CONFERENCE AGENDA
Detroit 2018 Edition
May 15-17, Michigan Science Center

Tuesday May 15th – Workshops, Demo Sessions (from 12pm), Round Table Discussions and Exhibition Preview (from 1pm)

Morning workshops 9:15am – 12:45pm:

- Introduction to Image processing
  Dr Rania Hussein, Lecturer, Electrical Engineering, School of STEM, **University of Washington Bothell**

- Functional safety requirements for ADAS and AVs
  Riccardo Cagnacci, Senior Functional Safety Architect, **Intel Corporation**

Afternoon workshop 2pm – 5:15pm:

- Understanding lidar and its use cases
  Mark McCord, Co-Founder and VP Engineering, **Cepton** and **Steve Vozar,** Co-Founder and CTO, **May Mobility**

Round table sessions from 5:30pm, sign up here https://www.surveymonkey.co.uk/r/922CMBB:

1) LIDAR Opportunities and Tradeoffs in ADAS
   What practical LIDAR specs for ADAS will be available by 2020 and what tradeoffs should OEMs make?
   Hosted by **Angus Pacala,** CEO, **Ouster**

2) Compute architectures for sensing in autonomous vehicles
   What factors need to be considered to meet the sensor processing needs for the upcoming higher levels of autonomous drive? Is centralized or decentralized compute architecture the way forward for sensing?
   Hosted by **Soshun Arai,** Director, ADAS/Automated Driving Platform Strategy, **Arm**

3) Which role does GPS currently play in your autonomous driving stack? Which receiver technology are you currently using? What limitations of GNSS technology are you currently dealing with? Which functional safety requirements do you have for a deeper integration of GNSS sensor data into sensor data fusion?
   Hosted by **Peter Kalinowski,** Co-Founder and **Sven Bauer,** CTO, **Naventik**

Followed by our welcome Drinks Reception from 6:15pm, in the Atrium, exhibition area.

CONFERENCE AGENDA
Detroit 2018 Edition
May 15-17, Michigan Science Center

<u>Wednesday May 16th – Conference Day 1</u>

OPENING PLENARY

09:00 Opening remarks from Organizers and Chairs
Robert Stead, Managing Director, **Sense Media Group**
Prof Patrick Denny, Senior Expert, **Valeo Vision Systems**

09:10 Exploring the Real-World Impact of ADAS on Future Accident Frequency
- A targeted analysis of NHTSA accident data to understand the realities of ADAS' effectiveness with a realistic outlook for the potential reduction in accidents
- NHTSA, FARS and NTSB data will be presented to establish the true "addressable market" of accidents, to provide a reality check on some of the headline claims that ADAS & Automated driving will eliminate "human error" accidents
- SBD will also present an outlook of growth of ADAS & Automated Driving Systems in the market, and consider how increasing penetration of these features will impact the overall outlook for accident frequency, using our ADAS & Autonomous Vehicle Sales forecast data

Tim Dawkins, Autonomous Car Specialist, **SBD Automotive North America**

09:40 Why Intelligence Is the Future – A cognitive perspective to automation
The race to commercialize self-driving cars is in high gear. As carmakers and tech companies focus on creating sensors with more nuanced capabilities to achieve maximal effectiveness, efficiency, and safety, an interesting paradox has arisen: the human element has been dismissed. If machines are to seamlessly interact with humans, they must integrate the fundamentals that make us human like spontaneous rule-breaking behaviour. Bridging the gap between engineering and cognitive science, the case for bringing complex human cognition like collaborative real-time adaptive problem solving and decision-making back into the equation of perception R&D is presented and that intelligent improvisation is argued as the future.
Dr Mónica López-González, Co-Founder and Executive Scientific & Artistic Director, **La Petite Noiseuse Productions**

10:10 Networking refreshment break

11:00 Approaches to validating Autonomous Vehicle safety
Validating perception is the toughest part of ensuring autonomous vehicle safety. This talk will explain why:
- Road testing should be used more for data collection than for testing

- A layered approach to simulation can provide more cost-effective validation
- Sensor-level fault injection can reduce the brittleness inherent in machine learning approaches

Philip Koopman, Associate Professor, Electrical and Computer Engineering Department, **Carnegie Mellon University**

11:25 Panel Discussion. Autonomous Driving: Safety & Privacy
- Safety: challenges due to attacks (ie preventing autonomous cars being used as weapons)
- Implication of offering human in the loop remote control service
- Safety: challenges due to environmental influences (10+ year old autonomous cars in the field); how to ensure robustness/fitness
- Privacy: who owns the data, both on high level but also the sensor data. Due to big data, seemingly independent information might lead to surprising knowledge

  Fabian Koark, Principal Consultant, **INVENSITY Inc.**
  Michael Fleming, CEO, **Torc.ai**
  John Thomas, Research Engineer / Scientist, Department of Aeronautics and Astronautics, **Massachusetts Institute of Technology**
  Moderated by **Catherine McCullough**, Executive Director, **Intelligent Car Coalition**

12:05 Starting Grid Showcase
  Oryx Vision
  Tome Software

12:20 Networking lunch break and poster sessions

	EMERGING DEVELOPMENTS, CHALLENGES AND OPPORTUNITIES FOR CAMERAS Chaired by **Dr Sven Fleck,** Managing Director, **SmartSurv Vision Systems**	EXPLORING NON-VISUAL SENSORS USE IN ADAS AND AUTONOMOUS DRIVING Chaired by **Alex Epstein,** Senior Director, Digital Strategy & Content, **National Safety Council**
1:40	Near-Infrared QE Enhancing Technology for Automotive Applications • Why is near infrared sensitivity important in automotive machine vision applications?	The future of automotive radar • Why is a radar needed in a self-driving car? Camera vs. Lidar vs. Radar • History of automotive radar – where do we stand today?

	• Combining thicker EPI, deep trench isolation and surface scattering to improve quantum efficiency, in CMOS image sensors, while still retaining excellent spatial resolution. • Improving the performance of CMOS image sensors for in cabin monitoring and external night time imaging. **Dr Boyd Fowler,** CTO, **OmniVision**	• Vision of the future of automotive radar • The grand roadmap for radars **Kishore Ramaiah,** Product Manager Radar and Analytics processor group, **Texas Instruments**
2:05	Challenges, opportunities and deep learning for thermal cameras in ADAS and autonomous vehicle applications • Deep learning analytic techniques including full scene segmentation, an AI technique that enables ADAS developers to create full scene classification of every pixel in the thermal image. **Mike Walters,** Vice President of Product Management for Uncooled Thermal Cameras, **FLIR**	Moving from legacy LiDAR to Next Generation iDAR • How can OEMs and Tier 1s leverage iDAR to not just capture a scene, but to dynamically perceive it? • Learn how iDAR optimizes data collection, allowing for situational configurability at the hardware level that enables the system to emulate legacy systems, define regions of interest, focus on threat detection and/or be programmed for variable environments. • Learn how this type of configurability will optimize data collection, reduce bandwidth, improve vision perception and intelligence, and speed up motion planning for autonomous vehicles. **Dr Barry Behnken,** VP of Engineering, **AEye**
2:30	The emerging field of free-form optics in cameras, and its use in automotive • Overview of the different types of free-form lenses. • Discussion of possible use-cases that represent the most visible benefits to the automotive industry: 2D vision, 3D depth sensing, low light situations, targeted field-of-view, adaptive headlamps, off-axis cameras and heads-up displays. • Powerful design, manufacturing and image quality testing software enabling free-form optics to be used and manufactured by all. **Li Han Chan,** CEO, **DynaOptics**	Enhanced Time-Of-Flight – a CMOS full solution for automotive LIDAR • The need for a real 3D solid state lidar solution to overcome challenges associated with lidar. • Enabling very wide dynamic range by means of standard processing tools, to amplify very weak signals to achieve high SNR and accurately detect objects with high resolution at long range. • Eliminating blinding by mitigating or blocking background sunlight, random light from sources in other cars, and secondary reflections. • Enabling very precise timing of the transmitted and received pulses, essential to obtain the desired overall performance.

CONFERENCE AGENDA
Detroit 2018 Edition
May 15-17, Michigan Science Center

		Nadav Haas, Product Manager, **Newsight Imaging**	
2:55	Panel discussion: how many cameras are enough? - Can we make sensors a cool feature not an ugly bolt-on? - How can we make ADAS features sexy? - Do we need to change perspectives on safety? - Can we learn from elsewhere, where safety sells? **Tom Toma,** Global Product Manager, **Magna Electronics** **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems** **Dr. Mohannad Murad,** Viewing systems Feature owner, **General Motors** and Adjunct Professor, **University of Detroit Mercy**		Panel discussion: do we have a lidar bubble? - Do we even need lidar in AV? - Which is the right combo; lidar + cornering radar or no lidar just radar + camera? - How many sensors are the minimum for autonomous driving - Are image sensors and cameras fit for autonomous driving? **Abhay Rai,** Head of Automotive Sensor Marketing, **Sony Electronics** **Angus Pacala,** CEO and Co-Founder, **Ouster** **Daniel Lopez Madrid,** Self Driving Car Engineer, **Jaguar Landrover**	
	3:25 Networking refreshment break		
	IMAGE QUALITY AND KPIS FOR VEHICLE PERCEPTION Chaired by **Robert Stead,** Managing Director, **Sense Media Group**		**LOCALIZATION AND MAPPING** Chaired by **Phil Magney,** Founder and Principal Advisor, **VSI**
4:15	Progress with P2020 – developing standards for automotive camera systems - Overview of the working group activity - Why P2020 is so important in the effort to improve road safety - Progress update – White Paper publication and Detroit meeting summary - Why you need to be involved **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**		Precision Localization: Methods for Map Based-Localization - Learn about the methods used for precision localization for automated vehicles. - What are the different methods, what types of sensors are necessary, how much computing power is required? - Dig into the different ways in which you can localize against a precision map such as image-based, scene-based, point cloud-based or RTK-based - Results from VSI's experiments conducted on its AV research vehicles. **Phil Magney,** Founder and Principal Advisor, **VSI**
4:40	A review of relevant existing IQ challenges **Uwe Artmann,** Partner and CTO, **Image Engineering**		High precision GNSS as a critical component of ADAS and Automated Driving - Complimentary to relative localization sensors - Improves availability of localization

		• Recent breakthroughs in cost and performance enabling new applications **Joel Gibson,** Vice President of Automotive, **Swift Navigation**
5:05	Addressing LED flicker • Definition, root cause and manifestations of LED flicker • Impact of LED flicker for viewing and machine vision applications • Initial proposals for test setup and KPIs, as defined by P2020 working group • Preliminary benchmarking results from a number of cameras **Brian Deegan**, Senior Expert Image Quality, **Valeo**	Disrupting autonomous vehicle mapping and localization with economical, scalable and precise 'fingerprint' technology • How proprietary 'fingerprint' technology will surmount challenges related to map data processing, storage requirements, power consumption, cost of hardware, bandwidth usage. • How this approach to autonomous driving eliminates the need for armies of engineers and fleets of survey vehicles. • Data points that demonstrate the advantages fingerprint technology provides. • Learning how these innovative approaches to autonomous vehicle mapping and localization have the potential to revolutionize an area that companies typically spend hundreds of millions of dollars on. **Sravan Puttagunta,** CEO and Co-Founder, **Civil Maps**
5:30	CDP – contrast detection probability • Exploring the KPI problem in image quality and system performance • Introducing CDP: A methodology for sensor performance prediction by a probabilistic approach, on the basis of significant critical use cases • As a result, the requirement engineering along the effect chain especially for safety relevant processes appears transparent and understandable • Showing specific examples from the field of image quality, including CDP challenges known KPIs such as SNR and MTF especially with respect their effects on automotive use cases	Application of deep learning in parking sign detection from street-level imagery • Toward facilitating the parking in dense cities • Evaluation of the application of state of the art deep learning models for parking signs recognition from street-level imagery aimed at facilitating the parking in dense cities. • Discussion of building a tool for parking sign localization. • Presentation of experimental results with high accuracy demonstrate the potential of leveraging street-level images using deep learning models and provide a viable solution for digitizing at scale all parking signs to help drivers understand parking rules and avoid fines. **Qazaleh Mirsharif,** Machine Learning Scientist, Computer Vision, **Figure Eight**

	Dr Marc Geese, Chassis Systems Control, Next Generation Video & Imaging Chain, **Robert Bosch GmbH**	
	5:55 Closing remarks and depart for networking drinks reception at HopCat	

Thursday May 17 - Conference Day 2

08:00   Arm Breakfast Briefing - Arm invite you to attend their hosted breakfast on the morning of Thursday May 17th, to discuss what it takes to bring autonomous vehicles to mass deployment. Attendees will enjoy a seated buffet breakfast and the chance to fit in some early networking, prior to the morning conference sessions.

	CHALLENGES AND OPPORTUNITIES FOR SENSORS IN THE SELF-DRIVING ECO-SYSTEM	EXPLORING TRAINING DATA FOR AVS
09:00	Opening remarks from Chair **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**	Opening remarks from Chair **Dr Goksel Dedeoglu,** Founder and Lab Director, **PercepTonic**
09:10	All-weather vision for automotive safety: which spectral band? • The AWARE (All Weather All Roads Enhanced vision) French public funded project is aiming at the development of a low-cost sensor fitting to automotive requirements, and enabling a vision in all poor visibility conditions. • Evaluation of the relevance of four different spectral bands: Visible RGB, Visible RGB Near-Infrared (NIR) extended, Short-Wave Infrared (SWIR) and Long-Wave Infrared (LWIR).	How Autonomous driving gets safer when deep learning is combined with a vision geometric • The vision geometric approach is an approach or a more direct method to detect objects and verify the results of deep learning object detection • Offering a set of closed form methods that offer a significant computational advantage with respect to almost all deep learning methods across a wide range of tasks.

	- Outcome of two test campaigns in outdoor natural conditions and in artificial fog tunnel, with four cameras recording simultaneously. - Presentation of the detailed results of this comparative study, focusing on pedestrians, vehicles, traffic signs and lanes detection. **Emmanuel Bercier,** Strategic Marketing, **ULIS,** Project Manager, **AWARE**	How autonomous driving gets safer, computations get cheaper, and the KPIs increased when modern deep learning is combined with the "classical" vision geometric approach. **Thusitha Parakrama,** Senior Manager – Advanced Technologies Camera Systems, **Hyundai Mobis**
09:35	Automotive Sensor Design Enablement; a discussion of multiple design enablement tools/IP to achieve smart Lidar - Demands of advanced automotive sensors, driving design of silicon photonics, MEMS, uW/RF, advanced node SoC, and advanced SiP. - Examining design enablement requirements for automotive sensors that utilize advanced design fabrics, and their integration. **Ian Dennison,** Senior Group Director, Custom IC and PCB Group, **Cadence Design Systems**	Accuracy of Deep Neural Networks for Vehicle Detection - In this session, we'll highlight learnings from Mighty AI's research into the accuracy of several state of the art deep learning models at the pixel-level, as measured against a highly accurate, human-annotated ground truth dataset, and share insights for how others can apply these lessons to their own model development. - We measured intersection over union (IoU) and pixel-level accuracy of five popular detection models on one of our datasets and compared them to human annotations. - In addition, we evaluated the robustness of the models against image noise and removal of color information. **Bernd Heisele,** Principle Computer Vision Engineer, **MightyAI**
10:00	Role of Specialty Analog Foundry in Enabling Advanced Driver Assistance Systems (ADAS) and Autonomous Driving - Driving improvements in device level figures of merit to meet the technical requirements of key ADAS sensors such as automotive radar, LiDAR and camera systems. - Optimizing the Rdson vs breakdown voltage to enable higher bus voltages of the future hybrid/EV systems. - Presenting an overview of advanced design enablement and design services capabilities required for designers to build robust products: design it once, design it right. **Dr. Amol Kalburge,** Head of Automotive Program, **TowerJazz**	LiDAR training data best practices - Accurate LiDAR classification and segmentation is required for developing critical ADAS & Autonomous Vehicles components. - Mainly, its required for high definition mapping and developing perception and path/motion planning algorithms. - Understanding best practices for how to accurately annotate and benchmark your AV/ADAS models against LiDAR ground truth training data. **Mohammad Musa,** Founder, **Deepen AI**

CONFERENCE AGENDA
Detroit 2018 Edition
May 15-17, Michigan Science Center

	10:25 Networking refreshment break and poster session	
	VALIDATION, TESTING AND SIMULATION Chaired by **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**	**DEEP LEARNING FOR AUTONOMOUS DRIVING** Chaired by **Dr Goksel Dedeoglu,** Founder and Lab Director, **PercepTonic**
11:10	Driving Blind: Understanding Real-World Imaging Scenarios that Severely Challenge ADAS/Autonomous Vision Systems • Review of the difficult use cases that hamper effective ADAS for drivers and cause autonomous vision systems to fail. • Discussion of various scenarios and the key reasons for failure. • Industry initiatives tackling these challenges, such as IEEE P2020. • Explanation of novel technical approaches for mitigating the issues. **Dave Tokic,** VP Marketing & Strategic Partnerships and **Felix Heide,** CTO, **Algolux**	Deep Learning Research in Safe Transition to the Future of Mobility • Focusing on the challenges and opportunities of autonomous vehicle technologies over the next decade. • Using deep learning to better understand vehicle's/driver's interaction with road users to better design interaction of automated vehicles with pedestrians/bicyclists, etc. • Deep learning is applied to analyze pedestrian's different physical aspects to better understand what their potential intent is in an intersection location. • Using deep learning to recognize the driving environment to help enhance the performance of object recognition and tracking for autonomous vehicles in a complex driving environment. **Rini Sherony,** Sr. Principal Engineer, **Collaborative Safety Research Center (CSRC), Toyota Motor North America**
11:35	Latest Technologies in Testing Automated Vehicles • "From the Lab to the Street: Solving the Challenge of Accelerating Automated Vehicle Testing" • Improving the relevance of simulation scenarios. **Dr Ding Zhao,** Assistant Research Scientist, **University of Michigan**	Security and Safety challenges in Deep Learning for Autonomous Driving • Applications of Deep Neural Networks (DNNs) in Autonomous Driving • Security and safety challenges resulting from DNNs • How to improve safety and security of DNNs for autonomous driving? **Suman Jana,** Assistant Professor, **Department of Computer Science, Columbia University**
12:00	Detailed Physics Based Sensor Simulation Approaches • Obtaining "raw" simulation data for development of automated vehicles will provide the ability to test and train faster than real time with substantially less cost.	Perception Systems for Autonomous Vehicles using Efficient Deep Neural Networks • How Deep Neural Networks (DNNs) for vision and perception are enabling safer autonomous driving

	- Introduction of advanced physics based sensor models, including Camera, Radar and V2X. - Showing how these models can be used to produce ROC (Receiver Operating Characteristic) curves and other measures of detection and estimation system performance. - Explaining their use in training or testing Artificial Intelligence Algorithms and systems. **Tony Gioutsos,** Director Sales and Marketing, **Tass International**	- The importance and challenges of developing efficient DNNs for automotive embedded systems - Building towards full autonomy by using DNNs to address immediate opportunities in driver-assistance **Forrest Iandola,** CEO, **Deepscale**
12:25	Hardware-in-the-Loop (HIL) Implementation and Validation of SAE Level 2 Autonomous Vehicle with Subsystem Fault Tolerant Fallback Performance for Takeover Scenarios - Due to the disadvantages of vehicle testing being expensive, time-consuming and hazardous for testing such scenarios, an alternative method of development and validation of autonomous vehicles is required. - This research presents a real-time powertrain-based Hardware-in-the-Loop (HIL) implementation and validation of an SAE Level 2 autonomous vehicle and the study of its the performance via simulations during takeover scenarios due to subsystem faults. - An acceleration-based Adaptive Cruise Control (ACC) was combined with a path-following lateral control along with supervisory control for system mode transitions due to system deactivations and faults. **Adit Joshi,** Research Engineer, Automated Driving HIL Simulation, **Ford Motor Company**	The need for a scalable camera platform for NCAP and automated driving. - Market evolution from ADAS toward AD: Vision the key technology - Safety & security, no compromise allowed - Balancing performance & power requires heterogeneous computing architectures - Why open platforms accelerate time to market from prototype to volume production - All Systems Go – implementation in real cars **John Buszek,** Director – ADAS and Autonomous Driving Systems, **Renesas**

12:50   Networking lunch break

Closing plenary

CONFERENCE AGENDA
Detroit 2018 Edition
May 15-17, Michigan Science Center

1:55   Welcome back from Chairs
Robert Stead, Managing Director, **Sense Media Group** and **Prof Patrick Denny,** Senior Expert, **Valeo Vision Systems**

2:00   Regulatory landscape for autonomous driving and testing in the US
- Who's Who in the Regulatory AV Space
- Federal AV Legislation
- State AV Legislation

David Strickland, Partner, **Venable LLP**

2:25   Insights from the NWAPW Student Program
Steve Edelman and Dr Pittman, NWAPW

2:40   Global M&A in the ADAS and Autonomous technology space
Rudy Burger, Managing Partner, **Woodside Capital Partners**

3:10   The New Triad: People, Robots, and Infrastructure
Using examples from past, present, and future, this talk connects emerging scenarios, introduces new technologies to address the problems they raise, and offers a new vision of autonomy that connects people, robots, and infrastructure at scale. Lacking such novel approaches, the arrival of autonomous cars and other vehicles may continue to be postponed.
David Mindell, Co-Founder, CEO and Board Chair, **Humatics Corporation**

3:40   Closing remarks

3:45   Close of conference