# AutoSens

**Brussels 2018 Edition, Conference Agenda**
**17-20 September 2018, AutoWorld Museum, Belgium**

## Monday 17th September

Official meeting for the IEEE Standards Association Working Group on Automotive System Image Quality – P2020
(by invitation only)

## Tuesday 18th September: Technical Workshop Programme

(accessible with an AutoSensLEARN ticket only)

08:45 Check-in opens for workshops

**Morning Sessions (9:15-12:45)**

- HD Maps for Driverless Vehicles: Technologies, Business Models, and Players
  Led by **Dominique Bonte,** Managing Director, **ABI Research**
- Functional safety requirements for ADAS and AVs
  Led by **Riccardo Cagnacci,** Functional Safety Senior Architect, **Intel Corporation**

**Afternoon Sessions (13:45-17:15)**

- Simulation studies for sensor systems - How much can simulation emulate reality?
  Led by **Prof. Dr. Alexander Braun,** Professor of Physics, **University of Applied Science, Duesseldorf**
- Introduction to the world of Time-of-Flight for 3D imaging
  Led by **Prof Albert Theuwissen,** Founder, **Harvest Imaging**

Workshops are followed by Round Table discussions from 17:30-18:15.
Perception 2.0 - **AEye**
Why Hybrid Scanning LiDAR? The design and potential of hybrid scanning LiDAR for self-driving cars - **SOS Lab**
Lessons Learned in Building Production AI for Autonomous Vehicles - **Pure Storage**

Plus the Welcome Drinks reception on the mezzanine exhibition floor from 18:15. Both are open to all ticket holders

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## Conference Day 1: Wednesday 19th September

08:00 Check-in opens and refreshments served

| OPENING PLENARY<br>*Mezzanine Auditorium* |
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08:55 Opening remarks from organisers and Chairs
**Robert Stead,** Managing Director, **Sense Media Group** and **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**

09:05 Solutions and Open Challenges in Vehicular Perception
- What information is needed for automated vehicles?
- From lane recognition and object detection to scene understanding
- Maps – a blessing or a curse?
- Major technology challenges in vehicular perception

**Professor Christoph Stiller,** Automated Driving, Institute of Measurement & Control Systems, **Karlsruhe Institute of Technology**

09:35 A review of Optical Phased Array LiDAR
**Professor Michael Watts,** Associate Professor EECS, **MIT** and CEO, **Analog Photonics**

10:05 An Open, Transparent, Industry-Driven Approach to AV Safety
At Intel and Mobileye, saving lives drives us. But in the world of automated driving, we believe safety is not merely an impact of AD, but the bedrock on which we all build this industry. And so we proposed Responsibility-Sensitive Safety (RSS), a formal model to define safe driving and what rules an automated vehicle, independent of brand or policy, should abide to always keep its passengers safe. We intend this open, non-proprietary model to drive cross-industry discussion; let's come together as an industry and use RSS as a starting point to clarify safety today, to enable the autonomous tomorrow.
**Jack Weast,** Sr. Principal Engineer and Chief Systems Architect of Autonomous Driving Solutions, **Intel Corporation**

10:30 Starting Grid Showcase
**Brodmann17 | Helix Technologies | SAND Microsystems | UniqueSec**

10:45 Networking refreshment break

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| | CAMERA AND VISION CHALLENGES FOR AUTONOMOUS DRIVING AND ADAS<br>Chaired by **Dr Sven Fleck,** Managing Director, **SmartSURV**<br>*Mezzanine Auditorium* | THE FUTURE OF RADAR FOR AUTONOMOUS DRIVING<br>Chaired by **Robert Stead,** Managing Director, **Sense Media Group**<br>*Minerva Seminar Room* | SIMULATING AND VALIDATING DRIVER ASSISTANCE SYSTEMS FOR AD<br>Chaired by **Prof. Dr. Alexander Braun,** Professor of Physics, **University of Applied Sciences, Duesseldorf**<br>*Mahy Seminar Room* |
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| 11:35 | Critical factors and future pathways for Camera Monitor Systems (CMS)<br>• Understanding the development framework – ISO16505, UN Regulation no. 46 – missing elements for image stitching<br>• System fundamentals – sensor, interface, processing (examples and illustration of basic and advanced systems)<br>• Sensor fusion – the growing role of fusion in CMS<br>• Development pathways from current to a future of mirrorless vehicles, and challenges along the way<br>**Philipp Hoffmann,** Research, New Technologies and Innovation, Project Leader Interior Concept Research, **BMW Group** | Overview of radar technologies for automotive and review of the key players<br>The automotive radar market benefits from a 23% CAGR from 2016 to 2022. AEB application is the main driver for the 77 GHz long range radar market growth. Another trend with the advent of autonomous driving is the use of corner radar for the car 360° surveillance. These short and mid-range radar are supported by 24 GHz and more recently by 79 GHz module. The latest one being more suited for high resolution tracking which will be desirable for tasks such as target separation or even object recognition. Corner radars will be a must have for redundancy with other sensors such as camera or even Lidar for high-end robotic cars. In this presentation we will depict the radar market trend as well as the main technology evolution which can be expected for the next decade.<br>**Cédric Malaquin,** Technology & Market Analyst, RF Devices & Technologies, **Yole Developpement** | Application of a new optical model to concrete scenarios<br>• Presentation of research idea<br>• Demonstration of how the optical model makes simulations more realistic<br>• With a goal to have a direct comparison between a real-world test drive and the exact same scene in a simulation environment<br>**Matthias Lehman,** PhD Researcher, **University of Applied Sciences, Duesseldorf** |
| 12:00 | Digital Mirrors – International Regulation and System Design based on hybrid Image Processing<br>• International Regulation, comparison of the requirements for Europe (ECE countries) and the future developments for the US market<br>• State of the art camera monitor systems | Staying Ahead of the Curve: Advancing Radar and the Future of Autonomous Driving<br>• The potentially overlooked sensor gap to reaching level four and five autonomy<br>• How next-generation radar is an unexpected solution | Automotive Sensors: Physics Based Simulation and Its Application<br>• Demonstration of planning and control developments using a combination of physics based PreScan sensor simulations, and a |

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| | • CMS system design based on a novel hybrid SoC-FPGA platform<br>• Testing based on ISO 16505 and UN-ECE R.46<br>• The role of automotive camera systems in electrical engineering education<br>• Future developments<br>**Prof Dr Anestis Terzis,** Electrical Engineering and Information Technology, **Ulm University of Applied Sciences** | • The differentiation between next-generation radar and the current technology in use by level two and three automated vehicles<br>• How using a powerful, high-resolution radar can reduce the cost of the entire autonomous vehicle sensor suite.<br>• How to integrate and enable sensor fusion, while avoiding interference.<br>**Kobi Marenko,** Co-founder and CEO, **Arbe Robotics** | high-fidelity vehicle model from the Simcenter Amesim software.<br>**Michael Phillips,** Software Engineer, **Tass International** and **Son Tong,** Senior Research Engineer, **Siemens PLM Software** |
| 12:25 | Automotive HDR imaging – the history and future<br>• Overview on special requirements for automotive camera applications<br>• Evolution of automotive HDR imaging technology - key breakthroughs and game changers<br>• The state of the art of HDR imaging today<br>• Comparison to other industries<br>• Outlook on future requirements, new innovations and remaining challenges<br>**Dr Mario Heid,** General Manager, Europe, **OmniVision** | Reducing time to market for Radar Sensors: from Silicon to System Solutions<br>In this paper, we will explore how market leaders of radar solutions are helping manufacturers reduce time-to-market, while still fulfilling their specific requirements. Specifically, we will cover how the use of Software Development Kits (SDKs) can help reduce the time to develop a radar sensor and lower the barriers to entry. We will further explore some of the key features in the NXP RadarSDK required for the typical radar processing flows, making use of the accelerators available in the silicon.<br>**Michael Staudenmaier,** Principal Radar Systems Engineer, Automotive Microcontrollers and Processors Group, **NXP Semiconductors** | Requirements in the Loop, the Future of Systems Engineering<br>Presentation of a very innovative and effective method called “Requirements in the Loop”, supported an easy-to use tool, STIMULUS. The textual requirements are part of a specification model describing the system architecture, its interfaces whereas the expected behaviour is described using a free mix of state-machines and textual requirements. Everything can be simulated, including the requirements which are "In the Loop".<br>**Yves Genevaux,** Director, **Argosim** |
| 12:50 Networking lunch break | | | |
| | STANDARDS FOR CAMERA AND VISION TECHNOLOGIES IN AUTOMOTIVE | THE ROLE OF LIDAR IN THE ADAS AND AV SENSOR SET<br>*Minerva Seminar Room* | SIMULATING AND VALIDATING DRIVER ASSISTANCE SYSTEMS FOR AD |

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| | Chaired by **Dr Marc Geese,** Chassis Systems Control, Next Generation Video & Imaging Chain (CC-DA/ESV5), **Robert Bosch GmbH**<br>*Mezzanine Auditorium* | | Chaired by **Prof. Dr. Alexander Braun,** Professor of Physics, **University of Applied Sciences, Duesseldorf**<br>*Mahy Seminar Room* |
| 14:05 | Progress with P2020 – developing standards for automotive camera systems<br>• Overview of the working group activity<br>• Why P2020 is so important in the effort to improve road safety<br>• Progress update – White Paper publication and Brussels meeting summary<br>• Why you need to be involved<br>**Prof. Robin Jenkin,** Principal Image Quality Engineer, **NVIDIA** | Self-driving cars and lidar<br>This talk will review some history of Google's self-driving car project and describe a few use-cases for lidars on Waymo cars. Out of that will emerge key differences between lidars for self-driving and traditional applications (e.g. mapping) which may provide opportunities for semiconductor lasers and detectors.<br>**Simon Verghese,** Hardware Engineer, **Waymo** | Domain-specific languages for specification, development, system design and testing of AVs<br>• Documenting the safety of autonomous driving functions requires a paradigm shift from showing controllability to documenting safe behaviour in relevant driving scenarios.<br>• Developing modelling and testing approaches for ADAS based on domain-specific languages that allow to describe requirements, system behaviour, and driving scenarios at a semantic level.<br>• These specifications are the basis for structured analysis of ADAS behaviour: so runtime monitors and test oracles from requirements and validate ADAS behaviour through automated variation of driving scenarios in simulations are generated<br>**Falk Howar,** Professor for Software Engineering, **TU Dortmund University** |
| 14:30 | Objective and Application Oriented Characterisation of Image Sensors with EMVA's 1288 Standard<br>• Basic principles behind the standard<br>• The standardised summary data sheet for easy comparison<br>• Flexibility with mandatory and optional measurements | Tier 1 achievements with solid state lidar<br>• Reporting on a number of applications where Tier I's succeeded in achieving superior safety and comfort improvements thanks to LIDAR based object detection.<br>• Concrete examples will be given of use cases where solid state lidar outperforms other sensor solutions.<br>**Filip Geuens,** CEO, **XenomatiX** | Improving confidence in the safety of ADAS and AV designs that incorporate 'unqualified' software or hardware components<br>• Many ADAS / AV projects face multiple constraints, such as: the available hardware and software components are not all 'qualified'; there may be 'gaps' between qualified components; the related safety standards are complicated; the |

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| | • The continuous evolution and extension of the standard with advances in image sensors<br>**Prof. Dr. Bernd Jähne,** Professor of Physics and Computer Science, **Heidelberg Collaboratory for Image Processing**, Chair, **EMVA 1288** | | development/management team lacks experience; there are time-to-market and unit-cost challenges …<br>• In this talk, it will be argued that splitting the system functionality from the safety functionality provides a practical means of meeting such constraints for many organisations.<br>• Techniques for performing this split (in compliance with ISO 26262) will be discussed.<br>**Dr Michael J. Pont,** Executive Director, **SafeTTy Systems** |
| 14:55 | PANEL: Vehicle perception of humans – what level of image quality is needed to recognise behavioural intentions<br>Chaired by **Dr Marc Geese,** Chassis Systems Control, Next Generation Video & Imaging Chain (CC-DA/ESV5), **Robert Bosch**<br>**Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**<br>**Abhay Rai,** Head of Automotive Sensor Marketing, **Sony Electronics**<br>**Philipp Hoffmann,** Research, New Technologies and Innovation, Project Leader Interior Concept Research, **BMW Group**<br>**Ajinkya Malasane,** Co-Founder, **Playment** | PANEL: Do we have a lidar bubble?<br>**Dr Valentina Donzella,** Smart Connected and Autonomous Vehicles MSc leader, Intelligent Vehicle group, **WMG**<br>**Simon Verghese,** Hardware Engineer, **Waymo**<br>**Stephen Lambright,** Vice President Marketing, **AEye**<br>Moderated by **Rudy Burger,** Managing Partner, **Woodside Capital Partners** | PANEL: Regulation, ethics and liability considerations for self-driving vehicles – how should we incorporate ethics into validation tests?<br>**Leon Suetfeld,** Researcher, Institute of Cognitive Science, **Osnabrueck University**<br>**Matthieu Worm,** Program lead autonomous driving, **Siemens PLM Simulation and Test Solutions**<br>**Falk Howar,** Professor for Software Engineering, **TU Dortmund University**<br>Moderated by **Prof. Dr. Alexander Braun,** Professor of Physics, **University of Applied Sciences, Duesseldorf** |
| 15:35 Networking refreshment break and academic poster session | | | |
| | DRIVER MONITORING AND HMI | LiDAR TECHNOLOGIES RAPID FIRE SESSION<br>*Minerva Seminar Room* | SAFETY CHALLENGES FOR AUTOMATED VEHICLES |

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| | Chaired by **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**<br>*Mezzanine Auditorium* | | Chaired by **Dr Marc Geese,** Chassis Systems Control, Next Generation Video & Imaging Chain (CC-DA/ESV5), **Robert Bosch GmbH**<br>*Mahy Seminar Room* |
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| 16:20 | Developing High Fidelity and Ecologically Valid Simulation Models for Conditionally Automated Vehicles<br>**Kübra Zehra Kaşıkçı,** Automated Driving Researcher, Environmental & Engineering Psychology, **University of Surrey** | LIDAR Opportunities and Tradeoffs in ADAS<br>**Raffi Mardirosian,** VP Corporate Development, **Ouster**<br><br>Hybrid scanning LiDAR systems for autonomous vehicles<br>**Jiseong Jeong**, CEO, **SOS Lab**<br><br>Coherent Lidar for Autonomous Driving – Radial Velocity on Every Data Point<br>**Stephen Crouch,** CTO, **Blackmore Sensors and Analytics**<br><br>Innovative laser sources for lidars in autonomous vehicles - advantages of 3D flash lidars and hybrid flash lidars<br>**Andreas Kohl,** Head of Operations Diode Lasers, **Quantel**<br><br>Opportunities in the Testing and Validation of LiDAR Sensors<br>**Dr. Mircea Gradu,** Chief Quality Officer, **Velodyne LiDAR,** and President and Chairman of the Board, **SAE International** | Active safety; mitigating danger of hackers<br>• How can one hack/break system<br>• What would happen<br>• Potential solutions<br>**Alexandre Hamez,** Technical Lead, **EasyMile** |
| 16:45 | Driver and compartment monitoring on the way towards autonomous vehicles<br>This presentation will discuss the principles and use cases of applying a driver monitoring system, DMS, and compartment monitoring in vehicles. A number of sensing cases based on deep learning and vision processing will be demonstrated that provides an opportunity to enhance the safety and comfort in vehicles.<br>**Henrik Lind,** Chief Research Officer, **Smart Eye** | | How to Improve the Performance and Safety of Automated Vehicles<br>From AV stack redundancy to remote teleoperation there are numerous ways to heighten the performance and safety of automated vehicles. In this session VSI explores the methods to improve the safety of automated vehicles.<br>**Phil Magney,** Founder and Principal, **VSI Labs** |
| 17:10 | Automotive in-cabin sensing solutions<br>The Automotive cabin is attracting a host of new applications, driven by efforts to make the vehicle safer and more autonomous. In addition, new human/car interactions are on manufacturers' wish-lists.<br>The cameras seeing in all conditions requires new kinds of image sensors that can see in both the near infra-red and visible light spectra.<br>This requires small-enough Automotive Global Shutter pixels, which must simultaneously have exceptional performance on noise, dynamic range, | | An Approach to realize "Safety Cocoon"<br>"Safety Cocoon" is a name expressing the creation of an area surrounding the car where a car can detect its surroundings in 360 degrees and prepare for danger avoidance from an early stage in various driving situations.<br>Adopting Sony's image sensor will contribute to achieving enhanced safety efficiently.<br>To realize this Safety Cocoon concept, key technical challenges exists such as realizing HDR, mitigating LED flicker, realizing functional safety and cybersecurity. In this presentation, key |

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| | sensor reliability (Mean Time between Failure) and operate with this performance at the highest temperatures. As important, these sensors must also support feature matching with the camera system, like high frame-rates or highly programmable sensor setup sequences.<br>Can any image sensor meet these objectives? Come hear STMicroelectronics and their thoughts.<br>**Nicolas Roux,** Business and Product Marketing Manager, **STMicroelectronics** | | concept and approach for these challenges will be discussed.<br>**Yuichi Motohashi,** Project manager, Automotive image sensors, Automotive Business division, **Sony Semiconductor Solutions** |
| 17:35 – 19:30 AutoSens Drinks reception<br>19:00 AutoSens Awards at the Atomium (separate registration required) | | | |

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## Conference Day 2: Thursday 20th September

| | BEYOND VEHICLE PERCEPTION AND SENSING<br>Chaired by **Phil Magney,** Founder and Principal, **VSI Labs**<br>*Mezzanine Auditorium* | AI, DEEP LEARNING AND AUTONOMOUS DRIVING<br>Chaired by **Jennifer Prendki,** VP of Machine Learning & Data Strategist, **Figure Eight**<br>*Minerva Seminar Room* | SOC DESIGN AND PROCESSING CHALLENGES<br>Chaired by **Dr Sven Fleck,** Managing Director, **SmartSURV**<br>*Mahy Seminar Room* |
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| 08:50 | Opening remarks | Opening remarks | Opening remarks |
| 09:00 | Visual SLAM and localisation<br>**Dr Catherine Enright,** Vision Fusion Software Team Manager, **Valeo** | How deep learning affects automotive SOC and system designs<br>• New processor architectures required for deep learning<br>• Classical computer vision and imaging to coexist with deep learning<br>• - Deep learning results in system and SOC design changes<br>**Marco Jacobs,** VP Marketing, **Videantis** | Review of signal processing hardware – pros and cons<br>**Felix Eberli,** Head of Department, **Supercomputing Systems** |
| 09:25 | Lidar-free 3D Mapping for Autonomous Driving<br>• Presentation of a 3D mapping approach that uses nothing but cameras and GPS to build high fidelity maps.<br>• Current progress of automatically inferring these maps without Lidar.<br>• How to extract geometric features (e.g. lane markings), attributes (e.g. types of road signs) and topology (e.g. how lanes are connected in intersections).<br>• The approach combines classical computer vision with modern machine learning approaches to build, update and maintain these maps efficiently.<br>**Dr. Henning Lategahn,** CEO, **atlatec** | Improving and implementing traditional computer vision algorithms using DNN techniques in autonomous vehicles<br>• Similarities between classical and deep vision<br>• How a classical vision algorithm can be expressed and adapted to become a trainable DNN<br>• Providing a low-risk path for developers transitioning from traditional vision algorithms to DNN-based approaches<br>**Bryce Johnstone,** Director of Automotive Segment, **Imagination Technologies** | Optimizing the sensor-set for Automated Driving and challenges for SOC design<br>• Is there a perfect sensor-set for automated driving? Camera, Radar, Lidar or more…<br>• Computational needs for sensing – do we need more than AI?<br>• Evolution of system architectures & challenges for SOC design<br>• Future of automotive embedded processors<br>**Rajat Sagar,** SOC Architect & Product Manager, **Texas Instruments** |

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| 09:50 | ROS Interfaced Autonomous Control System in the Loop: Real time simulated virtual sensor data<br>- The integration of an Autonomous Control System (ACS) from an Aurrigo low speed autonomous pod with the virtual test environment.<br>- The benefits of using the Robotics Operating System (ROS) to support the ACS integration.<br>- The configuration and simulation of sensor data, including LiDAR and stereo camera.<br>- Testing a hardware in the loop ACS with the virtual environment. Including a demonstration of a virtual pod mapping and localising.<br>- An overview of the technical accomplishments and challenges in the Innovate UK project Innovative Testing of Autonomous Control Techniques (INTACT).<br>**Dr Graham Lee,** Lead Engineer, Intelligent Vehicles Research, International Digital Laboratory, **WMG, University of Warwick** | Multiclass road object detection for advanced driver assistance using deep neural networks<br>This talk will showcase a perception subsystem as a part of a real-time augmented reality software solution, that utilizes vehicle sensors, map data, telematics, and navigation guidance with a set of advanced deep learning algorithms. The talk will address challenges of running advanced neural network models in real-time on the embedded hardware and some solutions to overcome them.<br>**Sergii Bykov,** Machine Learning Engineer, **Apostera** | Video pipelines for ADAS and AD – more than just a patchwork of single components<br>• Standardization vs functionalities: camera connection via Ethernet, SERDES or Automotive MIPI long distance?<br>• Migration of functionalities, taking the example of ISPs: place it in the cameras or in the ECU?<br>• Use case review of mass-market parking assistant systems: how to bring this functionality in entry- and mid-range segments?<br>**Simon Oudin,** Senior Technical Marketing, Global ADAS Centre, **Renesas** |
| 10:15 Networking refreshment break and academic poster session | | | |
| | BEYOND VEHICLE PERCEPTION AND SENSING<br>Chaired by **Phil Magney,** Founder and Principal, **VSI Labs**<br>*Mezzanine Auditorium* | AI, DEEP LEARNING AND AUTONOMOUS DRIVING<br>Chaired by **Jennifer Prendki,** VP of Machine Learning & Data Strategist, **Figure Eight**<br>*Minerva Seminar Room* | SOC DESIGN, COMPUTER VISION AND PROCESSING CHALLENGES<br>Chaired by **Dr Sven Fleck,** Managing Director, **SmartSURV**<br>*Mahy Seminar Room* |
| 11:05 | Intelligent car suspension making use of ADAS/AD sensors & sensor fusion<br>• Simulation results predict noticeable performance increase when applying this approach, but existing (similar) applications | Deep learning processing technologies for embedded systems<br>• Presentation of the problem of image processing in a typical AV/ADAS scenario, | Enabling Volume Deployment of the Autonomous Vehicle with a new AI Processor<br>This paper reviews some of the technical challenges remaining for wide-spread autonomous deployment, describes a sample AD ECU |

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| | are not yet meeting the comfort requirements targeted for L3+ Autonomous Driving.<br>• Sensor FOV and accuracy are tailored to current system level applications, the (fast-acting) suspension requires highly accurate but short-range data in order to be useable.<br>• These requirements seem to be challenging, regardless of the sensing technology.<br>• When applying ADAS/AD sensing technologies to accommodate enhanced suspension performance in the corresponding FOV, Tenneco experience learns that conclusions with respect to robustness and repeatability apply as with the more common ADAS applications (e.g. influence of environmental conditions).<br>• This highlights the need for a fusion approach, also for this application.<br>**Kylian Praet,** Associate Engineer, **Tenneco** | both in terms of required resources and of compute paradigm.<br>• Exploring the theoretical limits for processing efficiency, and analysis of the deficiencies which contribute to the large gap between theory and practice for different approaches.<br>• Analysing rear-view camera feed for parking assist to float some of the inherent system issues, performance requirements and the huge potential unlocked by a capable solution for running NNs locally.<br>• Guidelines for designing processing systems to achieve the required efficiency for running state of the art deep learning on embedded devices<br>**Orr Danon,** CEO and VP R&D, **Hailo** | processing flow, and proposes an entirely new AD ECU architecture enabled by the introduction of a revolutionary new AI processing platform from Graphcore: the IPU.<br>**Thomas Wilson,** VP Automotive, **Graphcore** |
| 11:30 | Attaining the Goal of SAE Level 5 Autonomy: Is R&D on a Collision Course with IT?<br>Dell and Zenuity will share their best practices of how the entire test and validation process can be leveraged in a private cloud environment and/or as a service to address these challenges and what a reference architecture that has been developed during various projects looks like<br>**Charles Sevior,** CTO, Unstructured Data Solutions, **Dell EMC** and **Robert Tapper,** Senior Director – Zenuity Core IT, **Zenuity** | Lessons learnt from deep learning approaches to self-driving<br>**Anantha Kancherla,** Head of Self Driving Software, **Lyft** | High resolution low power platform for efficient computer vision processing<br>In this presentation an overview of the evolution of stereo techniques is given leading to a description of the latest implementation of a dense high-resolution disparity map. In particular it will be shown the quantity and quality of information that can be extracted from a stereo system.<br>**Pier Paolo Porta,** Business Development Senior Manager, **Ambarella** |

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| 11:55 | PANEL: HAD (highly automated driving) - how can we get customers attracted to enjoy cruising with robots?<br>**Dr. Hadj. Hamma Tadjine,** Business Development & Projects, **IAV**<br>**Tobias Schneiderbauer,** Engagement Manager, **McKinsey**<br>**Kübra Zehra Kaşıkçı,** Automated Driving Researcher, Environmental & Engineering Psychology, **University of Surrey**<br>Moderated by **Peter Schubert,** Director ADAS SW Module Development, **Continental Teves** | PANEL: What do we need to watch out for as deep learning becomes the backbone of autonomous driving?<br>**Pejvan Beigui,** CTO, **EasyMile**<br>**Keith Manthey,** Global CTO for the Unstructured Division, **Dell EMC**<br>**Michael Povlin,** Senior Tensilica IP Executive, **Cadence**<br>Moderated by **Jennifer Prendki,** VP of Machine Learning & Data Strategist, **Figure Eight** | PANEL: How many ECUs are enough?<br>• ADAS vs AV<br>• Edge computing vs centralised computing<br>• Convergence of ECUs<br>**Martin Edney,** Function and Software Manager, **Continental**<br>**Cyril Cordoba,** Global ADAS solution group, Solution Strategic marketing, **Renesas Electronics**<br>**Felix Eberli,** Head of Department, **Supercomputing Systems**<br>**Pier Paolo Porta,** Business Development Senior Manager, **Ambarella**<br>Moderated by **Dr Sven Fleck,** Managing Director, **SmartSURV** |
| 12:35 Networking lunch | | | |

**CLOSING PLENARY**

*Mezzanine Auditorium*

Chaired by **Robert Stead,** Managing Director, **Sense Media Group** and **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**

13:45 Showcase of students from the NWAPW programme
Students on this programming workshop will be demonstrating their cars in action in the AutoSens exhibition area, and will give a short presentation describing the car, the software, how schools will join the program and how companies could, if they wanted, connect and partner with these schools

14:00 The Future is To See and Know: Cognitive Principles for Intelligent Autonomous Vehicles
Fleets of autonomous vehicles are the near future. As cameras and sensors become more accurate, efficient, and reliable, autonomous driverless cars will enter commercial markets at an unprecedented rate. While infrastructural changes and regulatory issues, among others, catch up to such a dynamic landscape, I present a cognitive perspective to automation and argue for the importance of human-machine interaction over machine dominance. Bringing cognitive science to the forefront of robotic innovation, I detail fundamental and translatable cognitive principles so far missing from perception R&D.
**Monica Lopez Gonzalez,** Co-Founder and Executive Scientific & Artistic Director, **La Petite Noiseuse Productions**

14:30 Global M&A in the ADAS and Autonomous technology space
**Rudy Burger,** Managing Partner, **Woodside Capital Partners**

14:55 How will the future of automotive develop and the AD ecosystem evolve?
**Glenn Schuster,** Director Sensor Ecosystem, **NVIDIA**

15:25 Closing remarks from organisers and close of conference