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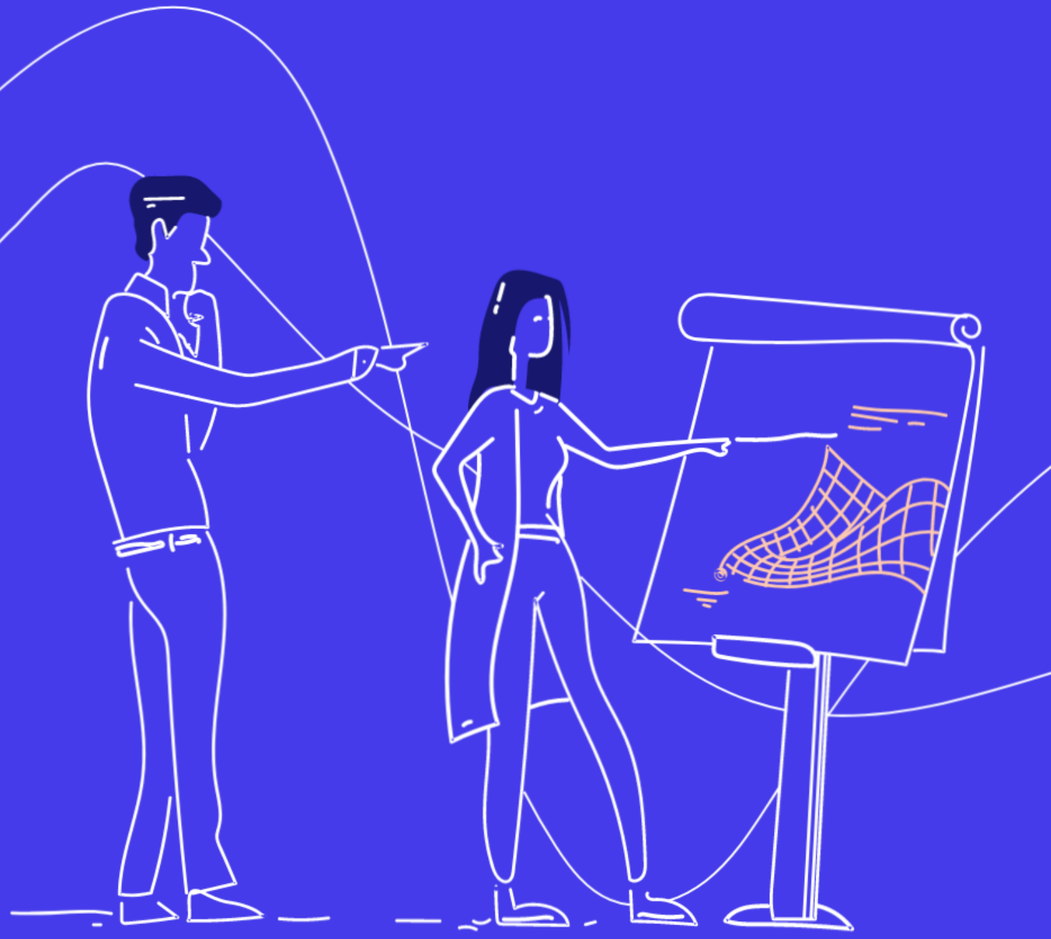
Automated Driving with MATLAB



SciEngineer's training courses are designed to help organizations and individuals close skills gaps, keep up-to-date with the industry-accepted best practices and achieve the greatest value from MathWorks® and COMSOL® Products.

Automated Driving with MATLAB

This two-day course focuses on developing and verifying automated driving perception algorithms using MATLAB and Automated Driving Toolbox. Topics discussed include labeling of ground truth data, visualizing sensor data, detecting lanes and vehicles, fusing sensor detections and tracking and generating driving scenarios and modeling sensors.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB. Image Processing with MATLAB, Computer Vision with MATLAB and basic knowledge of image processing and computer vision concepts. Deep Learning with MATLAB is recommended.

TOPICS

Day 1

- Labeling of Ground Truth Data
- Visualizing Sensor Data
- Detecting Lanes and Vehicles
- Processing Lidar Point Clouds

Day 2

- Fusing Sensor Detections and Tracking
- Tracking Extended Objects
- Generating Driving Scenarios and Modeling Sensors

Labeling of Ground Truth Data

OBJECTIVE: Label ground truth data in a video or sequence of images interactively. Automate the labeling with detection and tracking algorithms.

- Overview of the Ground Truth Labeler app
- Label regions of interest (ROIs) and scenes
- Automate labeling
- View and export ground truth results

Visualizing Sensor Data

OBJECTIVE: Visualize camera frames, radar, and lidar detections. Use appropriate coordinate systems to transform image coordinates to vehicle coordinates and vice versa.

- Create a bird's-eye plot
- Plot sensor coverage areas
- Visualize detections and lanes
- Convert from vehicle to image coordinates
- Annotate video with detections and lane boundaries

Detecting Lanes and Vehicles

OBJECTIVE: Segment and model parabolic lane boundaries. Use pretrained object detectors to detect vehicles.

- Perform a bird's-eye view transform
- Detect lane features
- Compute lane model
- Validate lane detection with ground truth
- Detect vehicles with pretrained object detectors

Processing Lidar Point Clouds

OBJECTIVE: Work with lidar data stored as 3-D point clouds. Import, visualize, and process point clouds by segmenting them into clusters. Register point clouds to align and build an accumulated point cloud map.

- Import and visualize point clouds
- Preprocess point clouds
- Segment objects from lidar sensor data
- Build a map from lidar sensor data

Fusing Sensor Detections and Tracking

OBJECTIVE: Create a multi-object tracker to fuse information from multiple sensors such as camera, radar and lidar.

- Track multiple objects
- Preprocess detections
- Utilize Kalman filters
- Manage multiple tracks
- Track with multi-object tracker

Tracking Extended Objects

OBJECTIVE: Create a probability hypothesis density tracker to track extended objects and estimate their spatial extent.

- Define sensor configurations
- Track extended objects
- Estimate spatial extent

Generating Driving Scenarios and Modeling Sensors

OBJECTIVE: Create driving scenarios and synthetic radar and camera sensor detections interactively to test automated driving perception algorithms.

- Overview of the Driving Scenario Designer app
- Create scenarios with roads, actors, and sensors
- Simulate and visualize scenarios
- Generate detections and export scenarios
- Test algorithms with scenarios

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