrating Hesai's expertise in lidar and Leapmotor's trust in their technology. The first model from this platform is expected to enter mass production in 2025.

RoboSense Wins GAC Aion Lidar Supply Contracts

RoboSense and GAC Aion have entered a partnership under which RoboSense will supply lidar systems for GAC Aion's NEVs. The two companies have been collaborating since 2021.

Aeva's 4D Lidar Picked for AV Validation

Aeva says their 4D lidar has been selected by a prominent European automaker for an AV validation program. Aeva's Aeries II sensors will serve as the benchmark for validating next-generation vehicle automation systems.

DoIT Boasts 1st Taiwan-Made 'AI' Solid-State Lidar

Taiwan's Department of Industrial Technology (DoIT) in Taipei announced the launch of Taiwan's first 'AI' solid-state lidar system. Funded by DoIT and developed by the Industrial Technology Research Institute (ITRI), one key player is Compertum Microsystems, a MEMS company supported by leading connector supplier Lotes.

Waymo Expansion Funded

Waymo has closed a USD $5.6bn investment round, led by Alphabet. This funding aims to accelerate the growth of Waymo One ride-hailing services and improve the Waymo Driver, their 'AI'-powered AD system. Expansion will cover cities like San Francisco, Phoenix, Los Angeles, and new markets such as Austin and Atlanta through a partnership with Uber. Waymo recently launched a safety impact hub to offer insights into how the Waymo Driver affects road safety.

Zeekr to Launch Public No-Map HD Nav Test

Geely's premium new energy vehicle brand Zeekr has announced nationwide public testing of their latest Haohan 2.0 'smart' driving system, featuring HD map-free urban NZP (Navigation Zeekr Pilot) function, which allows users to set specific daily routes, which the vehicle 'learns' and memorizes over time, enabling automatic navigation on frequently-travelled paths. Zeekr also launched the Mix model, which comes standard with lidar sensors and dual Nvidia Orin-X, with capabilities for remote intelligent parking and HD map-free NZP.

QCraft, NavInfo Launch Urban NOA for C¥150kCars

Autonomous driving solution developer QCraft and NavInfo have unveiled what they say is the industry's first cost-effective urban NOA (navigation on autopilot) solution based on the Horizon Robotics' Journey 6M platform. The system has demonstrated highway NOA performance with over 1,000 km between safe interventions, 99 per cent ramp passage success, and 99.5 per cent lane change accuracy.

Will Robotaxis Be an Emerging Lidar Market Soon?

A DVN Special Report

Waymo recently closed a $5.6bn investment round, led by Alphabet, to accelerate the growth of Waymo One ride-hailing services and improve their Waymo Driver 'AI'-powered AD system.

Expansion will cover cities like San Francisco, Phoenix, Los Angeles, and new markets such as Austin and Atlanta through a partnership with Uber.To support the expansion process and improve the transparency of its operations, Waymo has recently launched a safety impact hub to offer insights into how the Waymo Driver affects road safety.

Waymo is in the process of scaling up their commercial operations and could begin contributing to Google's bottom line within the next few years. So, it is time to think about the effects for the lidar Business.

Waymo's Operations: Key Data

After 15 years of R&D, more than $8bn of investment, and multiple pilot programs, Waymo's robotaxis have become a business booking more than 150,000 rides a week with a fleet of around 700 vehicles.

Waymo is nearly alone in offering a commercial service to customers. Assuming an average fare of $20 per ride, this means an annual revenue of $100m per year.

- Customer drives: 150,000 customer drives per week (San Francisco, Phoenix). Waymo has expansion plans for LA, Austin, and Atlanta.
- Safety: after over 7 million customer rides, 84 per cent fewer airbag-deployment crashes.
- Distance per disengagement close to 20,000 km—similar to Pony, Weride, and Cruise. Zoox is far ahead with 100,000 km.
- Social Acceptance: So far, no critical behaviour or accident with humans (vs GM's Cruise, who lost their license after one of their robotaxis rolled over and dragged a pedestrian). There have been a few incidents of vandalism in San Francisco, and the cars have caused traffic jams and blocked emergency vehicles responding to calls.
- Local Approvals: The California Public Utilities Commission approved paid service on San Francisco freeways in May, but San Mateo county has so far not done that, which would be required for Airport service. Right now, only the DMV (state department of motor vehicles) is allowed to issue permits for autonomous vehicles. California Senate Bill 915, which would have regulate autonomous-drive services, was pulled in June after the Assembly Committee made major amendments to give the power to regulate this to the hands of the local city/county governments.
- Validation requires millions of miles on public roads and billions of miles of simulations. The sixth generation of Waymo's driver was released in 2024.
- Investment: Alphabet CFO Ruth Porat said earlier this year that the company will invest another $5bn in the self-driving unit over several years.
- Operations: Waymo has suggested the cost of their vehicles will come to around 30¢ per mile, excluding maintenance, service costs, and depreciation. The complete cost might be as high as 50¢ to 60¢, versus the average cost per ride-hailing mile in Western ride-hailing markets of around $2.40, and the cost of a personally-owned vehicle at about 70¢ per mile. Today, the price per ride is set at around 20 per cent more than an Uber ride.

ROBOTAXI – LIDAR SENSORS MARKET*
Source: LiDAR for Automotive report, Yole Intelligence, 2023

Short-range LiDAR	Company	LiDAR supplier	Long-range LiDAR
4	Waymo	WAYMO	1
0	Cruise	HESAI OUSTER	5
4	Aurora	blackmore HESAI	3
4	Apollo	HESAI	1
4	Didi	HESAI	1
3	Motional	HESAI OUSTER	1
3	Pony	HESAI	2
4	We Ride	HESAI	3
0	AutoX	HESAI	2
0	Yandex	Yandex	4
4	Zoox	HESAI	4

* Non exhaustive list of companies

YOLE

Customer voice - Driving in SF

Business Insider's Lloyd Lee wrote this past July: *"The touchscreen center console shows riders the maneuvers the Waymo drive is making, such as a lane change or yielding to a pedestrian.*

Waymo's 5th generation autonomous driver could be best described as a safe but not annoyingly cautious driver. It maintained the city's speed limits, caught yellow lights from a reasonable distance without speeding, and could make a succession of lane changes smoothly on busy streets.

What impressed me more, however, was how it handled riskier drivers on the road and maneuvers necessary to execute in SF.

For example, double-parked cars are a common sight in the city. Sometimes, this means drivers will have to briefly move into the lane of opposing traffic to get around a vehicle.

The Waymo driver knew how to do that, recognizing that the car in the opposing traffic lane stopped to give us the right of way.

The Waymo also appeared to detect a person on an e-scooter coming from behind and inched a little to the left of the lane to give room for the scooter rider. It did the same thing to give itself more room when it detected a large, parked bucket truck slightly in Waymo's lane.

In one instance, when another driver cut off Waymo, the autonomous driving system handled it with poise since the other driver had plenty of room to go in front of the Waymo.

At yellow lights, the Waymo made good judgment calls about whether it had enough space to catch the light or stop without pressing the brakes hard.

The expectation I had that the Waymo driver would be stiff, as the term 'robot taxi' might suggest, was dispelled throughout the rides".

According to the J.D. Power 2024 U.S. Robotaxi Experience Study just released:

"Consumers report high satisfaction with robotaxi rides, citing technology as a key factor. Although initially skeptical, Consumer confidence when riding in a fully automated, self-driving vehicle is 56 points higher among those who have ridden in a robotaxi (76 per cent) than in the general population who have not had the experience (20 per cent).

Key findings of that study include:

- Consumers seek safety features. When asked what the ideal robotaxi service should offer, the most important items are emergency button to connect with local emergency services; share location with authorities; ability to select a vehicle that has the safety features they want; and the ability to set the route beforehand.
- Unmet needs drives novelty usage: currently, consumers are using robotaxis as a novelty, as they do not fulfill the riders' needs pertaining to the service area coverage and cost of the services. Until robotaxi providers can fulfill these and other needs, the service will remain a novelty transport mode.
- Obeying the law: Attributes in the technology category that score highest among robotaxi riders are vehicle obedience of traffic laws (8.36 on a 10-point scale) and the vehicle's performance maneuvering in normal traffic conditions (8.30).
- Robotaxi vs. rideshare:When given a series of scenarios assuming the cost for either service would be the same, 77 per cent of riders say they would prefer a robotaxi service without a human driver when they need to have a private conversation in the vehicle (*a bit incredible, given extensive in-car monitoring --DVN*), while a ride-hailing service like Lyft or Uber is preferred when traveling in an area they don't know well.

Can we expect quick deployment of Waymo **robotaxis?**

To speed the deployment of Robotaxis, Waymo needs to complete many validations

- Critical use cases: Waymo's software is tested on private test tracks, where complex scenarios can be staged. Waymo has completed over 40,000 unique scenarios in closed-course environments.
- Public Road tests & simulation: the company has performed extensive testing and continues to scale up their fleet, for a total of 20 million self-driven miles on public roads by 2020 and over 10 billion simulated miles. The total real-world miles might reach close to 100 million by the end of 2024.
- Data collection: Waymo's approach isn't as data intensive as Tesla's. Waymo is using a redundant and complementary sensing suite with vision, radar, lidar, which gives good detection data in all conditions, in contrary to Elon Musk's singular insistance that his camera-only systems are superior. Multimodal sensing means a more robust system which doesn't need millions of hours of validations.

- Validations to operate in new cities: One of the potential weaknesses of Waymo's approach is that new geographies must be mapped in detail before Waymo can deploy their vehicles. This is because custom 3D maps, along with real-time sensor data, are used to determine the vehicle's exact location. But Google is used to roving mapping operations.

- Time to Market: With a robust detection technology, Waymo can complete the validations faster than the likes of Tesla, and be first on the market. What Waymo must do is to expand their service step by step, maybe in 3 or 4 new cities each year, to operate in 20 cities by 2030.

Performance & Safety: Can Tesla Compete?

Autonomous vehicle companies must be able to offer a safe service which makes riders feel comfortable and is commercially viable. So far, Waymo's service appears to be safe, and early consumer feedback is generally positive.

• Miles per disengagement: Waymo is at the level of most competitors with about 20,000 km per disengagement. Zoox is ahead but the data are not necessarily comparable. For example, Waymo has tested their vehicles on freeways (with safety drivers) for more than a decade, but still doesn't allow their robotaxis to use freeways.
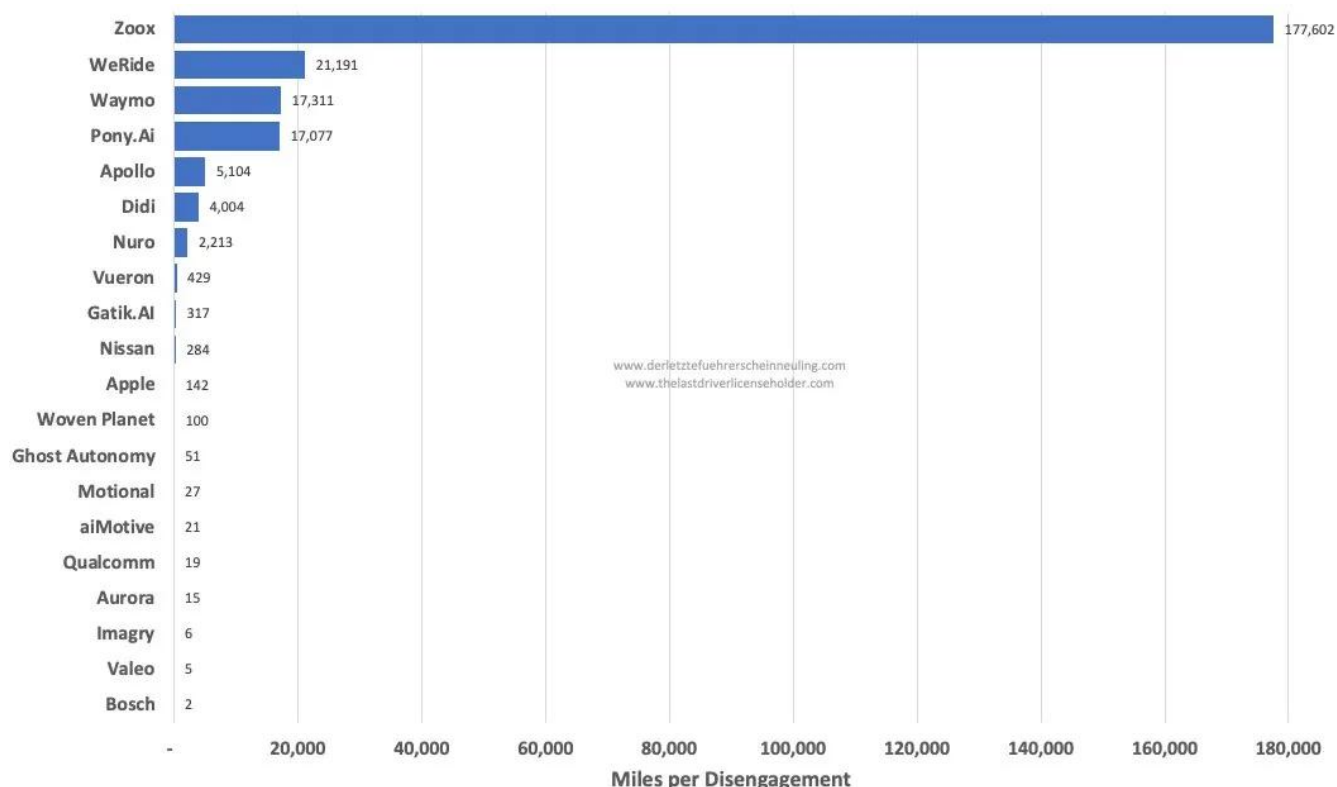
Tesla is far behind for safety; their so-called 'Full Self Driving' L^{2+} system has not proven better than the standard ADAS systems for the same category of vehicles, and also for miles per disengagement.

And while Tesla's cars get in whole categories of crashes most other cars avoid, Waymo has a good safety record. The most recent update—September 2024—shows that Waymo offered over 22 million rider-only miles driven through the end of June. Most of these have been driven in Phoenix (15.4m) and San Francisco (5.9m), with some in Los Angeles (855k) and Austin (14k). In all those, Waymo robotaxis have been involved in 84 per cent fewer crashes with airbag deployment, 73 per cent fewer injury-causing crashes, and 48% fewer police-reported crashes than human drivers.

Most notably, Waymo robotaxis have been assessed as 3.65 times safer than human drivers in Phoenix and San Francisco, with 0.82 injury-reported crashes per million miles compared to 2.92 for human drivers.

Airbag deployment crash rates were 0.23 per million miles for Waymo versus 1.45 for human drivers. This translates into one airbag-deployed crash for every 4.35 million miles, beating Tesla handily.

Does Tesla Have a Plan to Compete with Waymo?

Well...maybe. Leaving aside Elon Musk's perpetual claims ("soon", repeated year after year after year), here is a theoretically possible plan for the launch of Tesla's long-promised robotaxis, based on Yole's Computing & AI for Robotic Mobility report, 2024:
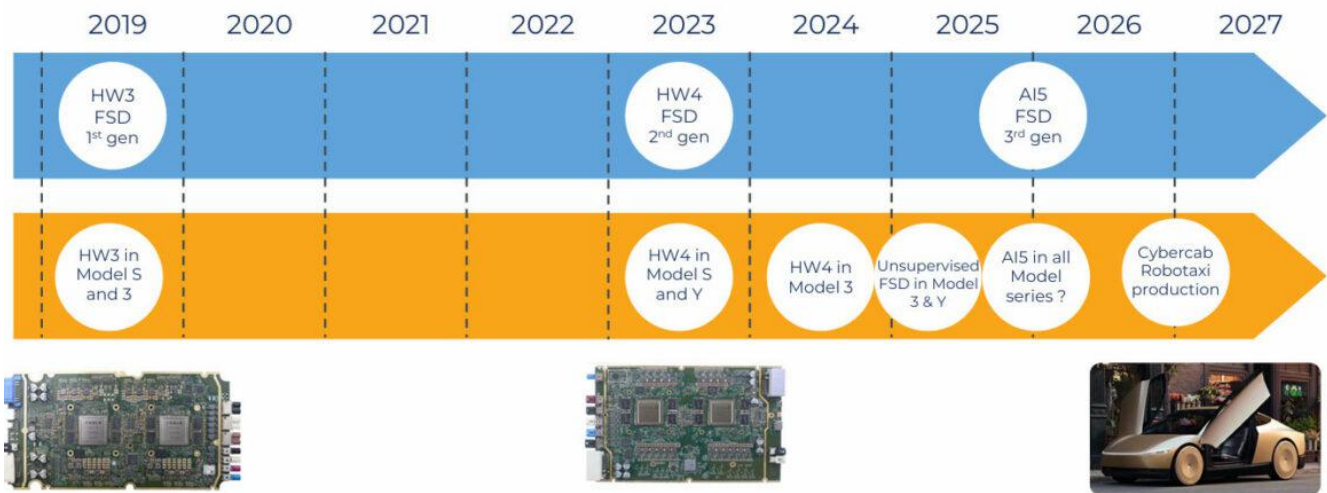
A validation roadmap is a huge challenge for Tesla, and prospects look murky. Tesla's current 'Full Self Driving' has a failure rate much, much worse than what it needs to be in order to be operated unsupervised.

Zoox CTO Jesse Levinson recently said that he uses Tesla 'FSD' regularly and he is impressed by what it can do, but he is afraid that it can create complacency: "Usually it does the right thing, and then it sort of lulls you into this false sense of complacency, and then it does the wrong thing. You're like, 'Oh, my God!'".

When can China be Ready?
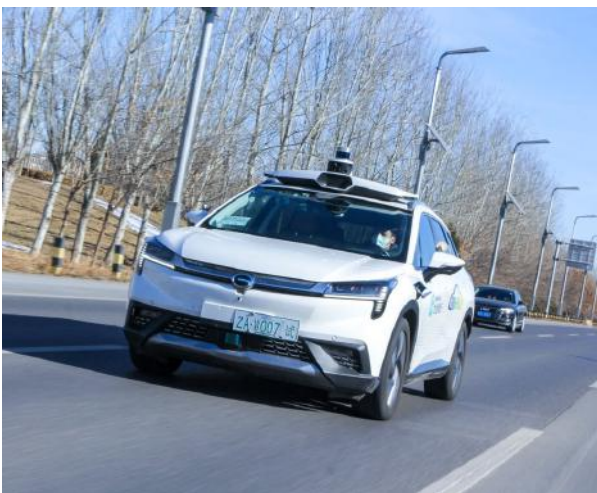
China had more than 7 million registered ride-hailing drivers as of the end of May, according to the Ministry of Transport; that country is saturated with taxis when compared to the U.S. which had nearly 400,000 taxi and ride-hailing drivers, shuttle drivers, and chauffeurs in 2022.

China wants to catch up for the robotaxi market, and authorities there have so far issued 16,000 autonomous-vehicle testing permits and opened 32,000 kilometers of public roads for autonomous vehicle testing.

In November 2023, the Chinese Government introduced regulations to pilot market access for AV products that have passed technical tests and are ready for mass production. Once approved, these vehicles can be insured, registered, and used in pilot programs within designated areas. The relevant ministries have jointly issued a notice detailing management measures for road traffic safety and cybersecurity, promoting the application of 'vehicle-road-cloud integration' systems.

Baidu CEO Robin Li told investors in May that more than 70 per cent of Apollo Go robotaxi rides in April were fully driverless, with no human staff inside. He predicted that figure will reach 100% in the coming quarters, and allow Apollo Go to break even in Wuhan first.

Wuhan is the largest operational region for Baidu's Apollo Go, one of the largest robotaxi operators in China. The company has more than 500 robotaxis operating in the city and plans to increase that to 1,000 by the end of the year. This is a similar number of robotaxis as Waymo.

It is very likely that Baidu will become one of the key players in the robotaxi market in China and will gather a similar experience as Waymo, if not larger.

WAYMO COULD SURPASS BAIDU-APOLLO BY THE END OF 2024
Sources: Computing & AI for Robotic Mobility report - Computing & AI for Automotive report, Yole Intelligence, 2024

Number of Baidu-Apollo rides vs Waymo rides, per quarter

Sources: Baidu financial results,
Waymo announced 700k rides for 2023, 50k paid rides/week in May 2024, +2M paid rides as of July 2024 and 100k paid rides/week in August 2024.

Conclusion

Waymo is currently the clear leader in the self-driving space. Even if competition increases over the next few years, it is difficult to see the market transitioning to price-based competition any time soon, as self-driving vehicles will only represent a fraction of the market in most places.

If the scale-up of Waymo's operations goes well, the company could break even over the next few years, although it will be some time before Google recoups the enormous investment they have made in self-driving technology. Particularly given the large capital investment that will be required to build a large fleet.

Assuming Waymo needs a revenue of $2bn per year to be profitable, that means a fleet of about 15,000 robotaxis each equipped with 5 lidars—a total of 75,000 lidars. The additional market for lidars is not that big in the short or mid term, but the revenue might look better with a higher lidar price than for cars.
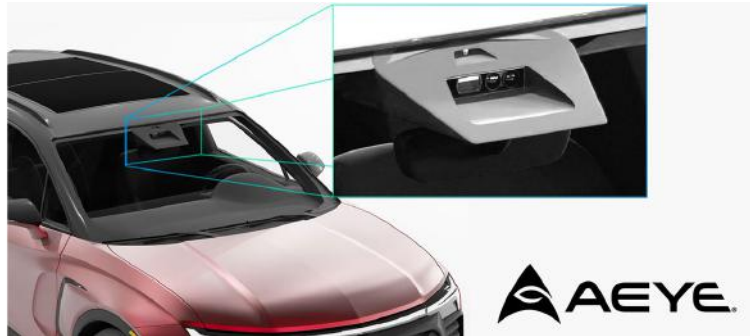
It is also expected the market will develop fast in China, with giants like Baidu and Didi leading the way.

So it's not yet an emerging market for lidar but the progress is significant since 2023 and we can expect 2027 to be the year when robotaxis will become an emerging market.

AEye Demonstrates Matchless Performance at 1 km

Aeye's Apollo lidar sensor has achieved exceptional results in recent field tests, consistently delivering high-resolution data at distances over one kilometer—a significant milestone in the lidar industry, and critical for allowing drivers (human and machine) more time to respond effectively at high speeds.

During testing, the Apollo accurately detected vehicles and objects on a busy freeway at distances beyond one kilometer. Customers, tier-1 suppliers, and automakers provided positive feedback as Apollo demonstrated its capability to gather detailed data over long distances.

CEO Matt Fisch said, "Apollo's performance at over one kilometre makes a strong case for 1550-nanometer technology as an ultra-long-range high-speed lidar solution. We believe Apollo meets all NHTSA safety performance requirements, including forward collision warning at speeds up to 90 miles per hour."

The Apollo is the inaugural product in AEye's 4Sight flex next-generation family of lidar sensors. It supports up to 120° horizontal and 30° vertical field of view, with long-range detection of up to 325 meters at 10-per-cent reflectivity and up to 6.2 million points per second. It also provides horizontal and vertical resolutions within a region of interest as fine as 0.025°.

There are multiple integration options, including behind the windshield, on the roof, or in the grille, allowing automakers to incorporate essential safety features with minimal disruption to vehicle aesthetics. The Apollo is considered the only 1,550-nm high-performance lidar sensor capable of integration behind the windshield. It was introduced at the Auto Lidar Tech Conference held in Suzhou, China, in June 2024.

🔖 DVN comments

AEye had teamed with Continental in the past to develop a new lidar, the HRL 131 by Continental. This sensor, based on AEye's 4Sight lidar, was announced to have long-range capabilities for L3+ ADAS features in commercial and passenger vehicles. AEye also announced this past May a partnership with Accelight and LighTekton to deliver 4Sight lidar solutions to the Chinese market.

BYD Leopard 5 Lidar Could Use Huawei ADS 3.0

The BYD Leopard 5 lidar model has reportedly been observed in spy shots. Notably, a lidar—likely a Huawei 192-line item—is situated on the roof, improving obstacle detection and distance maintenance.

The lidar-equipped Leopard 5 variant might use Huawei ADS 3.0, like the Leopard 8. This collaboration between the two companies aims to develop the world's first off-road vehicle driving solution.

ADS 3.0 is Huawei's third-generation autonomous driving solution, designed to provide humanlike but safer assistance. It is said to deliver exceptional driving and navigation support, particularly in narrow paths, U-turns, and other complex driving scenarios.

🔖 DVN comments

Huawei's lidar is one of several sensors used by the ADS 3.0 system. This version represents an upgrade from ADS 2.0, improving features such as mapless 'intelligent' driving, collision avoidance, and all-scenario parking. Road and scene recognition in ADS 3.0 has improved due to cloud and real vehicle training. ADS 3.0 also includes the updated GOD network (general obstacle detection), which builds on the architecture of the bird's eye view (BEV) network and the GOD network in ADS 2.0.

LSLidar 1,550-nm Solid State Lidar Has Ultra-Wide FOV

As well as automotive safety and automated driving, the automation level of mines and construction sites increases, operational safety and work efficiency have become core concerns for enterprises. Construction machinery such as mining trucks and loaders face potential risks of collisions with obstacles, other equipment, or personnel when operating in complex and dynamic environments. These risks are heightened at night, in foggy conditions, or under poor visibility due to limited vision and large blind spots.

To address these issues, LSlidar has the LS500W1, a 1,550-nm hybrid solid-state lidar with an ultrawide field of view. This lidar provides mining trucks, loaders, and other construction vehicles with enhanced environmental sensing capabilities, improving both operational efficiency and safety. Features include:

- a 120°W × 73°H coverage, allowing it to capture a broader range of surroundings. It can effectively detect and recognize humans, animals, small tires, and fallen objects, significantly reducing blind spots.
- Obstacles detected up to 150m away, allowing autonomous vehicles or drivers to react in time to prevent collisions.
- 480 scanning channels and a point rate of up to 3.7 million points per second. This allows it to quickly generate highly detailed 3D point cloud maps of the surrounding environment, presenting a realistic and accurate three-dimensional view of the surroundings.
- Robust construction for durability in harsh weather like rain, snow, and fog.

🔖 DVN comments

This sensor is also suitable for trucks, buses, or trams, providing peripheral detection of objects such as infrastructure, vulnerable road users, and other vehicles in low-speed traffic situations, particularly in urban contexts. Its large size is not suitable for cars.

Will Radar-Based ADAS Replace Lidar for NOA?
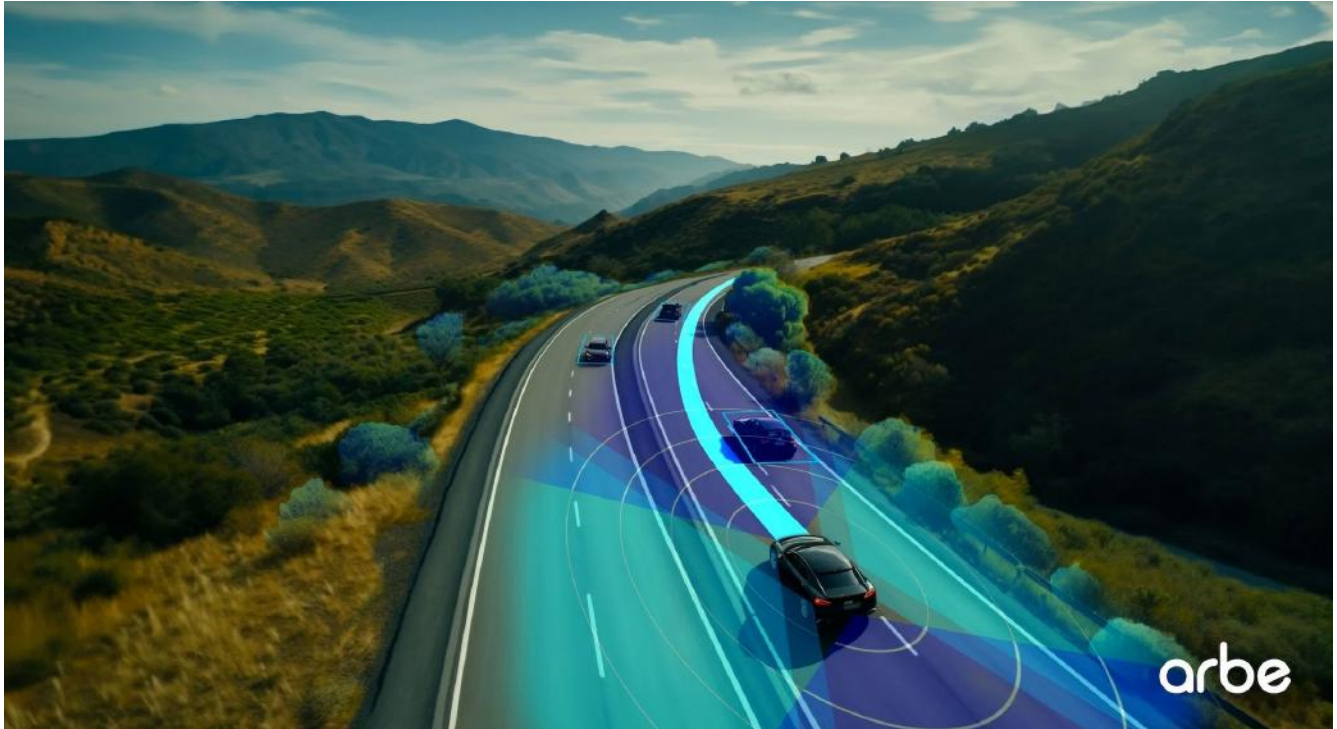
Arbe Robotics and their tier-1 partner HiRain Technologies have announced an ambitious project for a Chinese automobile manufacturer. Using an LRR610 imaging radar from Arbe and camera fusion system, HiRain's new ADAS will eliminate the need for lidar, while maintaining the same level of quality and performance for NOA applications (hands-on / eyes-on system).

 Serial production is expected by Q4 2025, pending final approval from the automaker. HiRain's extensive data collection initiative is proving the system's reliability, with 1 million kilometers covered using radar-equipped vehicles.

Arbe's chipset, which powers HiRain's radar, features an industry-leading 48 transmitting and 48 receiving channels. This creates a highly detailed imaging system, providing radar performance that rivals other traditional sensors. According to CTO Chengjian Fan, the company's "recent data collection initiative has shown the optimization of both sensor fusion and perception, further enhancing the capabilities of imaging radar and making advanced ADAS systems more affordable".

Fraunhofer IOF's IR Camera for Safer Autonomous Driving
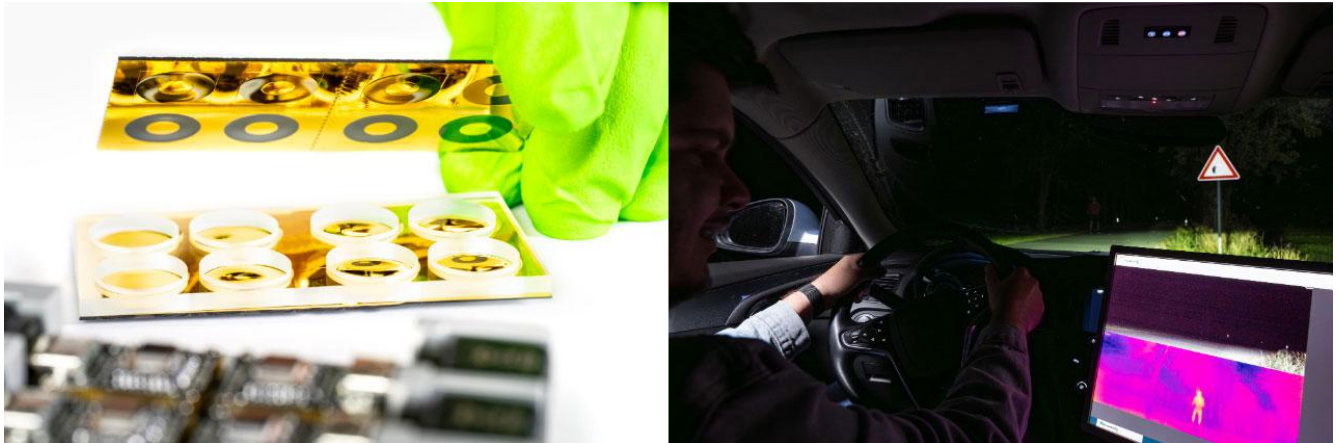
Researchers from Jena have developed an affordable, highly effective infrared camera, specifically designed for use in autonomous vehicles. The Fraunhofer Institute for Applied Optics and Precision Engineering (IOF) showcased this innovative infrared camera at the International Suppliers Fair (IZB) in Wolfsburg.

For road users in the Northern Hemisphere, the onset of darker mornings and evenings, often accompanied by mist or fog, necessitates increased caution due to deteriorating visibility conditions. Thermal imaging cameras that can reliably detect individuals under poor or limited visibility conditions are crucial for enhancing safety. This is especially pertinent for autonomous vehicles, where continuous human observation is absent.

A team from IOF has engineered an affordable thermal imaging camera tailored for road traffic applications. This advanced infrared camera operates within the 8 to 14 µm wavelength range, which corresponds precisely to the thermal radiation emitted by humans, detectable both day and night.

"This technology can substantially enhance road safety and prevent accidents," stated Martin Hubold, project manager at IOF. "This improvement is achieved by augmenting conventional camera systems and sensors, such as lidar or radar, under challenging visibility conditions, without necessitating active illumination."

The researchers used their experience with multi-aperture cameras. "The core idea is to build the camera from several small and cost-effective uncooled bolometer arrays," said Hubold.

The individual image segments are combined by software into a large overall image with a resolution of about 530 × 210 pixels over a field of view of 34 × 13 degrees. The sensors are equipped with a catadioptric optics system, comprising mirrors and prisms. This allows for a flat design of just 10 mm. In cooperation with the Fraunhofer Institute for Silicon Technology (ISIT) in Itzehoe, scalable and cost-effective lithographic methods were used for its production.

The camera features fast optics (f/1.1) and high angular resolution (16 pixels/degree). The infrared camera has a wide horizontal field of view to detect pedestrians or cyclists under poor lighting conditions, such as darkness or glare from oncoming traffic, making it suitable for driver assistance systems and L^3-and-above AVs.

In addition to its use in autonomous vehicles, the infrared camera also offers various applications. These include detecting heat losses, safety applications for monitoring landfills, during fire department operations, and new concepts in industrial process monitoring.

🔖 DVN comments

Deploying multiple small, uncooled, cost-effective bolometer arrays for the Far Infrared spectrum (8 to 14 microns) could create a high-resolution image with adapted software. However, integrating these in the bumper area or on the roof may be challenging.

Sony to Launch Industry-First CMOS Image Sensor for Car Cameras
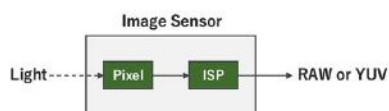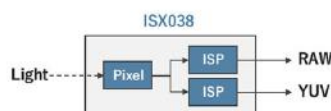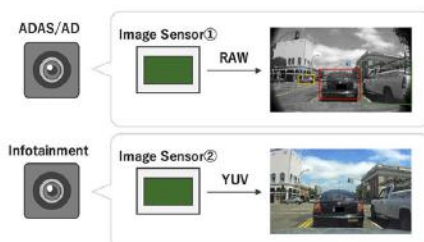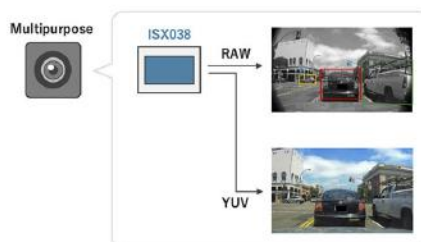
Sony Semiconductor Solutions has announced the upcoming release of their ISX038 CMOS image sensor for automotive cameras. They say it is the first to process and output RAW and YUV images simultaneously.

The new sensor includes a proprietary ISP and can handle both RAW images for external environment detection and recognition in ADAS and AD, and YUV images used for infotainment applications like drive recorders and augmented reality.

With the ability to support multiple applications from a single camera, the product aims to streamline automotive camera systems, saving space, cost, and power. As automotive cameras diversify with advances in ADAS and AD and the increasing focus on driver experience, there is limited space for additional cameras, driving the need for multi-functionality in a single unit.

The ISX038 employs a stacked structure comprising a pixel chip and a logic chip with a signal processing circuit featuring the proprietary ISP. This design facilitates high-precision environmental detection and recognition as well as visual information delivery for driver assistance through infotainment applications. Compared with conventional methods such as multi-camera systems or systems requiring an external ISP, this new product simplifies automotive camera systems, resulting in space, cost, and power savings. The ISX038 will be compatible with the EyeQ 6 SoC from Mobileye for use in ADAS and AD technology. Features include:

- **Wide dynamic range** even during simultaneous use of HDR and LED flicker mitigation: In driving, it's crucial to detect and recognize objects accurately, even in varying brightness like tunnel entrances and exits. Automotive cameras must also suppress LED flicker, especially in HDR mode, due to increasingly prevalent LED signals and traffic devices. This product's unique pixel structure and exposure method improve saturation illuminance, providing a wide dynamic range of 106 dB with HDR and LED flicker mitigation, expanding to 130 dB in dynamic

range priority mode. This design also reduces motion artifacts when capturing moving subjects.
- **Compliant with standards** required for automotive applications: The product meets AEC-Q100 Grade 2 reliability standards and follows ISO 26262 ASIL-B(D) for automotive safety.

🔖 DVN comments

It is crucial to detect and recognise objects accurately, even when there are quickly changing in light (ex: urban signalling). Effectively, for traffic light or VMS recognition Automotive cameras need to suppress LED flickering. The unique pixel structure and exposure method of this product improves saturation illuminance, providing a wide dynamic range of 106 dB with HDR and LED flicker attenuation, extending to 130 dB in dynamic range priority mode. This design also reduces motion artifacts when capturing moving subjects. The other advantage of this imager is to provide simultaneously pixels in RAW and YUV formats.

Autonomous Driving Newsbites

Euro NCAP Publishes Assisted-Driving Rankings

Euro NCAP has released their latest gradings for assisted highway driving systems across five popular car models. The BMW i5 and Mercedes C-Class were rated as 'Very Good,' achieving top marks in assistance competence and safety backup. The VW ID.7 and Volvo EC40 received a 'Good' grade, while the BYD Atto 3 was deemed 'Not Recommended' due to poor safety performance.

BlueCruise 1.5 Introduces Automatic Lane Change

Ford has unveiled BlueCruise 1.5, featuring an Automatic Lane Change function. In 2023, around 77 per cent of BlueCruise trips in the U.S. were under 20 min. For longer trips, such as those over an hour, BlueCruise was used more than half the time.

Lane Departure Prevention Gains Driver Trust

A recent IIHS study shows that nearly 90 per cent of drivers keep lane departure warning systems on, reflecting trust in crash avoidance tech. Also, 70 per cent use visual speed alerts. Though lane departure systems haven't cut crashes as much as forward collision warnings or automatic braking, their growing use shows potential. Automakers have improved designs to reduce past annoyances.

Xpeng P7+ Debuts at Paris Motor Show

Xpeng introduced their P7+ 'AI-defined' electric vehicle at the 2024 Paris Motor Show. The Chinese auto brand says they are committed to transforming mobility by incorporating 'AI' and autonomous technologies into their vehicles.

FAW Audi to Show New A5L at Auto Guangzhou with Huawei ADS 2.0

FAW Audi announced plans to introduce the new Audi A5 family to China, including the A5 and S5 sedan, and the A5 and S5 Avant wagons. Alongside these, FAW Audi will debut the new China-made A5L, a model tailored for the Chinese market.
The new A5L will feature a custom intelligent driving system co-developed with Huawei, built on the Huawei ADS 2.0 architecture with Audi-specific tuning.
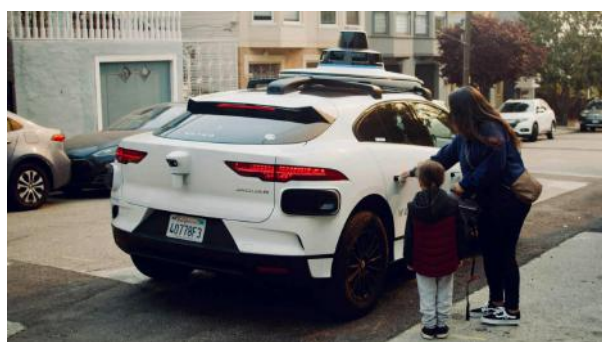
US Users Growing Less Distrustful of Robotaxis Trust: J.D. Power

Consumers report high satisfaction with robotaxi rides, citing technology as a key factor, according to the J.D. Power 2024 U.S. Robotaxi Experience Study. Although initially skeptical, riders show 56 per cent more confidence compared to non-riders. The study highlights safety, reliability, and trust as essential expectations for an ideal robotaxi service.

WeRide Unveils Spacious GXR Robotaxi

WeRide has introduced their GXR robotaxi, featuring capacious interior space and advanced L^4 autonomous driving technology. Passenger convenience and safety are prioritized with a spacious open-concept interior and the new Sensor Suite 5.6 for 360-degree perception. It also includes the world's first hidden B-pillar design, providing a wider entryway.

Wayve Expands to U.S. with Bay Area Testing

Wayve, a pioneer in 'Embodied AI' for the automotive industry, has expanded their U.S. presence with a new Silicon Valley office and the launch of an ADAS testing program in the San Francisco Bay Area. This move marks Wayve's first on-road trials outside the UK, and supports the company's mission to enhance driving assistance and automation on a global scale.

Pony, Emile Weber Sign MoU

Pony.ai Europe and Emile Weber have signed a Memorandum of Understanding (MoU) to promote development and deployment of autonomous mobility solutions in Luxembourg. This partnership aims to advance autonomous vehicle technology within the country, enhancing Luxembourg's position as a leader in innovative and sustainable transport. The agreement follows an earlier MoU between Pony and the Luxembourg Government, further underscoring the Grand Duchy's commitment to pioneering mobility solutions.

Hyundai, Waymo Partner on Autonomous Ioniq 5

Hyundai and Waymo have partnered to integrate Waymo's autonomous technology into Hyundai's electric Ioniq 5. This collaboration aims to improve the safety and convenience of autonomous driving. The Ioniq 5 will join the Waymo One fleet, with testing starting in late 2025. These vehicles, assembled at Hyundai's factory in the U.S. state of Georgia, will feature Waymo's sixth-generation technology. Hyundai and Waymo plan to produce these vehicles in large volumes over several years to expand the Waymo One fleet.

Torc Robotics Gooses Autonomous Trucking with Successful Tests

Torc Robotics, a subsidiary of Daimler Truck, recently achieved successful validation tests of their autonomous trucks at full operating speeds (105 km/h) without a driver on a closed course. This phase of development is crucial as it transitions from prototype engineering to a production-ready solution, with a possible launch in 2027.

Tesla 'We Robot' Event: Promises, Glitz, and Not-Quite-Robots

Tesla held a 'We Robot'-themed event, presented as a glimpse into the future of automation and self-driving technology. Tesla boss Elon Musk, having for many years promised a robotaxi "soon", has shored up the promise by showing a mockup called the Cybercab. It has two upward-opening gullwing doors and looks like a coupe derivative of Tesla's Model 3. We note that while 2-door taxicabs have been popular in developing countries (e.g., VW Beetle for decades in Mexico, now long gone from the roads), mature markets tend to heavily favor the practicality of 4-door models for taxicabs.

Musk claims the Cybercab will be built in "very large numbers" because he wants to "change the look of the road"—a brash aspiration which reminds a bit of Musk's breezy scorn for "boring round" steering wheels, his justification for installing **widely-panned** yokes instead.

Musk says software for autonomous driving that does not require human intervention is to hit the roads in Texas and California next year in the current Model 3 and Model Y vehicles. Musk still wants to skate by with cameras and software and, more to the point, without the lidars and other non-camera technology virtually every expert considers indispensible for adequately performant machine vision and redundant safety.

NHTSA Scrutinizing Tesla Crashes Again

NHTSA has launched a Preliminary Evaluation into Tesla's so-called 'Full Self-Driving' (FSD) system, after four crashes involving reduced visibility conditions like sun glare, fog, or dust. These incidents, which occurred with FSD engaged, included one fatal pedestrian collision and another that caused injuries. The investigation will assess FSD's performance in these challenging environments.

**ADAS Alerts Cause Most New-Car Problems**

A J.D. Power study has found that ADAS accounts for 12.8 per cent of problems reported in new vehicles, with 24.9 issues per 100 vehicles. Vehicle alerts are a primary concern, as owners find them annoying. The study suggests educating consumers about ADAS to improve satisfaction and ensure these systems improve the driving experience without causing distractions.

DVN-Lidar Conference Final Docket
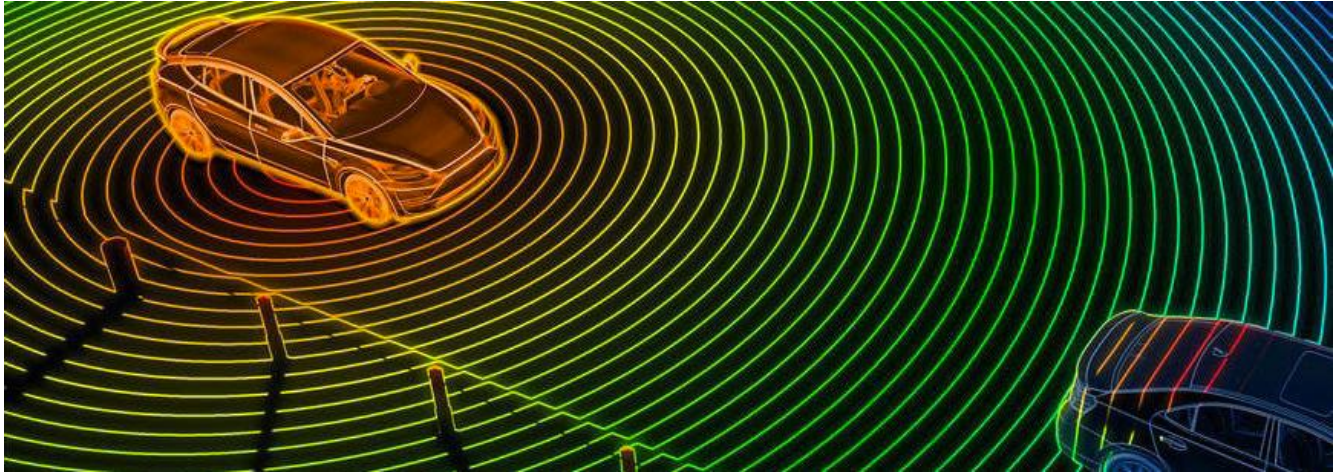
Agenda: 7th Dvn Conference On Automotive Lidar

Sessions: Applications; Ecosystem; Technology; AV sensors & Fusion

DAY 1 - MONDAY, 18 NOVEMBER - Lidar Applications; Ecosystem

REGISTRATION AND LIGHT WELCOME LUNCH	11:20-12:45
TEST Democars: Robosense, Seyond, Valeo, Vueron, Cepton	

OPENING the Conference (Eric Amiot – Head of DVN Lidar)	12:45-14:10
Introduction of the exhibitors	
KEYNOTE 1: FORD – Peter Zegelaar / LiDAR's essential role in highway automated driving	
KEYNOTE 2: VALEO – Antoine Lafay / AV Sensors & AI for a safe L2+/L3 driving	

SESSION 1 • LIDAR APPLICATIONS 1

14:10-15:00

MERCEDES/VALEO - Konstantin Fichtner/Clement Nouvel
Insight Mercedes-Benz: Drive Pilot
HYUNDAI MOTORS - Youhoon Park / K.C.Kweon
A Research on Lidar behind the Windshield in Autonomous Mobilities &
Need for Reliability: Verification of Opto-electronic Semiconductor
Devices for LiDAR sensors
Wideye by AGC - Raed El Makhour
Lidar integration scenarios and challenges: Way beyond a "Plug & Play"
approach
Q&A

COFFEE BREAK-1 + TEST DEMOCARS

15:00-15:20

SESSION 2 • LIDAR APPLICATIONS 2

15:20-16:25

CONTINENTAL - Wolfgang Schultz
Multi-Modal Rare Events Detection for SAE L2+ to L4
FRAUNHOFER ILT - Arnold Gillner
Integrated Headlight with LiDAR and Radar Sensors
CEPTON - Henri Haefner, Saturai Kazutoschi
Safe and autonomous transportation for everyone - Upcoming regulation
& consumer ratings as driver for lidar adoption
GRVA/UNECE - Francois Guichard
Update on international regulatory activities for ADAS/ADS and outlook
Q&A

COFFEE BREAK-2

16:25-16:40

SESSION 3 • LIDAR ECOSYSTEM

16:40-17:45

SCHOTT - Maximilian Glanzer, Sandra von Fintel
Schott BOROFLOAT® - Pioneering the future of autonomous driving
DEXERIALS - Ryosuke Endo
Nanotechnology-Enhanced Anti-fogging and Anti-Reflection Solution
YOLE Group - Pierrick Boulay
The LiDAR Frontier: Exploring Supply Chain, Market, and Trends
Fka GmbH - Amogh Sapkal
Overview of Lidar standardization Activities
Q&A

DISCUSSION PANEL I

17:45-18:10

A safe L2+/L3 driving and an affordable Lidar as key factors for Lidar Growth

SOCIAL COCKTAIL + TEST DEMOCARS

18:10-20:00

WELCOME DINNER

20:00

Conference Room

DAY 2 - TUESDAY, 19 NOVEMBER

Lidar Technology; AV Sensors & Fusion

OPENING DAY 2

08:25

KEYNOTE 3:

08:30-09:00

ROBOSENSE - Felix Yang
Driving into the Future: Innovations and Prospects in Automotive LiDAR Technology

SESSION 4 • LIDAR TECHNOLOGY 1 / SENSORS

09:00-10:10

SEYOND - Leilei Shinohara
High-Performance Mid-Range Near-Field LiDAR Sensors for ADAS & AD
HESAI - Tilman Gasche
Size Matters: Improving Lidar Integration and Scaling Mass Production
LUMINAR
(speaker & title tbc)
INNOVIZ - Nir Goren
Beyond the Basics: Lidar Key Performance Indicators (KPIs)
Q&A

COFFEE BREAK 1 + TEST DEMOCARS

10:10-10:50

SESSION 5 • LIDAR TECHNOLOGY 2 / MEASUREMENT & PROCESS

10:50-12:00

TRIOPTICS - Dirk Seebaum
Tailor-made optical alignment solutions: Bridging the gap from custom
LiDAR design to mass production
SCRAMBLUX - Mirvais Yousefi
Dynamic 4D LiDAR testing to accomplish comprehensive sensor fusion
qualification
KONRAD - Urban Claus
(title tbc)
DEKRA - Uwe Burkhardt
Tool Chain for ADAS/AD Validation
Q&A

LUNCH & NETWORKING + TEST DEMOCARS

12:00-13:45

SESSION 6 • LIDAR COMPONENTS

13:45-14:50

ams OSRAM - Clemens Hofmann
Next Gen EEL: improving efficiency and heat management in LiDAR
Sensors using 5-junction technology
SUNA Optec - Laurent Lengignon
Silicon cap solutions to achieve low loop ESL for high performance &
miniaturized Lidar application
RENESAS - Leonard Germic
Rethinking LiDAR Technology: Cost-Effective System Integration with
enhanced Safety Features
ANSYS-OnSemi - David Auger, Colin Barry
Simulating LiDAR receiver SPAD response using Speos workflow
Q&A

SESSION 7 • NEW TECHNOLOGIES

14:50-15:55

PERSIVAL - Christoph Popp
Towards Credible Lidar Sensor Simulation in Challenging Environmental
Conditions
VOYANT - Chris Phare
FMCW Lidar using photonic integrated circuits
SCANTINEL - Stanislav Aksarin
FMCW LiDAR detection performance in adverse weather conditions
enables SAE L5
VANJEE - Zhai Zhao
How will VanJee LiDAR+C-V2X Solution Create Vehicles with Utmost
Safety?
Q&A

DISCUSSION PANEL II

16:05-16:30

Key factors for low cost lidars (specs, sensors, components), competition with HD Radars

CLOSURE (PROGRAM DVN 2025)

16:30-16:40

TEST DEMOCARS

16:40-17:40