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ADAS

& AUTONOMOUS VEHICLE

TECHNOLOGY EXPO

San Jose - California

SHOW
PREVIEW

BRAND NEW FOR CALIFORNIA -

The New ADAS & AV Tech Expo for
Developing and Building Next Generation
Connected and Fully Autonomous Vehicles
- it's Here, San Jose Convention Centre
September 7/8 2022



SEPTEMBER 7/8 2022

SAN JOSE, CALIFORNIA

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& AUTONOMOUS VEHICLE
TECHNOLOGY EXPO
San Jose - California

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SEPTEMBER 7 & 8, 2022
SAN JOSE, CALIFORNIA

Brand new for California - The New ADAS & AV Tech Expo for Developing and Building Next Generation Connected and Fully Autonomous Vehicles - it's Here, San Jose Convention Centre September 7/8 2022. It's become the leading Expo on the subject in Europe and it's now set to become a permanent feature in September in California. The event will showcase developmental tools and service providers for improving ADAS and moving towards full AVs. Simulation, modelling, absolute positioning and signal testing will be just some of the developments tools on show alongside LIDAR, Radar, GNSS, and Ultra High Performance cables and harnesses. Everything you need for your testing and vehicle progression under one roof with expert speakers presenting in the adjoining Conference.



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PLUS:
DEDICATED
CONFERENCE
FEATURING
70+ SPEAKERS

SEE PAGE 14

For the latest news and updates about the expo
and conference, and to register to attend, go to:
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Intelligent computing platform to build L4 AD system

Ecotron

Ecotron's EAORA04-D is an intelligent computing platform developed for autonomous driving systems using Nvidia Jetson Orin chips and Infineon TC297. Using the supporting basic software and development tools, developers can build an L4, low-speed autonomous driving system in a safe, convenient and efficient manner.

Nvidia Jetson Orin is designed for embedded intelligent systems, including AD systems, and can be used to implement functions such as sensor fusion, environment perception and path planning. Infineon TC297 is based on TriCore architecture with a 300MHz operating frequency and an ECC (error correction code) protected RAM with 728KB and 8MB capacity. It is designed based on the ISO 26262 standard and supports ASIL-D safety level requirements. Developers can work on and deploy vehicle control and functional safety strategies based on the MCU.

BOOTH: 6020



Hyperspectral synthetic data to accelerate ADAS/AU development

Anyverse

The ADAS and AV industry is implementing a new generation of deep learning perception systems using advanced sensors and optical systems that demand accurate data to fulfill the most challenging scenarios. Its new sensing capabilities include photodetectors covering different parts of the spectrum and automatic adaptation to dark conditions. Synthetic data will unequivocally be needed to design, train, calibrate and validate this new generation of autonomous systems. However, not all synthetic data is made equal. Pixel-accurate synthetic data is required to reduce the domain gap and accurately reproduce the sensors' behavior.

Anyverse has deployed a flexible, modular software platform for scene generation, rendering and sensor simulation, allowing users to design their use cases and data set production processes at will.

The company employs a pure spectral ray-tracing engine that computes the spectral radiance of every light beam interacting with materials in the scene,

simulating lights and materials at a close physical level. With the spectral information provided by the render, Anyverse simulates the physics happening inside the sensor and ISP. As a result, the user can evaluate and test any camera sensor with high accuracy and decide which sensor fits best with their system. Furthermore, the platform enables users to design scenarios using an extensive assets library to compose the scene, apply dynamic behaviors, program the environmental variability, produce data sets in the cloud and explore the results, including all the associated ground truth data.

Anyverse's approach opens new opportunities for ADAS and AV developers in any deployment stage, allowing data engineers to simulate any scenario programmatically, configure variations, test different weather, light and environment conditions, and reproduce any corner case virtually while guaranteeing maximum accuracy throughout the process.

BOOTH: 1016

Cleaning system to maximize sensor performance

Kautex

Dirt, debris, weather and other environmental conditions can affect the performance of vehicle sensors. With the Kautex Allegro cleaning system, sensors are kept clear. Using both water and air cleaning, the performance of the vehicle and its sensors remains optimal.

With its expertise in cleaning systems and unique Allegro dynamic test bench, Kautex can simulate real-world environmental situations, including vehicle speed, temperature and rain. Learnings on testing and simulation are applied to the Allegro Premium Cleaning System software, which controls the actuators of the cleaning system.

The company's software defines the best cleaning strategy based on sensor state, sensor prioritization and driving conditions. In doing so, Kautex optimizes the cleaning time and minimizes the total water and energy consumption.

Intelligent and customizable Allegro cleaning systems can be used from L1 to L5 vehicles, from single camera cleaning points to camera and lidar combinations, up to multipoint sensor systems in highly automated vehicles. The Kautex Allegro cleaning system is designed and developed to meet any customer cleaning needs.

BOOTH: 4009



Scalable measurement data acquisition for ADAS development

ETAS

Powerful ECUs are used to coordinate the complex sensor networks that inform ADAS and autonomous driving platforms. These must be capable of processing huge quantities of data and deriving driving strategies from this data within milliseconds. To develop these complicated control strategies efficiently, development of the software functions is shifting to the lab. Wherever possible, virtualization is replacing experiments based on real hardware. This approach relies on adequate validation of the models with real environment data. This requires reliable, flexible tools for efficient data acquisition as well as the possibility of accessing data via a cloud or back end.

To manage data acquisition from multiple high-performance control units and vehicle sensors, ETAS provides its powerful GETK ECU interface technology. This can handle vast amounts of data and

connect a microprocessor's PCIe interface to the recording system. The V-GETK (virtual ETK) comes into play during the prototyping phase, if a production-ready ECU and sensor hardware are not yet available.

In San Jose, ETAS will showcase RALO (Rapid Logging), a Linux-based, modular, scalable data acquisition control and recording system to develop ADAS ECUs. The system can be used during test drives or in virtual test environments. It is portable, Ethernet-based and can be run on any PC for logging external data.
BOOTH: 4008



Multi-DUT signaling and non-signaling RF test platform

Noffz Technologies

Testing of connected car components is usually twofold: wireless functionality needs to be validated in both signaling and non-signaling modes.

At ADAS & Autonomous Vehicle Technology Expo in California, Noffz will showcase its UTP 7064 test system that covers it all. A COTS rack houses the Noffz Universal Wireless Tester (UWT) for non-signaling verification and the Noffz Base Station Emulator for signaling validation. Both are controlled via one software interface.

The Noffz UTP 7064 offers complete protocol stack implementation combined with calibrated measurement capabilities. Cellular coverage includes GSM, WCDMA, LTE and 5G NR, making it a perfect fit for all automotive telematic control units (TCUs), network access devices (NADs), intelligent antenna modules (IAMs) and connected gateways. Optional extensions for WLAN functionality up to wi-fi 6 or Bluetooth 5.x are available.

Additional wireless functionality – such as UWB for keyless access, onboard units for automatic toll payment or EV charging stations with mobile access – increases the driver's comfort. At the same time, all these connected car components need to be thoroughly tested, for which the Noffz UTP 7064 is perfect.

Designed as a multi-DUT test system, the Noffz UTP 7064 can connect 64 DUT RF ports. The configuration options enable true 4x4 MIMO or eight DUTs tested and monitored in parallel while registered to one mobile cell.

The Base Station Emulator software incorporates tasks for testing and monitoring multiple DUTs in parallel. The new measurement plug-in web service extends high-level signaling parameters with selectable physical layer measurements and control switches and offers an intuitive configuration interface. For debugging, users can also access a standalone GUI for prototyping tasks and use modern, platform-dependent API for test automation.

This solution combines a parameter and monitoring test station in a single rack. For higher throughput and better test times, or for future testing needs, the rack can be easily upgraded with additional RF analyzers, generators and other test equipment.
BOOTH: 1022



Precise reference motion and navigation sensing for VIL testing

GeneSys

Many drivers benefit from ADAS functions but the complexity of these systems increases as they aim toward fully automated driving. Consequently, the classical test methods on the proving ground (PG) become more complex, too: they are time-consuming, require significant investment in testing HW and setup and are often difficult to realize. The vehicle-in-the-loop (VIL) testing method provides an effective alternative to the classical testing methods for the validation and development of new ADAS performance. VIL closes the gap between the simulation world and in-vehicle testing: a virtual environment

is integrated into a real VUT sensing system. All testing maneuvers can be undertaken in an easy-to-realize PG environment. The correlation between the physical VUT and the virtual testing environment is guaranteed.

A virtual test environment offers the possibility to collect data from multiple scenarios under true PG conditions. The productivity of the test stations and measurement devices is significantly scaled and optimized.

To achieve reliable, accurate and valid VIL measurement data, a high-precision, high-performance navigation and inertial sensor is required. The VIL complete solution from IPG combined with the ADMA Inertial Sensor from GeneSys guarantees the necessary performance to test complex ADAS scenarios in real-time-generated multiple virtual environments.
BOOTH: 3034



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4D lidar with camera-level ultra resolution

Aeva

At the upcoming ADAS & Autonomous Vehicle Technology Expo in California, Aeva will demonstrate its recently announced Aeries II, the world's first 4D lidar sensor with camera-level ultra resolution.

This revolutionary technology leverages the company's Frequency Modulated Continuous Wave (FMCW) 4D technology and the world's first lidar-on-a-chip silicon photonics design. Aeries II exceeds the capabilities of legacy time-of-flight lidar sensors to provide instant velocity detection for each point, at distances up to 500m. The sensor is built for reliability, with automotive-grade ratings for ingress, impact, temperature and shock and vibration to ensure optimal performance across a wide variety of vehicle applications including ADAS and Level 3 and 4 autonomy.

Aeries II provides ultra-long-range object detection and tracking, 4D localization and freedom from interference. Aeva's FMCW technology resists interference from sunlight and other lidar sensors, including Aeva sensors, ensuring peak performance across a wider set of environmental conditions and when used near other lidar-equipped vehicles. It can detect, classify and track dynamic objects of



concern, such as oncoming vehicles, pedestrians and animals, at greater distances than today's time-of-flight legacy lidar. In addition to providing superior hazard detection, Aeries II delivers lane and road boundary perception. Aeva's proprietary 4D perception software provides ultra resolution, a real-time camera-level image with resolution that is up to 20 times greater than that of legacy lidar. The per-point instant velocity data enables 4D localization features such as real-time ego vehicle motion estimation with six degrees of freedom, and accurate vehicle positioning and navigation in GPS-denied and featureless environments, without additional sensors such as IMU or GPS.

Aeries II is 75% smaller than its predecessor, Aeries I, enabling a wide range of sensor integration points in automotive and non-automotive applications. It is completely configurable.
BOOTH: 6010

CONFERENCE SPEAKER SPOTLIGHT

DR XIN FENG

**ADAS U&V MANAGER,
 SIL/HIL/BENCH TEST,
 STELLANTIS**



**DAY 1
 WEDNESDAY,
 SEPTEMBER 7**

**NHTSA FARS data
 analysis for
 AD development
 and testing**

FARS (Fatality Analysis Reporting System) is a nationwide census providing NHTSA and the American public with yearly data regarding fatal injuries suffered in traffic crashes. In his presentation, 'NHTSA FARS data analysis for AD development and testing', Dr Feng will focus on FARS data (2000-2019) alongside GPS information, identifying certain geographic patterns that he first discovered using statistical data analysis. As the AD industry launches more ground truth data collection and real-world closed-loop testing, such research provides pragmatic guidelines to improve the test coverage of ODD. The presentation will also offer a few proposals to benefit AD industries with assistance from NHTSA and FARS data collectors.

Please visit the website to see the full conference program and speaker details

High-precision temperature measurement module

Ipetronik

With the new M-THERMO3 16 temperature measurement module, Ipetronik is ushering in a new generation of devices. As the first module in the M3 family, the M-THERMO3 16 sets standards in modular measurement technology. Its 16 channels, which can be selected independently of the thermocouple type, offer a high degree of precision and flexibility with a high-resolution 24bit analog-to-digital converter (ADC).

The M-THERMO3 16 is ultra-compact, robust and boasts a new wireless and magnetic connection concept that saves time during installation and offers the best-possible security for data connection.
BOOTH: 3046



Simulation software for design validation

Hexagon

While the complexity of ADAS and AV systems is increasing, development cycles must drastically decrease. To tackle these challenges, virtual development and validation are a necessity. There is growing demand for virtual proving grounds with 24/7 accessibility, plus integration into CI/CD.

At the expo, Hexagon will provide visitors with a glimpse into generating and editing accurate simulation maps based on several sources. Representatives will also show the company's vision for reducing the building times of road networks. Hexagon's tools provide the ability to aggregate these maps with 3D environments, enabling the verification and validation of perception algorithms.

BOOTH: 3044



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**CONFERENCE
SPEAKER
SPOTLIGHT**



**DR CARRIE
BOBIER-TIU**

**SENIOR MANAGER,
CONTROL,
WOVEN PLANET**

**DAY 1
WEDNESDAY,
SEPTEMBER 7**

**Chauffeur and
Guardian: a holistic
approach to
vehicle safety**

Dr Bobier-Tiu will explain how Toyota views driver and vehicle as teammates, and how, over the last several years, Toyota Research Institute (TRI) has been developing a blended approach to make driving safer and more enjoyable. She will describe how Toyota's Guardian works alongside a driver in parallel autonomy, amplifying the human capabilities for enhanced accident prevention by communicating with the driver and augmenting their commands under difficult circumstances. Toyota Chauffeur is a vehicle concept for full autonomy where the human is removed from control, to increase vehicle access by those who cannot normally drive themselves. Dr Bobier-Tiu will discuss the unified control approach developed for these AD/ADAS applications, including design considerations, open problems and a high-level overview of the systems.

Please visit the website to see the full conference program and speaker details



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online!

**Drag-and-drop
driving scenario tool**

TraceTronic

Scenario-Architect is TraceTronic's new solution and a revolution in the iterative development of driving scenarios. The tool enables users to graphically design road traffic situations, for example, overtaking maneuvers, traffic, bicycles or intersections. The behavior of the involved participants under respective conditions can be specified via drag-and-drop action blocks or nodes.

At the same time, test operations for any XIL test can be placed at safety-relevant points in the simulation. Equipped with explicit information for test execution, the developed scenarios are then either transferred directly to the connected test automation tool through an ECU test or exported as OpenSCENARIO files, compatible with a range of environment simulation tools.

To facilitate collaboration between teams, each scenario can be exported as a video with annotations. Roads and custom tracks can be imported via the OpenDRIVE standard format.
BOOTH: 2048



**Ethernet switch with
Nvidia Jetson integration**

Intrepid Control Systems

Keeping pace with the evolution from domain to zonal topologies, Intrepid Control Systems will announce its Rad-Epsilon product family at the ADAS & Autonomous Vehicle Technology Expo in San Jose, California this September.

In-vehicle networks are increasingly dependent on audio-video bridging (AVB) and time-sensitive networking (TSN) standards to deliver quality of service (QoS) guarantees needed in latency, determinism and reliability to ensure the networks meet the needs of all applications that rely on their service. These guarantees require the use of managed Ethernet switches not only for forwarding frames but also for filtering, metering, shaping network traffic and keeping the network time-synchronized.

Rad-Epsilon is a nine-port automotive Ethernet-managed switch with 6x 1,000BASE-T1, 2x 10GBASE-T and 1x USB3/GigE connected to an embedded processor with 2x CAN-FD and LIN. Standard features include single/dual VLAN tagging, port-based VLANs, eight priority queues and

port mirroring. It also supports many IEEE standards expected in the automotive profile for TSN (p802.1dg) such as gPTP (802.1AS), credit-based shaping (Qav), time-aware shaping (Qbv), filtering and policing (elements of Qci) and persistent stream reservation (Qat). TCAM is also present to support QoS or other applications of deep packet inspection.

Rad-Epsilon's most innovative feature is that it is not just a switch but an entire motherboard bringing automotive Ethernet directly into an Nvidia Jetson Nano over PCIe Gen3 from a switch with 6x 1,000BASE-T1 and 2x 10GBASE-T ports. Linux applications can be written for standalone logging and/or simulation. In addition to standard peripherals (HDMI/DisplayPort/USB/SDCard), future expansion adds high-speed SerDes camera interfaces, for example, FPD-Link III and GMSL, for machine learning and AI algorithm development on the Jetson Nano.

According to Intrepid Control Systems, the Rad-Epsilon switch is the only complete open development platform designed to bring autonomous technology into one unit at a reasonable price.

BOOTH: 2000



Radar scene emulation with sharpened vision

Keysight Technologies

» Achieving the next level in vehicle autonomy demands robust algorithms trained to interpret radar reflections detected by automotive radar sensors. Keysight's first-to-market technology combines hundreds of miniature radar target simulators into a scalable screen that can emulate objects with up to 512-pixel resolution and at distances as close as 1.5m. This breakthrough radar scene emulation (RSE) solution overcomes conventional radar sensor test solutions that have a limited field-of-view (FOV) and cannot simulate objects at distances less than 4m.

Utilizing 'total scene generation', the radar scene emulation solution exercises automated drive systems and algorithms by applying time-synchronized inputs to the actual sensors. Its open architecture also closes the loop with existing hardware-in-the-loop (HIL) systems and 3D modelers. These capabilities create a solution that complements – and fills the gap between – software simulation and on-road testing. As such, it overcomes the limitations of software simulation, which does not test real radar sensor response, while achieving



repeatable testing of radar scenes, which cannot be done on the test track.

The RSE allows users to emulate real-world driving scenarios, varying speed, distance and number of targets across a contiguous FOV. With radar sensors and back end software confidently tested against the complexity of real-world driving scenarios, ADAS and next-generation vehicle autonomy can be achieved sooner and with less risk.

Keysight's RSE system has already been awarded the Tech.AD Europe Award for Best Project in Testing, Validation & Safety and the American Business Award for Achievement in Product Innovation 2022.

BOOTH: 3000

3D perception stereo vision system

Foresight Automotive

» Current ADAS use mono-camera-based solutions. Vehicle manufacturers want to improve the performance of existing systems while keeping the existing hardware to avoid integration complexities and design changes that can affect production timelines.

At ADAS & Autonomous Vehicle Technology Expo in California, Foresight will showcase its Mono2Stereo solution that enhances existing vision sensor systems by using proprietary software-based algorithms to create a 3D-perception stereo vision system. This solution can amplify the performance of existing ADAS sensors, resulting in better distance accuracy and more robust active safety features.

Its unique capabilities include an additional safety layer, enhancing the detection and perception capabilities of existing mono-camera systems and all-objects detection. It is a software-based solution that creates 3D perception. It is also low-cost.

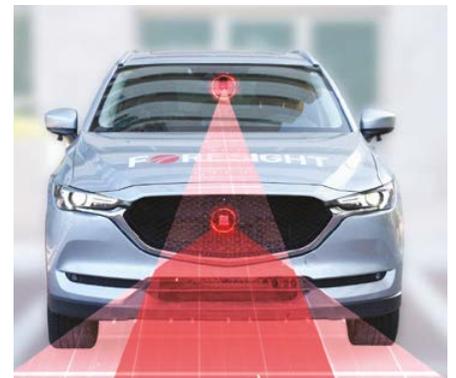
In addition to Mono2Stereo, Foresight will show its ScaleCam separated stereo cameras solution that enables large baselines, resulting in greater distance accuracy at long ranges.

Stereoscopic vision systems need continuous calibration to ensure distance accuracy. Mounting stereo cameras on a fixed beam compensates for decalibrations caused by vibrations but may limit camera placement positions and result in installation-related technical complications.

Foresight's auto-calibration solution allows stereo cameras, both visible-light and thermal infrared, to be placed independently apart, without being limited by stringent mechanical constraints. This solution compensates for decalibrations caused by vibrations and temperature changes.

ScaleCam's capabilities include 3D perception, higher distance accuracy at long ranges, simple installation, vehicle design via flexible camera placement and low cost.

BOOTH: 3048



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AV hardware and software selection made easy

Dataspeed



» Dataspeed will be showcasing its newly launched Kinetic Kits at the expo. These innovative starter packages were designed to offer educational institutions and small companies reliable, flexible platforms that feature industry-leading hardware and software for autonomous vehicle (AV) research and development.

With the influx of driverless technology providers in recent years, it is often overwhelming for teams to navigate the seemingly endless options. Dataspeed Kinetic Kits were developed to streamline the AV hardware and software selection process to allow teams to focus their efforts on their research and testing. Each component was hand-selected by the company's

experienced engineering team, based on extensive industry knowledge and experience.

Dataspeed Kinetic Kits are offered in three packages: starter, intermediate and advanced. All kits include mechanical and electrical integrations of the Dataspeed by-wire system, Ouster digital lidar, long-range radar and Neosys computing platform. All levels also include the following Dataspeed software: a turnkey development environment for ROS, sensor calibration tool, sensor fusion module and a lidar and radar object tracking module. Dataspeed software included in the intermediate and advanced kits has added functionality to demonstrate object detection and avoidance, path following and highway driving. Additional sensors and customizations are available for each package.

BOOTH: 2040

SEPTEMBER 7 & 8, 2022

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Advanced GNSS simulator

Orolia

Orolia's Skydel GSG-8 advanced GNSS simulator has been developed to deliver the highest standard of GNSS signal testing and sensor simulation performance in an easy-to-use and scalable platform.

This advanced solution offers the best of both worlds, combining the performance expected from a top-grade GNSS simulator with the economy of scale and flexibility of the Skydel user interface and GSG-8 software-defined radio (SDR) hardware architecture. From home offices to research labs, automotive manufacturing to defense, the Skydel GSG-8 solution is ready to meet simulation and testing needs with either a turnkey or bring your own hardware (BYOH) solution. A complete set of in-field upgradeable GNSS signals and advanced features such as HIL are available to meet all simulation requirements.

The Skydel GSG-8 simulator is packed with a rich feature set including 6DOF receiver trajectories, a 1,000Hz simulation iteration rate, low-latency HIL, remote control from user-defined scripts, multivehicle simulation, on-the-fly scenario reconfiguration, live sky time synchronization and access to hundreds of satellites in real time using off-the-shelf graphics cards (GPU). Advanced jamming and



spoofing enable users to simulate multiple threats simultaneously, while Skydel's API brings an unparalleled level of control over simulation, enabling customers to build complex, elaborate and repeatable scenarios with open-source client libraries for Python, C# and C++.

Visit the company's booth to see its innovative starter package: GNSS simulation that includes two standard configurations selected for the automotive industry. If customization is required, the team of experienced professionals is ready to help configure a solution.

In addition, Orolia's Skydel forum connects customers with users across multiple industries and leading research universities. The plug-in GitHub is host to everything needed to tailor Skydel to your requirements.

Orolia's Skydel GSG-8 solution offers unmatched flexibility and scalability in a well-organized user interface to meet all its customers' GNSS simulation needs.

BOOTH: 1030

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Data connectivity solutions

MD Elektronik

The rapid transition to AI self-driving vehicles requires not only hardware such as camera, radar and lidar sensors but also high-performance cables and harnesses. This cable connectivity provides the necessary network communication between the sensors (eyes and ears) to the AI chip core (the brain).

As one of the world's leading automotive data transmission companies with more than 25 years of experience in high-frequency wire harness solutions, MD Elektronik can provide the correct data cable for any technical requirement.

With automotive Ethernet solutions from 100Mbit/s (IEEE 802.3bw) to more than 10Gbit/s, MD's portfolio ranges from connectors between ADAS ECUs and sensor types such as radar, lidar or cameras, to cable assemblies and wire harnesses.

As a long-time partner of the semiconductor industry, the company is looking to future applications and their special requirements. Optical connector systems for 1Gbit/s and multi-gigabit are also under development.

According to MD Elektronik, FAKRA and mini-coax products will also play an important role in ADAS and autonomous driving applications in the future. These connector systems are suitable for 5G, GPS, Bluetooth, FPD-Link and GSML protocols. They provide multiple connections on a small package size and frequency range up to 15GHz.

MD claims FAKRA and mini-coax cable assemblies are the right choice for positioning sensors, multicamera and display applications.

BOOTH: 1012



CONFERENCE SPEAKER SPOTLIGHT

ZOHAIB MIAN

UP PRODUCT ENGINEERING,
 VELODYNE LIDAR



DAY 2
 THURSDAY,
 SEPTEMBER 8

Developing and evaluating ADAS functionality using a SOTIF (safety of the intended functionality) approach based on relevant use cases

PAEB systems are a foundational element for ADAS and AV applications. They provide automatic braking for vehicles when pedestrians are in the path of the vehicle's travel and the driver has taken insufficient action to avoid an imminent crash. However, current systems utilizing camera and radar technology frequently fail to protect pedestrians in dark conditions, according to independent testing by the National Highway Traffic Safety Administration (NHTSA) and the American Automobile Association (AAA). To reflect real-life conditions, the white paper proposes expanding future PAEB testing protocols to include tests conducted in dark, night-time conditions. The new tests would be conducted in less than one lux ambient illuminance, using low-beam headlights and without streetlights. This change would provide the public with useful information on the performance of pedestrian detection systems in low-light conditions that occur on roadways. To demonstrate how expanded testing would work, the white paper details the results of night-time PAEB tests conducted by Velodyne. The tests evaluated a highly rated PAEB system using current camera- and radar-based technology and Velodyne's PAEB system that uses Velodyne's lidar sensors and Vella software. In these night-time conditions, the camera- and radar-based PAEB system failed in all five scenarios while the lidar-based system avoided a crash in every situation tested.

Please visit the website to see the full conference program and speaker details

True solid-state multibeam lidar

XenomatiX

» In 2021, XenomatiX launched XenoLidar-X, a true solid-state lidar designed for high-resolution, accurate analysis of a vehicle's surroundings. The sensor is lightweight and small, ideal for seamless integration in a vehicle, drone or robot. It uses an innovative concept of performant global shutter, otherwise known as the multibeam process. Its true solid-state design, mature components (VCSEL and CMOS) and working principle make it suitable for harsh environments and rough weather conditions, with a robustness that guarantees a high MTBF.

XenoLidar-X features a small design with high-resolution point clouds. The company offers and promotes total solutions together with its partners to integrate, clean and utilize the sensor in various applications. Integration has been an important element of XenomatiX's partnerships with Tier 1 automotive suppliers (AGC, Marelli and Kautex, for example) to create a complete, customizable, modular and flexible lidar solution. These partnerships deliver lidars that integrate into the windshield, rear window, grille, headlight, taillight and bumper of a vehicle. The new 4D AI NN training gives eye-opening results in an efficient way.

BOOTH: 2026



Open-architecture platform to assess autonomous driving stacks

Klas

» At the inaugural ADAS & Autonomous Vehicle Technology Expo in San Jose, Klas will showcase RAVEN, an open-architecture platform of computing, storage, networking and connectivity for in-vehicle development and assessment of autonomous driving stacks.

The challenge for many AV developers is that legacy logging systems lack the power to log and process the terabytes of raw data that come from integrating GMSL-based cameras and automotive Ethernet-based sensors such as lidar.

To collect and assess vehicle data efficiently and effectively, AV developers need additional computing for visibility, to ensure that the data set collected is fit for purpose; filtering, for pre-processing and tagging of relevant data sets; compression, for ease of offloading terabytes of data in the shortest time; and encryption, for secure storage and transfer of raw data.

RAVEN is a modular system that meets the needs of modern AV development by providing scalable compute platforms to log, process and securely transfer data. Furthermore, it dramatically simplifies access to data for use in hardware-in-the-loop (HIL) or software-in-the-loop (SIL) environments.

The holistic platform lightens the load for AV development by providing all the necessary computing, datalogging, data storage, networking and connectivity in a compact, standardized and ruggedized form factor designed for life on the road.

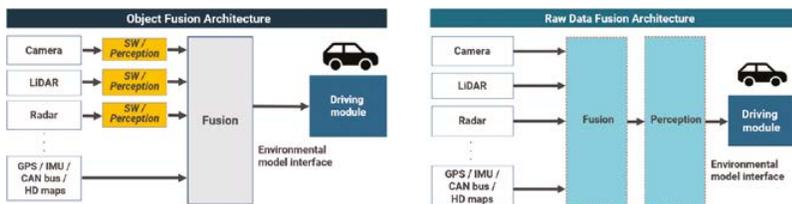
AV developers can easily integrate compute capabilities into existing test harnesses or replace legacy logging systems by selecting the standalone RAVEN logging and storage module, the TRX D8.

In San Jose, Klas will showcase a range of RAVEN modules that include scalable x86 compute (up to 96 cores) to identify and filter valuable data sets; GPU, where data sets can be assessed, compressed or encrypted with Nvidia Turing; logging via the capture and storage of up to 240TB of data in a swappable storage cassette; connection to CAN, Ethernet and automotive Ethernet vehicle networks; and connectivity, where data can be securely accessed live over wi-fi, LTE or 5G from remote locations.

In addition to RAVEN, Klas will showcase its Blackrock virtualization, automation and management software suite.

Blackrock is designed to simplify laboratory integration of agile software development environments with real-world driving scenarios running on RAVEN.

BOOTH: 2050



Raw data sensor fusion technology accelerates ADAS performance

LeddarTech

» A recurring and critical question raised by engineering teams across the world is how to solve object detection, classification and tracking challenges to unlock ADAS features on vehicles.

As demonstrated through nuScenes, a standard approach for evaluating object detection, raw data sensor fusion and perception has exhibited strong performance and represents a much better alternative to the standard approach in meeting the challenges in Level 2-3 ADAS development.

At the expo, LeddarTech will highlight LeddarVision, a raw data sensor fusion and perception solution for safe and reliable ADAS and AD applications.

Each sensor, whether lidar, radar or camera, has its weaknesses, such as a camera's poor performance in bad weather, radar's poor resolution and lidar's range limitations. This problem is solved with raw data sensor fusion that detects and classifies objects by

combining raw data from all sensor modalities to provide confident and accurate object detection, tracking and classification, unlike traditional perception systems that perform object-level fusion and individually classify objects.

Raw data sensor fusion technology outperforms with superior object detection, classification and tracking performance; it provides fewer false positives and negatives and has a built-in redundancy component. Alternatively, when sensor data is not fused, the system may get contradicting inputs from sensors and, therefore, be unable to determine the next course of action with an acceptable degree of certainty. For example, if an obstacle is detected by the camera but not by the lidar or radar, the system hesitates over whether the vehicle should stop, thereby potentially causing an accident. Raw data sensor fusion solves this problem.

BOOTH: 1052

SEPTEMBER 7 & 8, 2022

SAN JOSE, CALIFORNIA

Web- and loop-based calibration

Deepen AI

At the upcoming expo in San Jose, Deepen AI will showcase its easy-to-use browser-based tool that supports intrinsic and extrinsic calibrations. It will also present its newly developed proprietary loop-based calibration optimizer.

Deepen Calibrate extends the company's suite of data lifecycle tools, including Deepen Annotate and Deepen Validate. It reduces the time spent on calibrating multisensor data from hours to minutes, enabling accurate localization, mapping, sensor fusion perception and control. The tool now supports 10 calibration pairs and sensors including lidar, camera, radar and IMU.

The company's proprietary loop-based calibration optimizer identifies and fixes small errors in multiple sensor calibrations, resulting in highly accurate sensor fusion. It works for multiple sensors, forming a closed loop. By adding the calibration optimizer on top of the regular techniques, errors are reduced and sensor fusion accuracy is significantly increased.

Deepen Calibrate makes the critical task of sensor data calibration quick and simple. It manages the complexities of the calibration process, ensuring accuracy and making autonomous systems safer, while also reducing a job that formerly required the time of a PhD-level engineer into something anyone can do. Licensing and customized packages are available, with more calibration types added regularly.

BOOTH: 2032

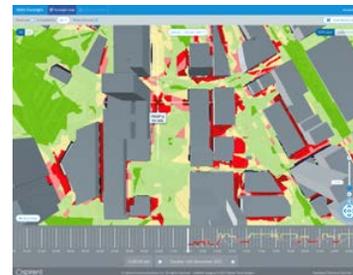


Cloud-based GNSS reliability analysis

Spirent

Autonomous and ADAS vehicles operate in environments where obstructions to GNSS signals are common, resulting in inconsistent GNSS positioning and navigation. Spirent's GNSS Foresight analyzes GNSS signal reception based on the actual city environment, including buildings and other signal obstructions, ensuring the AV knows the expected performance and when to utilize and prioritize GNSS as part of the navigation solution.

Spirent's GNSS Foresight is a cloud-based service that uses 3D maps and precise orbital information to enable users to find out where and when GNSS will be reliable, allowing them to plan routes to optimize navigation performance and operate safely. Foresight works by ray casting/tracing each GNSS satellite's line-of-sight and non-line of sight for every square meter, every second. The Foresight engine calculates the times and locations at which each satellite will be obscured by buildings or other impediments with a high degree of accuracy, accurately predicting satellite availability and associated positioning performance.



With Foresight, users can improve receiver performance; by enabling the prioritization of line-of-sight signals over non-line-of-sight, and by identifying satellites for multipath rejection, it can increase accuracy and reliability by up to 50%. Users can also improve sensor fusion, as the service can enable a sensor fusion engine to know where and when GNSS is usable, leading to real-time performance optimization. In addition, by knowing when and where GNSS will be reliable, users can therefore deploy more reliable systems with higher performance, without the requirement for additional and expensive sensors.

BOOTH: 3029

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Image-grade lidar for superior perceptive detection

LSLiDAR

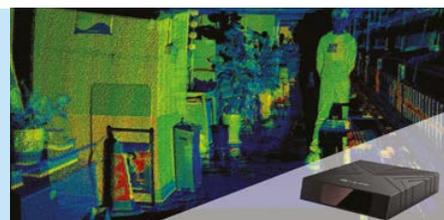
LSLiDAR will exhibit its high-quality LS series products. These are embedded with the 1,550nm pulsed fiber laser lidar for autonomous driving. Image-grade lidar has a unique ability for superior perceptive detection, allowing it to form a high-definition image with clear detail.

The LS series contains various auto-grade lidar models with a scanning capability of 128/256/512 lines. All models are embedded with a 1,550nm fiber laser for line/path scanning and have a measuring point rate up to 1.6/3.2/6.4 million points per second with highly impressive accuracy ranging to $\pm 2\text{cm}$. The point cloud imaging capabilities of this series currently occupy a leading position in the lidar industry.

The series has a $120^\circ \times 25^\circ$ field-of-view with a high angular resolution of $0.09^\circ \times 0.05^\circ$.

The whole field-of-view is considered in the ROI area, which can detect and identify all objects entering the field of view. LSLiDAR claims that the most important factor is that the dynamic ROI scan area can also be customized with higher resolution. These key ingredients provide sufficient and reliable road-environment-related information for cars, which plays an important role in improving road safety and making autonomous driving more intelligent.

The series uses the IEC-60825-certified 1,550nm fiber laser, which is more friendly and safe for human eyes. The LS series enhances the transmitting power and improves the detection range, with a maximum detection range of 500m. The detection range can reach up to 250m under the condition of 10% reflectivity. This can provide sufficient safe



redundancy distance for intelligent driving and can perceive road conditions ahead to make autonomous driving safer.

The LS series has a compact internal structure (ultra-thin size of $225 \times 106 \times 45\text{mm}$), more than 20% smaller than similar products available in the market. It can be subtly embedded in the car body without affecting the aesthetic design.

According to LSLiDAR, the series has become the most cost-effective lidar in the automotive industry, boasting the outstanding advantages of in-house key components, which will accelerate the assembly of 1,550nm pulsed fiber laser lidar.

BOOTH: 4044

Advanced XIL simulations to accelerate ADAS and AV validation

Opal-RT

Opal-RT will show its advanced X-in-the-loop (MIL/SIL/DIL/VIL) simulation technologies that allow engineers to accelerate validation at every stage of their development cycle for fields that use ADAS and AD systems. These include automotive, tractor, train, eVTOL and robotic systems.

Traditional road and track tests are incredibly costly and take a long time to complete. For over 20 years, Opal-RT's systems have been overcoming obstacles that the transportation industry faces when testing AVs, by migrating physical testbeds onto simulation platforms.

In addition, the technology used by Opal-RT is flexible enough to easily connect and integrate each new technology as it is introduced to the vehicle, from data fusion and deep learning to new sensors. For example, it can simulate multiple sensors such as camera, GNSS, lidars and radars to estimate distances, velocities and other data in a 3D environment. It can also combine these different sources of data to make predictions or decisions. It can reduce risks and accelerate time-to-market by simulating deep learning models. This solution helps users improve accuracy when the vehicle is reading and detecting pedestrians, signs and objects.

Opal-RT's simulation technologies can emulate industry-standard communication protocols such as CAN/CAN FD/CANopen, LIN and automotive Ethernet, and perform the most realistic real-time simulations possible.

BOOTH: 1026



Comprehensive digital twins and integrated point solutions

Siemens

Siemens is accelerating the development of ADAS and AV technology with its comprehensive software portfolio, creating a complete value chain from integrated chip design and embedded systems, through virtual vehicle testing for safety and compliance, to manufacturing and deployment in smart city environments. Leveraging the company's Xcelerator portfolio, automotive OEMs, Tier 1 and 2 suppliers, truck and heavy equipment manufacturers and tech companies can simulate and test solutions for chips, electronics, motion planning and tracking, perception algorithms and stacks, sensors, vehicles and occupants.

In addition to its software portfolio, Siemens will also showcase its leading point solutions that create an integrated tool suite covering data capture, analysis and diagnosis, design and exploration, as well as verification and validation. The point solutions form the backbone and cover data accessibility, detailed physics modeling, fast real-time models, scenario creation, traceability of requirements and coverage-driven verification. The tool suite's flexibility, modularity and interfacing ensure easy integration with partners.

Simcenter Prescan360 accommodates path planning as well as detailed physics-based simulations. Known for its industry-leading sensor models, Prescan continues to be the go-to tool for both sensor perception and full AV system development. Featuring an API to automate model creation and parametrization in combination with an easy-to-use front end, the effort on large volume simulation execution (on cloud/cluster) and data analysis is significantly reduced. The ISO 26262 certified tool provides powerful sampling strategies to reduce the number of simulations by up to 90%.

Simcenter SCAPTOR brings value to its clients' data by recording, visualizing and retrieving raw data, through high-speed in-vehicle data recording and time-synchronous replay. The searchability of the data and real-to-sim conversion allow for simulation and critical scenario creation according to the SOTIF standard definitions using a patent-pending approach to generate unsafe-unknown scenarios, in a systematic and automated way.

BOOTH: 4020



High-accuracy RTK-enabled datalogger

VBOX Automotive

With a growing demand for both higher levels of accuracy and the ability to test anywhere, VBOX Automotive will present a wide range of high-accuracy RTK-enabled testing and validation solutions including the all-new VBOX 3i (ADAS), VBOX Sigma and VBOX Touch RTK.

The VBOX 3i is a flexible and intuitive datalogger developed exclusively for ADAS testing. Featuring the latest in multiconstellation, dual-frequency RTK GNSS receiver technology, it offers robust signal reliability to maintain RTK accuracy.

The resilient RTK delivers centimeter-level accuracy even in challenging conditions, ensuring consistent ADAS testing both at proving grounds and out on the open road.

The VBOX Sigma is a cost-effective, RTK-enabled datalogger with an integrated NTRIP modem that delivers centimeter-level positional accuracy in challenging environments, making it an ideal reference for ground truth. Its multiconstellation, multifrequency GNSS engine offers outstanding RTK performance even in areas with poor and multipath satellite coverage. This highly accurate position validation is ideally suited to AV

development, making position logging of multiple vehicles affordable.

VBOX Touch RTK is an incredibly versatile datalogger that offers robust position accuracy and precise measurements of speed and distance. The dedicated vehicle separation app delivers an efficient and easy-to-install solution for measuring and recording the distance between two moving targets, making it an ideal, cost-effective addition to any ADAS testing toolkit.

For indoor automotive and ADAS testing, the VBOX Indoor Positioning System (VIPS) has established itself as an industry-leading solution. VIPS can run up to five target vehicles simultaneously and deliver centimeter-level accuracy at high speeds, with no loss of data between indoor and outdoor transitions or between building levels.

Installations at the world's longest indoor AV test track at AstaZero Test Site in Sweden, and in the test hall at CARISSMA at the Ingolstadt University of Technology, have contributed to further improvements to the performance and capabilities of VIPS.

BOOTH: 2020



SEPTEMBER 7 & 8, 2022

SAN JOSE, CALIFORNIA

Absolute positioning systems to complement relative sensors

Trimble

Trimble will demonstrate its absolute positioning solutions that complement relative sensors within an ADAS or AV system. Its products range from software libraries and correction services to truthing systems for research, development and mapping – capable of locating a vehicle in a lane on highways worldwide.

Precise, absolute positioning has proved to be a key element in the technology stack for AVs and a requirement for safety-certified systems.

Trimble has more than 20 years of experience operating a global precise point positioning (PPP) network, Trimble RTX, which makes highly accurate corrections accessible from almost anywhere. It is a fundamental element of an ever-expanding portfolio that will help enable greater levels of vehicle autonomy for years to come.

The RTX system is road ready and road tested. It has already successfully enabled over 16 million kilometers of incident-free autonomous driving for multiple OEMs. Meanwhile, other OEMs and Tier 1s currently leverage Trimble development and truthing kits to help them design their autonomous systems for the future.

Trimble delivers precise positioning accuracy of less than 10cm with sub-minute convergence times. It operates a dedicated integrity monitoring network that ensures positioning confidence. Two separate data checks – pre- and post-broadcast – detect and filter out faulty corrections, thereby verifying reliable, lane-level positioning.

Protection levels ensure compliance with the most rigorous safety certification standard (ASIL D ISO 26262). Trimble has developed a patent-pending methodology for maintaining strict protection levels while increasing the availability of absolute measurements.

For driving environments where line-of-sight to the sky may be compromised, Trimble systems use inertial measurement units and odometry to allow the positioning system to move through GNSS outages until the signal can be re-established. This is ideal for tunnels, underpasses and other challenging road environments.

BOOTH: 3040



Precise position and orientation data

OxTS

OxTS provides precise position, orientation and other measurement data. As an inertial expert, the company fuses data from a wide variety of sensors within its proprietary navigation engine, delivering navigation anywhere.

OxTS is specialized in three core applications: vehicle performance test and validation, map creation and autonomous navigation and vehicle localization.

Its ground-truth reference systems record full vehicle dynamics during testing, generating an accurate benchmark to judge performance.

Furthermore, the company's mapping solutions, including GeoReferencer, help users to generate accurate point clouds, thereby improving map quality and fidelity.

OxTS's systems provide accurate vehicle position and orientation in the toughest environments even in the absence of GPS/GNSS.

Visit OxTS's booth to discuss the company's solutions for vehicle position and orientation data, as well as to see its latest developments in sensor fusion, where it is adding sensors such as lidar and ultra-wide-band radio to its portfolio.

BOOTH: 3050



Single lidar AD solution approved by California DMV

Vueron Technology

Lidar AV startup Vueron Technology has succeeded in obtaining an AV permit that uses only one lidar sensor that no one has yet tried in California, where numerous AV companies are fiercely competing.

The California Department of Motor Vehicles approved lidar-only AV testing permits for Vueron. Following this, Vueron succeeded in driving 616km from Los Angeles to San Francisco via Interstate 5 and Interstate 580 for six hours at a maximum speed of 112km/h. According to Vueron, the safety driver who rode in the vehicle never held the steering wheel during the entire trip.

Its lidar-only autonomous driving permit puts Vueron one step closer to adapting lidar (which was expected to be expensive and difficult to apply) effectively to actual autonomous driving services and everyday life.

Generally, diverse sensors are used at the same time for autonomous driving, but Vueron has implemented self-driving by using only one lidar sensor and has verified its solution through self-driving tests in a variety of roadway conditions and environments. The self-driving system did not use any camera, radar, GPS or HD map, utilizing instead just one single spinning lidar sensor.

At the expo, Vueron will show the self-drive video from Los Angeles to San Francisco, clearly demonstrating the high lidar cognitive performance.

BOOTH: 4010



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DAY 2
 THURSDAY,
 SEPTEMBER 8

How real-world
 research informs
 a safe and capable
 autonomous
 driving system

Testing is one of the most common ways engineers advance autonomous driving systems, whether it's on public roads, within closed courses or through simulation. But it is important that what we measure in testing also resonates with the needs and expectations of users and the traffic community in which we drive. User- and community-centric metrics are a critical input that helps guide AV development and system requirements. Hear from Waymo's user research team about how they collect data and amass insights to better inform the engineering teams who are building the autonomous driving technology and product applications, from ride hailing to trucking, and enabling the safe and successful deployment of autonomously driven vehicles at scale.

Please visit the website to see the full conference program and speaker details



Automotive Imaging on a windscreen test bench, applied from inside of the car and for ADAS image testing using the original installed onboard camera.

Glass inspection with optical quality testing for ADAS

LaVision

Representatives from LaVision will share more about the company's automotive glass characterization system, which combines automotive glass inspection with optical quality testing for ADAS.

The system measures optical distortion of windshields installed on a vehicle, on a laboratory test bench or even in a quality control context. This whole-field imaging technique permits flexible selection of the field-of-view and accurately measures the optical distortions in millidiopters with high spatial resolution. The diopter map of the driver's whole viewing zone can be measured or zoomed into on the ADAS camera viewport. The system uses a high-resolution widescreen monitor to display calibration targets. A digital camera images the monitor through the windshield for the measurements. No special alignment is required, permitting fast and easy setup. The camera can be mounted on a robotic arm with autofocus capability for repeatable programmed operation. The same system quantifies the image quality of the ADAS camera

performance in terms of the modulation transfer function (MTF) line pair analysis, image contrast and brightness (transmission).

Other image quality indicators can be added to the test sequence. The MTF of the ADAS camera system describes its so-called spatial frequency response and is a fundamental indicator of optical performance. It measures to what extent details from the scene in front of the car are preserved in the camera image. The MTF is measured as a two-dimensional map across the entire camera view.

These image quality tests, as well as diopter measurements, are also possible using an already installed onboard ADAS camera, supporting image transfer to the automotive imaging system. Measurements made in this fashion contain the total effect of the glass and ADAS camera. The image distortion from the windshield is captured at the correct viewing angles and light ray paths, which are different when looking straight through the ADAS windows as with conventional scanning systems.

BOOTH: 1036

Modular CPU acceleration card solves problems in most advanced datalogging

Xylon

Xylon will present its new CPU acceleration module that solves different datalogging challenges in high-end ADAS and autonomous systems. For example, besides generating video, smart cameras also generate data on detected objects, projected trajectories, diagnostics and similar heterogeneous data that must be decoded in real time and displayed during test drives. This requires dedicated powerful processing resources, and Xylon's new module provides this with the integrated CPU with two FPGA companion chips. The FPGA chips significantly expand standard CPU capabilities.

The new card offers a rich choice of communication channels. 10Gb input and output, supported by implemented Data Distribution Service network middleware,

enable direct datalogging from popular automotive AI platforms that multiplex all sensory data on a single Ethernet channel. Convenient auxiliary 2x USB 3.1 interfaces support new GPS modules, dash and reference H.264 cameras and the recorded data offload.

One of the most important new capabilities is full datalogging support for reference Ethernet surveillance cameras, such as the Real Time Streaming Protocol and GigE Vision cameras. Due to H.264 or H.265 video compression, video output from such cameras inherits the frame jitter that makes time-stamping imprecise. Xylon has solved this problem by using custom HW accelerators implemented in FPGA companion chips.

The new CPU module also enables the Universal Measurement and Calibration



Protocol (XCP) master mode on CAN and Ethernet networks, as well as the AUTOSAR Scalable service-Oriented MiddlewarE over IP (SOME/IP) Ethernet communication protocol.

The module's CPU card is modular and has three slots for additional Ethernet network modules of the customer's choice that can be easily plugged into the box.

Xylon offers the 100B-T1, 1,000B-T1 and 2.5GB-T automotive Ethernet modules, as well as the 1,000B-T Ethernet module. All modules support PTP/gPTP time synchronization and provide four channels that can be used either directly or in a two-channel network TAP configuration.

BOOTH: 4036

Bringing together world-leading experts in the fields of autonomous vehicle research, AI, software, sensor fusion, AV testing, validation, development, standards and safety.

The 2022 ADAS & Autonomous Vehicle Technology Expo Conference will be held alongside the expo in San Jose, California, on September 7 & 8. Over 70 speakers will discuss the latest developments in the world of next-generation ADAS and autonomous vehicle technology.



Topics include:

- Innovations, issues and strategies on the road to safe autonomous driving
- Advances in AI, software and architecture development
- Regulations, law and standards - implications for engineers
- Verification, validation and data management in the virtual domain
- Advances in sensing, vision, mapping, positioning and in-the-loop testing technologies
- Real-world/physical test and development, and integration with and implications for virtual testing
- Connectivity: IoT, V2X and telematics - challenges and solutions
- Best practices for safe autonomous driving





Speaker highlights



Intelligent intersections for protecting vulnerable road users
Dr Liam Pedersen, deputy director - robotics, Alliance Innovation Lab - Silicon Valley, USA



The road to mass deployment of highly automated trucks
Dr Anurag Ganguli, UP of R&D, Plus, USA

Chauffeur and guardian: a holistic approach to vehicle safety.
Dr Carrie Bobier-Tiu, senior manager - control, Woven Planet, USA



Understanding the continuous evolution of ADAS testing and regulations
Ryan Harrington, principal, Exponent Inc, USA

Strategies for managing vehicle training data
Douglas O'Flaherty, global ecosystem leader IBM storage, IBM, USA



How real-world research informs a safe and capable autonomous driving system
Megan Neese, manager, Waymo Insights Team, Waymo, USA

Proving ground testing in the context of automated vehicles
Nils Katorke, project coordinator, Mercedes-Benz AG, Germany

Driving sensing and perception beyond today's capabilities
Dr Maha Achour, CEO, CTO, founder, Metawave Corporation, USA



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