

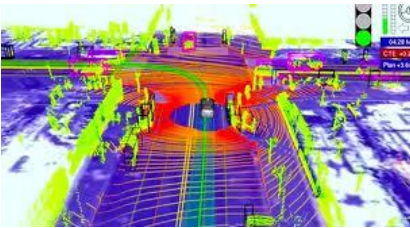
# I ILLINOIS

## Principles of Mobile Robotics

ABE 424, Fall 2020 (4 credits with Lab)

In process to be cross-listed as ECE 424

Instructor: Dr. Girish Chowdhary ([girishc@illinois.edu](mailto:girishc@illinois.edu))



Want to learn how to design sensing and software systems for mobile robots that operate in harsh, uncertain, and changing, field environments? Then principles of mobile robotics is for you. We will cover three primary aspects of autonomous field robotics: **Perception, Motion Control, and SLAM**, and bring everything together through labs involving Ground robots and flying Unmanned Aircraft (Drones). The topics covered are:

- **Mobile and Field robotic systems**
  - Autonomous cars and on-road robots
  - Field and off-road robotic systems
- **Motion Control and Trajectory Planning**
  - Dynamics of aerial and ground robots
  - Trajectory planning and motion control
- **Mechanics and modeling of sensors**
  - GPS and RTK GPS
  - Inertial sensors
  - LIDAR sensors
- **Sensor fusion and SLAM**
  - Derivation of the Kalman filter
  - Aided navigation systems
  - SLAM
- **Laboratory**
  - UAS: GPS based waypoint following
  - Ground vehicle: LIDAR data and SLAM
  - Sensor integration: Program GPS-INS Kalman filter, Program motion controllers, and collect data
- This course is to be approved as an ECE Tech Elective

**4 Credit hours + LAB, Entirely online in Spring 2020: T-TR 13:00-14:20, LAB W 14:00 - 15:50**

Prerequisites: MATH 221, MATH 225, MATH 241, MATH 285, graduate standing, or instructor consent