INTRO TO
AUTONOMOUS MOBILITY

Lhpu
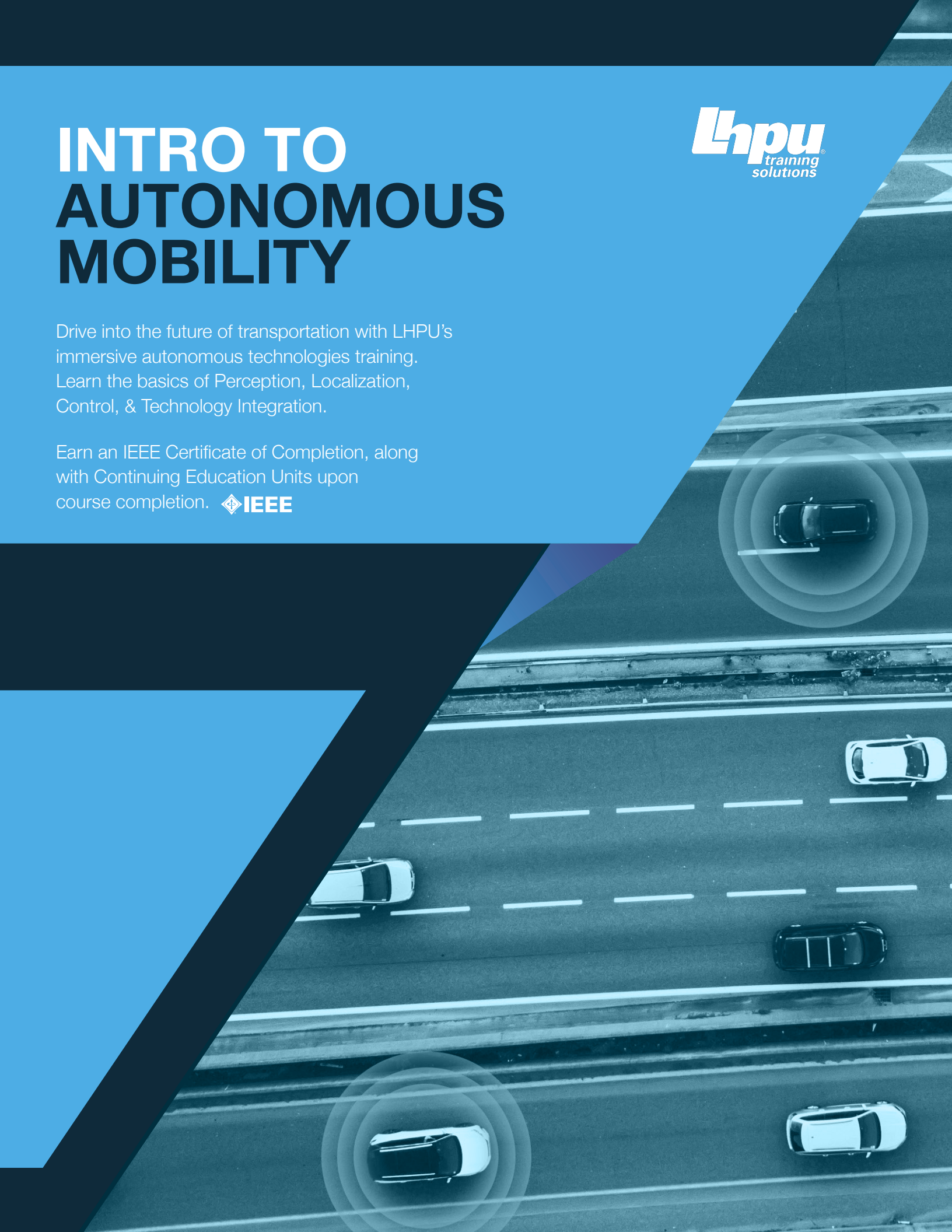training solutions

Drive into the future of transportation with LHPU's immersive autonomous technologies training. Learn the basics of Perception, Localization, Control, & Technology Integration.

Earn an IEEE Certificate of Completion, along with Continuing Education Units upon course completion. ◆IEEE

WHY SHOULD I LEARN ABOUT VEHICLE AUTOMATION?

There is no denying the autonomous revolution is rapidly accelerating. OEM, Tier 1, and Tier 2 manufacturers are increasing their rate of production on autonomous fleets, while the largest constraint is the complexity to integrate these technologies in a safe and trustworthy manner. The transportation industry is in desperate need of engineers with the knowledge to safely integrate autonomous subsystems into a vehicle, and the practical hands on experience of overcoming these technological complexities.
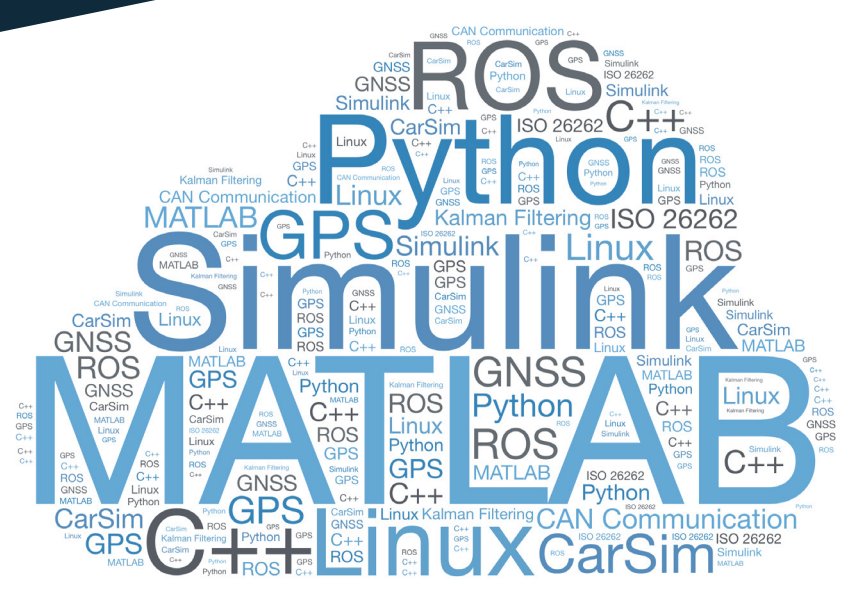
GET STARTED

Control your future in the Autonomous Mobility Mega Trend. Stand out in the market by describing how you integrated sensor technologies and programmed code to run an Autonomous Electric Vehicle. Be ready to perform Day 1 of your new career.

BE BOLD

Make the bold move to launch or advance your career in the Autonomous Mobility market. Join LHPU for the traditional 9-week bootcamp or personalize your training approach by choosing a module that fits your schedule and career path.

INTRO TO AUTONOMOUS MOBILITY
COURSE OVERVIEW

Module 1 – Foundational Essentials for Autonomous Mobility and Sonar

Learn about Robot Operating Systems (ROS) and how it provides a flexible and unified software environment. Then get the basics on Python programming language, the most popular and fastest growing language used in programming autonomous vehicles. Become proficient in CAN Communications J1939 protocol and develop an understanding of how it enables data sharing and transfer for autonomous vehicles. Work with sensors, starting with Sonar, and learn how to program the device and manage signal processing. Finally, learn about the industry leading simulation software CARSIM, by Mechanical Simulation Corporation, which will be used throughout the course.

Modules 2,3,4 – Perception using LiDAR, Radar, and Computer Vision

Learn how LiDAR, Radar, and Computer Vision act as the eyes of self-driving vehicles, providing a 360-degree view, proximity localization, and detection of static and dynamic objects. Spend time processing signals from LiDAR, Radar, and Computer Vision hardware on workbenches, while receiving one-on-one instruction from our experienced trainers.

Module 5 – Machine Learning

Learn how machine learning and its various concepts are being used in autonomous vehicles, focusing on the deep learning aspect and how machine learning goes together with perception. Learn to use the power of machine learning techniques where OpenCV fails to work. Gain experience with object recognition in real time scenarios. Discuss the challenges faced for deep learning and how to solve them as a team. Train your own machine learning model, integrate the model with ROS and a camera, then pair with all knowledge from previous modules to develop algorithms to control the autonomous vehicle.

Module 6 – Localization using RTK GNSS

Gain an understanding of coordinate systems, map making, and necessary formulas. Take a deep dive in the GNSS System and why it is a key enabler of autonomous mobility. In this module, analyze accuracy performance between standard and RTK enhanced GPS data, understand how to connect to a live GPS receiver stream and how to analyze this data, and collect GPS data from a full-size autonomous electric vehicle as it maneuvers a course. Also, record data from a second receiver and determine how it calculates orientation.

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Module 7 – Drive by Wire
Learn about Drive by Wire (DBW) and how it enables autonomous vehicles. Become familiar with throttle, brake, and steering actuators which are essential to autonomous vehicle operation. Then work with actual DBW components on benches, learning about how the steering and braking mechanisms and actuators work. Implement a simple steering angle controller (PID) to position the wheels, gathering data to manage both the position of the steering angle and velocity. Install your steering controller algorithm onto an autonomous electric vehicle allowing it to either directly control the steering or run in "safe parallel" where it computes steering actuator commands compared to the vehicle's commands.

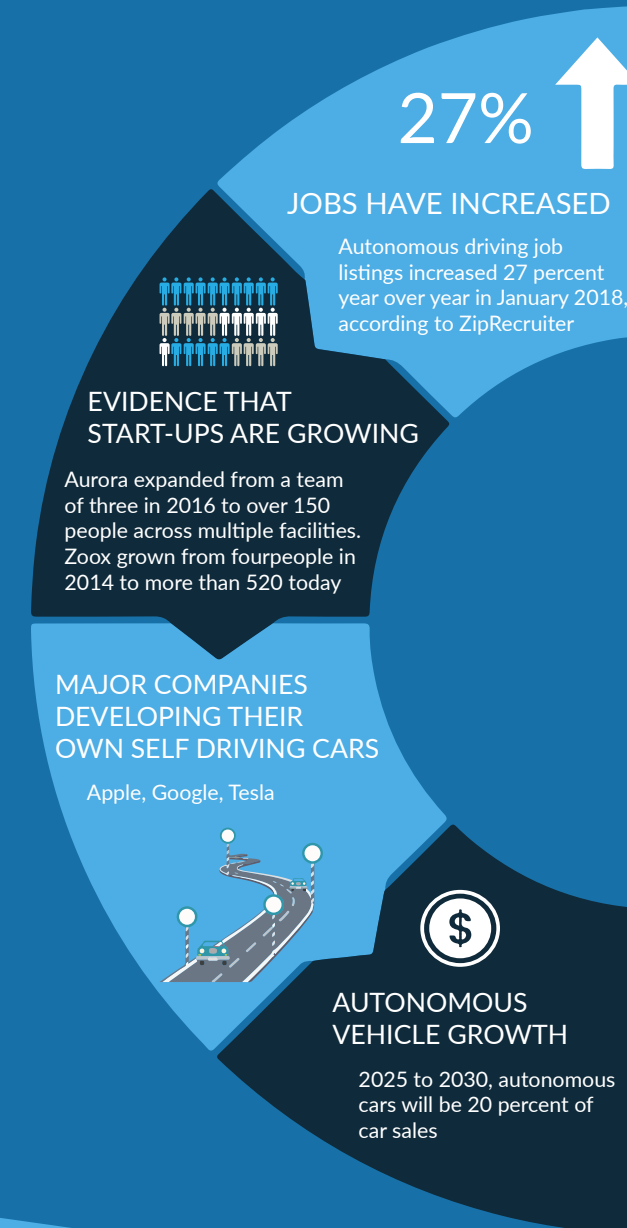**Module 8** - Sensor Fusion, Path Planning, and Control
In this module, bring it all together by creating models for sensor fusion, path planning, and vehicle control using MATLAB Simulink and CARSIM. Dive into Kalman Filtering and then develop and demonstrate building an IMU GPS filter structure and assess performance of the filter, using MATLAB control system and sensor fusion toolboxes. Further, learn discreet path planning and prediction concepts, followed by trajectory generation, then ultimately generate a unique path plan. Learn about closed-loop feedback controls, understanding the Model Predictive Control formulation, and then finally gain the experience and knowledge of the integration and tuning of advanced controls in the simulation environment, CARSIM.

Module 9 – Capstone Project
Apply all your learning in the previous 8 weeks as part of a project team by tackling a tough challenge on one of our autonomous electric vehicles. Perhaps you will integrate a new sensor, such as LiDAR, onto the vehicle and must create a path plan to enable autonomous functioning, or perhaps your task will be to improve the machine learning functionality of the vehicle's controller. Whatever the challenge, your learning will culminate with an experience that cannot be found in any other training program, one which can be used to communicate a grasp of autonomous mobility technologies in front of hiring managers looking for someone with your newly acquired skills. An IEEE certificate of completion, with continuing education units, will be awarded upon successful completion of the course.

JOB OUTLOOK OF THE
AUTONOMOUS
TRANSPORTATION INDUSTRY

The autonomous vehicle industry is creating jobs, especially as multiple companies race to put the first self-driving car into action.

27%
JOBS HAVE INCREASED
Autonomous driving job listings increased 27 percent year over year in January 2018, according to ZipRecruiter

EVIDENCE THAT START-UPS ARE GROWING
Aurora expanded from a team of three in 2016 to over 150 people across multiple facilities. Zoox grown from four people in 2014 to more than 520 today

MAJOR COMPANIES DEVELOPING THEIR OWN SELF DRIVING CARS
Apple, Google, Tesla

AUTONOMOUS VEHICLE GROWTH
2025 to 2030, autonomous cars will be 20 percent of car sales

TOP 10 SKILLS FOR AUTONOMOUS VEHICLE JOBS

Rank	Skill	
1	Programming: C or C++	indeed
2	Programming: Python	
3	Image Processing	
4	Artificial Intelligence	
5	Machine Learning	
6	Programming Tools: Git	
7	Programming: Matlab	
8	Programming: Java	
9	Programming: Shell Script	
10	Embedded Software	

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