Automated Driving with MATLAB

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.

Day 1 of 2	
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

Day 2 of 2

Day 2 of 2	
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