Sample Problem Statements / Challenges for CoE: Automotive (ACES)

1. M/s TATA Motors Limited

Focus Area (ACES)	Problem Statement Details	What is Expected
A	**Optimally combine sensor data -** Autonomous, and ADAS, vehicles require highly accurate sensing, with both low false positive and negative rates. Cost is also a factor, so these requirements cannot generally be achieved with a single type of sensor; multiple types of sensors need to be used together. Joining the sensor outputs together is a challenge which is achieved by using a sensor fusion system, however, the very few solutions available on the market generally fail to combine the sensor streams in a way which accounts for the strengths and weaknesses of the different sensors.	A solution is needed which will fuse the sensor data, whilst also taking into account the different sensing coordinate systems and performance in different environmental conditions. This solution also needs to be efficient enough to run on low powered computational hardware, and be configurable for multiple sensor layouts.
A	**Optimize the computational load placement of radars for cost reduction –** Radar is the key sensor for most ADAS, due to its performance in multiple weather conditions and relatively low price. However, most radars available on the market have a large onboard computational capacity which is not fully utilized, making them expensive for a multi-sensor system.	It is likely cheaper to offload the computational capability (for FFT and object tracking) onto a central compute node whilst keeping the on-radar compute to an absolute minimum. This solution is not available from the usual suppliers, who can only sell higher-priced units, and would require developing unit packaging and software.
A	**Odometer based localization -** A critical requirement for autonomy is localisation: knowing where you are (accurately and in real time). This cannot be done with GPS alone (too unreliable). It can be done with SLAM (Simultaneous Location And Mapping) or with V2X way points, but there are limitations and costs. The lowest cost, most basic localisation tool is odometry – counting wheel rotations from a start position along a known route. ACES vehicles often have step motors where the step count is known, they will have steer-by-wire and so steering angle is also known – with these 2 pieces of information, basic localisation is possible. However, the vehicle behaviour may change with loading, or road surface, or tyre pressure etc.	Can the startup simulate how good odometer based localisation could be – perhaps demonstrate the repeatability of an ACES vehicle following this method. What other (free) vehicle information could improve the accuracy?
A	**Driveable area determination -** With Camera - real time drivable area segmentation in clutter road conditions.	Real time drivable area segmentation in clutter road conditions.
A	**High speed in vehicle network –** In the domain of in-vehicle networks, the demand for connectivity forcing OEMs to look into new network technology that can handle quick, large-volume, high-speed data transmissions to enable effective coordinated control across multiple functional domains in autonomous trucks.	In the domain of in-vehicle networks, the demand for connectivity forcing OEMs to look into new network technology that can handle quick, large-volume, high-speed data transmissions to enable effective coordinated control across multiple functional domains in autonomous trucks.

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A	**Customization of ADAS technologies -** ADAS technologies available with overseas MNC's, OEM's cannot be adopted in as it is condition looking at Indian versatile traffic situations and road infrastructure.	Significant customization is very much important in the perspectives of system trigger speeds and vehicle braking and deceleration targets specially in commercial vehicles.
A	**ADAS virtual validation -** ADAS virtual validation and correlation with actual field test data, automation system development to utilize annotated data on HIL system.	ADAS virtual validation and correlation with actual field test data, automation system development to utilize annotated data on HIL system.
C	**Low light camera image enhancement (Rear view camera) –** Development of Software/Algorithm for image processing	Development of Software/Algorithm for image processing
C	**Optimal usage of Network for data sharing between Telematics and Cloud –** AI based data filtering (Signal signature learning) inside Telematics and sending only anamolies to the cloud	AI based data filtering (Signal signature learning) inside Telematics and sending only anamolies to the cloud
E	**Navigation data extraction –** Navigation data extraction from Google maps. (Traffic status, time, route, gradient, average speed)	Navigation data extraction from Google maps. (Traffic status, time, route, gradient, average speed)

2. M/s. Intel Technology India Pvt. Ltd.

Focus Area (ACES)	Problem Statement Details	What is Expected
A	**Ability for a vehicle in front to monitor and react to collision situations from the rear –** Forward Collision warning systems are the more common once. A front facing camera will monitor the traffic in front and appropriately react/generate warnings for the driver to respond. But if a vehicle that does not have a warning system is on a collision path from the rear, there is nothing I can do. This is where the concept of a rear facing collision warning system is relevant. The need for this has come up more in the commercial truck and buses domains.	A rear facing camera that can monitor vehicles coming toward it and appropriately flag a warning and also enable a way where a warning can be given to the vehicle approaching that can help it take evasive action

3. SAE India

Focus Area (ACES)	Problem Statement Details	What is Expected
E	**Low cost Electrification Components –** Can there be any low-cost inverters, motors, DC-DC Converters and Batteries for Off highway Automotive. Today normally these are sourced from Other countries like China, Taiwan etc.	Can there be any low-cost inverters, motors, DC-DC Converters and Batteries for Off highway Automotive. Today normally these are sourced from Other countries like China, Taiwan etc.

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C	**Low cost Communication Solutions –** There is a great need of connected vehicles when it comes to Automation/Autonomous solutions in Automotive industry.	Can there be a LOW-COST solution for Machine to Machine communication with low operational and maintenance cost for real time communication.
A	**Triggered Image Data logging system –** While collecting data for Vision systems for a vehicle it is always critical task to collect data. While collecting data there is always a need of collecting unique scenarios but most of the time systems keep collecting or logging same or redundant data.	Can there be a solution that can take are of Triggered image acquisition, avoid redundant data based on scenario based, CAN message based or some other events.

4. M/s. MathWorks India

Focus Area (ACES)	Problem Statement Details	What is Expected
S	**Detecting deviations from route based on bike's pings / or even the quality of pings**	Establish reliable connectivity with the cloud
S	**Detecting bike quality in photos taken by users – e.g. damage or missing part**	Compare Bike's pictures with reference images
S	**Analyze sensor time-stamped data for predictive maintenance**	Ensure that the sensor response being logged is within tolerance and latency, and if its not, use the PM algorithm. Predict time to failure
S	**Analyze sensor data for asset security (e.g. tilt and tow sensor)**	Design handshaking mechanics
C/E	**Intelligent battery health monitoring and connected electric vehicles** • Capturing vehicle data and building prognostics related applications • Predictive maintenance of battery systems • Integrating road maps for electric vehicle range prediction and planning charging ecosystem	Capturing vehicle data and building prognostics related applications Predictive maintenance of battery systems Integrating road maps for electric vehicle range prediction and planning charging ecosystem
C	**Verifying and validating the ARAS (Advanced Ride Assist Systems) using virtual vehicle platform**	Self-balancing, Reverse guidance Blind spot detection, Turn assist

5. M/s. Visteon Technical & Services Centre Pvt. Ltd.

Focus Area (ACES)	Problem Statement Details	What is Expected
A	**Automatic Emergency braking and collision avoidance**	
A	**Traffic jam assist for stop and go traffic up to 45 Kmph**	

Note: The start-ups having any innovative idea/solution in ACES domain are encouraged to apply for MOTION / OCP. Sample Reference Problem Statements are given above.