Leveraging Computer Vision for ADAS and Autonomous Driving

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Challenge: What Can You Do With a Camera & a Control System?
Challenges Developing Camera Based ADAS Systems

**Vision**
- Time to develop new functionality
- Testing algorithm with other vehicle sensor data and controls

**Control**
- Black-box vision systems
- Simulation and closed loop testing
Computer Vision for ADAS Architecture

- **Detection / Classification**
  - Is object visible in every frame?
  - Is the size of object changing?
  - Is the object moving?

- **Tracking**
  - What is the size of object in meters?
  - How fast is it moving?

- **Size / Distance Estimation**
  - What is the speed of vehicle, yaw rate etc.
  - Is my RADAR sensor seeing the same thing?
Computer Vision for ADAS Architecture

Detection / Classification ➔ Tracking ➔ Size/Distance Estimation ➔ Sensor Fusion

Target Track and Location

Range to Target (m)

X Distance (m)

4.38 meters
Why use MathWorks Tools for Vision-based ADAS

- **Vision Engineers**
  - Save time developing new algorithms
  - Use Simulink to integrate and test with control systems
  - Reduce software development costs

- **Controls Engineers**
  - Vision systems don’t have to be black boxes
  - Easily create low-fidelity vision algorithms to prototype control systems
Vision System Design for ADAS

- Simplify time consuming workflows

- Broad algorithm coverage
  - Object detection, recognition and tracking

- 3D vision and point cloud processing

- Frameworks to create object detectors
  - E.g. Pedestrian detector, traffic signs
Thank You