



AutoSens

CONFERENCE AGENDA

Detroit 2019 Edition

May 14-16, Michigan Science Center

AutoSensLEARN Tutorial Day - Tuesday May 14

Morning workshops* 9:15 – 12:45:

1) Infrared Camera Sensing for ADAS and Driverless Vehicles: Applications, Challenges and Design Considerations
Led by **Rajeev Thakur**, Regional Marketing Manager, **OSRAM Opto Semiconductors**
Chrysler Science Stage

2) Survey of Enabling Technologies for Automated Driving
Led by **Forrest Iandola**, CEO, **DeepScale**
Toyota Engineering Theater

Afternoon workshops* 2:00 – 5:30:

3) Material interactions for autonomous sensor applications
Led by **Jim Howard**, Software Research Specialist, and **Jonah Shaver**, Optical Technologist, **3M**
Toyota Engineering Theater

4) A ROS tutorial
Led by **Divya Argawal**, Staff Software Engineer, **NIO**
Chrysler Science Stage

*The above workshops are accessible with an AutoSensLEARN ticket only

5:45 Sponsored round table sessions, including discussions led by **Siemens, Ouster and AEye**

AutoSens Main Conference Day 1 – Wednesday May 15

IMAX THEATER Opening plenary

8:55 Opening remarks from Chairs
Robert Stead, Managing Director, **Sense Media**
Prof Patrick Denny, Senior Expert, **Valeo Vision Systems**

9:10 The effectiveness of existing deployed ADAS explained in numbers
Matt Moore, Senior VP, Highway Loss Data Institute, **IIHS**

9:40 Keynote: The Future Car Impact on our Future Lives
Over the past two to three years, we have seen the topic of autonomous cars go from a novelty to a popular topic at parties to a consistent part of our daily conversation and news feeds. During this time, we've had the opportunity to interview experts working on 3D printed autonomous shuttles, electro-mobility, mobility as a service, flying cars, the technology impact on distracted driving, intelligent traffic systems and autonomous driving platforms and simulations.
The result is a multifaceted perspective on issues faced by the transportation industry as it prepares for the future. The insights gained in these conversations are used in this presentation to explore what engineering challenges must be overcome for the vision of the future car to become a day-to-day reality, and the subsequent changes to our lives.
Ed Bernardon, Vice President Strategic Automotive Initiatives, **Siemens**



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10:00 Fireside Chat - The engineers tell us that autonomous driving is still at the research stage. The product managers tell us that robo-taxis are launching this year. Can both of these be true? What is the short- and long-term future for mobility with this in mind?

Danil Prokhorov, Department Head, Toyota R&D, **Toyota Motor Corporation**

Marcus Welz, President, Intelligent Traffic Systems, **Siemens Mobility Inc.**; President & CEO, **Bytemark Inc.**

Prof. Edward Olson, CEO, **May Mobility**

Moderated by **Kirsten Korosec**, Journalist, **TechCrunch**

10:45 *Networking break*

	IMAX THEATER	TOYOTA ENGINEERING THEATER
	In-Cabin Monitoring and Human Factors Chaired by Sven Fleck , Managing Director, SmartSURV	Exploring non-visual sensors use in ADAS and Autonomous Driving Chaired by Rudy Burger , Manager Partner, Woodside Capital Partners
11:35	Keeping eyes on the passengers - developing an in-cabin omni-sensor <ul style="list-style-type: none"> The importance of in-cabin monitoring today and, in the future An omni-sensor solution Building a machine learning based device Dr Guy Raz , CTO, Guardian Optical Technologies	Automotive Radar performance in adverse weather: 10 years of discoveries and future opportunities Daniel Flores Tapia , Staff Radar Engineer, Cruise
12:00	Transfer of Control: The need for human machine collaboration and intelligent driver sensing <ul style="list-style-type: none"> Challenges in driver distraction and the need for intelligent driver sensing Building human machine cognitive systems that build a holistic model of environment scene and driver Case study of a proposed method where we used eye-tracking metrics such as gaze density, cognitive state and AV environment perception input to predict driver takeover readiness Explore deep learning approaches to better understand the context of 	The FIR Revolution: How FIR Technology Will Bring Level 3 and Above Autonomous Vehicles to the Mass Market This presentation will assess technical advantages of FIR such as resolution, invariant images for lighting conditions, and the use of long-wave IR. FIR performs how it should even in inclement weather, because it uses long waves. Discussion of these advantages and others will highlight the use cases in which FIR and CMOS camera could be used in a fusion solution to deliver complete sensing capabilities needed to achieve Level 3 and above autonomy, at mass market prices.



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	<p>human behavior in scenarios before and during take over. Nandita Mangal, Product Lead, Aptiv</p>	<p>Yakov Shaharabani, CEO, Adasky</p>
12:25	<p>MBUX Interior Assistant – The first step towards an intelligent interior Mercedes-Benz follows the vision of an intelligent interior, which detects the body language of the occupants and supports them by automating comfort functions. The MBUX Interior Assistant is the first step towards this vision, based on cutting edge 3D sensing and AI vision processing. The MBUX Interior Assistant features global proximity detection, can distinguish between driver and passenger operation and provides a new and intuitive light control. It establishes a new category of in-cabin user experience. Volker Entenmann, Senior Manager, UI Functions, Digital Vehicle & Mobility, Daimler AG - Mercedes-Benz Cars</p>	<p>The Future of Driving: Enhancing Safety on the Road with Thermal Sensors</p> <ul style="list-style-type: none"> • Thermal imaging capabilities and in relation to other radars available for automobiles • Thermal sensors' role and optimization in autonomous vehicles • Real-life use cases and examples of thermal sensors impacting the safety of autonomous vehicles <p>Tim LeBeau, CCO, Seek Thermal</p>
12:50	Networking lunch break	
	<p>Camera Design and Image Quality Challenges in Automotive Chaired by Prof Patrick Denny, Senior Expert, Valeo Vision Systems</p>	<p>Considerations for LiDAR in Automotive Chaired by Rudy Burger, Manager Partner, Woodside Capital Partners</p>
2:05	<p>RGB-IR Sensors for In-Cabin Automotive Applications Our RGB-IR technology consists of both optical filtering and image signal processing enabling cameras to capture color and near infra-red images simultaneously, using a dual passband optical filter. We describe the sensor construction including the on-chip color filter array and the on-chip near infra-red pass filters. In addition, we describe the image signal processing and algorithms necessary to render high quality color images from the sensor.</p>	<p>Robust Inexpensive Frequency Domain LiDAR using Hamiltonian Coding Frequency domain LiDAR systems such as the Photonic Mixer Devices employed in Microsoft's Kinect 2 gaming controller offer an inexpensive method of 3D LiDAR sensing without moving parts. However, due to their sensitivity to ambient light and limited range, frequency domain sensors have largely been limited to indoor applications. Hamiltonian Coding is a way to boost the signal to noise ratio of frequency domain sensors by an order of magnitude or more, opening up various applications in Automotive Sensing.</p>



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	<p>Boyd Fowler, CTO, OmniVision Technologies</p>	<p>Prof. Andreas Velten, Director, Computational Optics Group, University of Wisconsin-Madison</p>
2:30	<p>Progress with P2020 – developing standards for automotive camera systems</p> <ul style="list-style-type: none"> • Overview of the working group activity • Why P2020 is so important in the effort to improve road safety • Progress update – White Paper publication and Brussels meeting summary • Why you need to be involved <p>Prof. Robin Jenkin, Principal Image Quality Engineer, NVIDIA</p>	<p>The Next Generation of SPAD Arrays for Automotive LiDAR</p> <p>This presentation will focus on the various techniques for LiDAR system design using SPAD arrays and review the technical characteristics and market landscape for this exciting new technology.</p> <p>Wade Appelman, VP Lidar Technology, ON Semiconductor</p>
2:55	<p>Contrast Detection Probability – A new P2020 KPI for System and Component Level Image Quality</p> <p>Robert Sumner, Lead Engineer, Imaging Science, Imatest</p>	<p>What’s in Your Stack? Why Lidar Modulation Should Matter to Every Engineer</p> <p>This session will outline the differences between amplitude modulated pulsed-based lidar systems and frequency modulated (FM) continuous wave lidar systems. Specifically, he’ll discuss the importance of measuring both range and velocity, and the challenges faced by environmental and solar interference. He’ll also touch on the subtleties of range-Doppler ambiguity and why not all 1550 nm lidar are created equal.</p> <p>Bill Paulus, VP of Manufacturing, Blackmore Sensors and Analytics, Inc.</p>
3:20	<p>Addressing LED flicker</p> <ul style="list-style-type: none"> • Updates on test procedures, KPIs • Preliminary results from Psychophysics study (relating subjective and objective experience of flicker) • Update on phase study • LED flicker white paper update <p>Brian Deegan, Senior Expert, Valeo Vision Systems</p>	<p>From Camera to LiDAR systems alignment and testing in mass production of ADAS Sensors</p> <ul style="list-style-type: none"> • How industry proven procedures, algorithms and equipment from camera alignment and testing can be transferred to production systems for LiDAR applications • Measurement principles for evaluation of laser beam contrast modulation and intensity profile pattern using real life examples • Active and passive alignment procedures for LiDAR systems (sender and receiver modules)



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		Dr Dirk Seebaum , Business Unit Manager Automation, Trioptics GmbH
3:45	Networking refreshment break and poster presentations	
	Camera Design and Image Quality Challenges in Automotive Chaired by Prof Patrick Denny , Senior Expert, Valeo Vision Systems	Mapping and Localization Chaired by Phil Magney , Principal, VSI Labs
4:35	<p>The influence of colour filter pattern and its arrangement on resolution and colour reproducibility Especially low light performance is becoming more and more important for achieving beyond human eye capability. The image sensor has been evolved as a part of viewing camera and many sensors adopt 3-color filter pattern said “Bayer”. Another pattern is used for a recent automotive sensor. In this presentation, we will discuss the influence of colour filter pattern and its arrangement on resolution and colour reproducibility.</p> <p>Tsuyoshi Hara, Solution Architect, Sony</p>	<p>Rapid fire session, presentations from:</p> <p>Combining Sensor Observations with Streaming HD Maps for Robust AD Frans de Rooij, Regional Director Product Management, TomTom Autonomous Driving</p> <p>HD Live Maps for Automated Driving: An AI Approach Xin Chen, Director of Engineering, HERE</p> <p>AV Maps: How High is High-Def, How Real is Real-Time? Ethan Sorrelgreen, Chief Product Officer, CAMERA</p>
5:00	<p>Highly Efficient Autonomous Driving with MIPI Camera Interfaces</p> <ul style="list-style-type: none"> • MIPI CSI-2 protocols’ latest features and key technical advantages, providing a fast and power-efficient interface between camera sensors and host devices in automotive functional-safety ADAS SoCs • Different use-cases and implementations of the MIPI camera interface solutions in automotive applications • Importance of using automotive-grade IP to accelerate SoC-level ISO 26262 certification and meet stringent automotive standards • MIPI’s new automotive protocol for ADAS and surround sensor applications <p>Hezi Saar, Sr. Staff Product Marketing Manager, Synopsys</p>	<p>Autonomous Vehicle Navigation in Snow Using Ground Penetrating Radar Byron Stanley, Co-Founder and CTO, WaveSense</p>



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5:25	<p>Panel discussion: How can road design and markings, as well as maintenance, be optimised for the various sensor modalities?</p> <p>Ane Dalsnes Storsæter, Senior Engineer, Statens Vegvesen - Norwegian Public Roads Administration</p> <p>Abhay Rai, VP of Product Marketing, Visteon Corporation</p> <p>Moderated by Robert Stead, Managing Director, Sense Media Group</p>	<p>Panel discussion: What role will mapping play as move towards full autonomy? Researchers expect that self-driving cars could eventually become less dependent on maps, as Lidar sensors improve enough to allow them to navigate their environment. What will their role be in the future? Will this/should this influence their development now?</p> <p>Introduced by Phil Magney, Principal, VSI Labs</p>
6:00	All delegates are invited to an evening reception at HopCat from 6pm, sponsored by Siemens PLM Software	



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AutoSens Main Conference Day 2 – Thursday May 16

	IMAX THEATER	TOYOTA ENGINEERING THEATER
	Image Processing and Computer Vision Chaired by Sven Fleck , Managing Director, SmartSURV	Challenges and opportunities for sensors in the autonomous vehicle eco-system Chaired by Phil Magney , Principal, VSI Labs
8:50	Opening remarks from Chair	Opening remarks from Chair
9:00	Tuning image processing pipes (ISP) for automotive use Manjunath Somayaji , Director of Imaging R&D, GEOSemiconductor	Avoid, Mitigate, Correct: Ways to Lift Envirofencing in Extreme Climate Conditions The physical surface of certain sensors like cameras and LiDAR are literally the top of the data funnel. When this funnel is blocked by challenging environmental conditions like bugs, mud, snow, freezing rain, salt, road tar or dirt, data input is reduced or completely disabled. Current R&D efforts on autonomous driving systems are primarily limited to near-ideal climates where vehicles are not only geofenced but also “envirofenced” to avoid the funnel blockage that happens when hardware perception surfaces are occluded. Diane Lansinger , Founder and CEO, SEEVA Technologies
9:25	ISP optimization for ML/CV automotive applications This presentation describes how ISP can be optimised for automotive ML/CV applications on algorithmic level. Why we need ISP in the first place and what kind of advantages it is going to provide for autonomous driving systems. What exactly is different in processing for human and computer vision, which stages are required and to which level of complexity. Alexis Lluis Gomez , Director ISP Algorithms & Image Quality, ARM	Computational imaging through occlusions; seeing through fog <ul style="list-style-type: none"> • What is computational imaging? • Imaging through occlusions with visible light. • Seeing through extremely dense fog as if the fog were not there. • Challenges and prospects of computational imaging for autonomous vehicles. Guy Satat , Researcher, MIT
9:50	Edge Intelligence: Edge Computing in the AI Era Weisong Shi , Director of the CAR Lab, Wayne State University	V2X Collaborative Environmental Perception This presentation covers Changan’s implementation of a collaborative environmental perception system. The system combines V2X communication with several sensing devices: GPS, DSRC, and forward-looking camera. We present the



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		<p>concept implementation with four well known cooperative safety applications: EEBL, IMA, BSW and LTA. Our results demonstrate that collaborative perception may indeed enhance perceived V2X market penetration. This conclusion is supported by comparing application performance using collaborative perception data with pure DSRC data. Even with a government mandate, it will take many years before enough vehicles have V2X devices on-board. This technology has the potential to enhance V2X market penetration, which will enable all its safety benefits.</p> <p>Dr Radovan Miucic, Technical Fellow, Changan US R&D Center</p>
10:15	<p>Computer Vision and Machine Learning for Large Scale Video Corpus Maintenance and Curation</p> <p>This talk will describe methods and a system for managing large video-based datasets for use in automotive development. Modern use cases in AV and ADAS development involve vast repositories of data, often dominated by video data. Engineering, research and QA teams need to effectively sift through the repositories to curate usable datasets that contain certain phenomena, both types of objects as well as temporal events. Doing this manually is cost and time prohibitive. This talk will present a system for doing this semi-automatically using modern computer vision and machine learning methods to help speed up and increase the robustness of the process. I will also discuss best practices in curating such mission critical focused data sets.</p> <p>Jason Corso, Associate Professor EECS, University of Michigan, Founder, Voxel51</p>	<p>A Perspective on Sensor and Perception System for Self-Driving Trucks</p> <p>Sharing the sensor and perception system design philosophy for L4 semi-trucks that operate in high-speed and complex scenario as well as perform delicate maneuvers. The unique requirements for self-driving trucks and differences between passenger vehicles will be explored in details. Zehua will present how TuSimple overcomes these challenges by developing a camera-centric perception system with the industry-leading performance. Zehua will also discuss how the overall self-driving system will be benefited from this perception design.</p> <p>Zehua Huang, Partner and Vice President of Engineering, TuSimple</p>
10:40	Networking refreshment break and poster presentations	
	Deep Learning and AI in the Automotive Ecosystem	Validation, Simulation and Testing Chaired by Benjamin May , CEO, AMX13



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	<p>Chaired by Dr. Goksel Dedeoglu, Founder and Lab Director, PercepTonic</p>	
11:25	<p>Ensuring safe AI in a car This talk is about the practical engineering challenges of turning deep learning, classical machine vision and sensor fusion algorithms from research prototypes into real-world automotive-grade systems. Codeplay is working hard in standards bodies and with industrial partners to deliver automotive-grade, safe, high performance AI software development tools. Michael Wong, VP R&D, Codeplay Software</p>	<p>What do we need to do to Trust AVs on our roads? Revolutionary Approaches to Building Simulated Cities for Training AVs</p> <ul style="list-style-type: none"> • How procedural technology can work to enhance simulated training environments • How to drive more revenue by multiplying the number of miles being simulated each week • How to clear the bottleneck of manually constructed environments • How to improve the simulation stack with real-world map data, procedural growth algorithms and generative models that can create even better virtual environments to serve the industry <p>Kevin McNamara, CEO, Parallel Domain</p>
11:50	<p>Human behavior prediction AI for next-generation ADAS and fully autonomous driving</p> <ul style="list-style-type: none"> • What is human behavior prediction and why does it matter? • Current technical approaches to human behavior prediction • Differentiated technical approach to human behavior prediction • Integration with Level 1-3 (ADAS) and full autonomous systems (Level 4-5) <p>Sid Misra, Co-Founder and CEO, Perceptive Automata</p>	<p>Pre-Silicon Verification for Autonomous Vehicles</p> <ul style="list-style-type: none"> • Pre-silicon algorithm development with virtual hardware in the loop testing of driving scenarios with high-fidelity sensing and vehicle dynamics • Bridging semiconductor and system design <p>David Fritz, Global Automotive Technology Manager, Mentor, a Siemens Business</p>
12:15	<p>Taming the Data Tsunami</p> <ul style="list-style-type: none"> • Understand the Herculean task we're currently asking of central processors in autonomous vehicles. • How do traditional LiDAR sensors collect information? • How distributed edge-processing brings intelligence down the stack, enabling much faster perception. 	<p>Challenges of synthetic scenario generation for ADAS development</p> <ul style="list-style-type: none"> • What are simulations and why do we strongly need them? • What are the automotive companies' requirements? • Simulations for KPIs checks, HiL and SiL • Test and Validation with simulations and how do they influence real scenario test cases



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	<ul style="list-style-type: none"> • What new types of intelligence and perception are possible when processing resources are freed up. <p>Dr Barry Behnken, Co-Founder and SVP of Engineering, AEye</p>	<p>Dr. Florian Baumann, CTO Automotive, Dell EMC</p>
12:40	<p>Realtime Deep Learning for Self-Driving Cars: Making the Mass Production of AVs Feasible</p> <ul style="list-style-type: none"> • While deep learning was originally designed for powerful processors (e.g., NVIDIA GPUs), efficient processors must be used in order to apply deep learning on the edge, which is crucial for self-driving cars. • Limitations of software optimization, algorithm optimization, and post processing • Running accurate deep learning algorithms on low power processors to significantly reduce cost and improve accuracy on powerful processors <p>Dr. Amir Alush, Co-Founder and Chief Technology Officer, Brodmann17</p>	<p>Accelerating Time to Market Responsibly with Simulation Testing</p> <ul style="list-style-type: none"> • Public and regulatory confidence • Compliance and performance-oriented standards • Delivering objective, repeatable, and transparent testing • Measuring progress and safety <p>Heikki Laine, VP Product & Marketing, Cognata</p>
1:05	Networking lunch break	

IMAX THEATER Closing plenary

- 2:15** Discussion session: Regulatory landscape for autonomous driving and testing in the US
Gail Gottehrer, Founder, **Law Office of Gail Gottehrer LLC**
Bryant Walker Smith, Assistant Professor, School of Law and (by courtesy) School of Engineering, **University of South Carolina**
- 2:55** M&A in the ADAS and AD development market
Rudy Burger, Manager Partner, **Woodside Capital Partners**
- 3:20** PANEL: What will China's impact be on the US autonomous vehicle market?
Bill Russo, Founder & CEO, **Automobility Ltd**
Wesley Shao, Director, Autonomous Driving, **BYTON**
Rudy Burger, Manager Partner, **Woodside Capital Partners**
Moderated by **Lance Elliott**, CEO, **Techbrium**
- 4:05** Closing remarks and close of conference