

Jalaj Maheshwari

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EDUCATION

University of Pennsylvania, USA

Master of Science in Engineering (M.S.E.)

Mechanical Engineering and Applied Mechanics

May 2017

Birla Institute of Technology & Science – Pilani, INDIA

Bachelor of Engineering (Hons.) (B.E)

Mechanical Engineering

July 2015

PROFESSIONAL EXPERIENCE

Center for Injury Research and Prevention, Children's Hospital of Philadelphia, PA, USA

May 2016 – Present

Research Assistant

- Analyzed simulator driving data to calculate reaction times in an autonomous vehicle to manual takeover scenario.
- Designed sled system to study occupant startle in lateral swerving using Arduino, relays, and motion capture systems.

mLab, PRECISE, University of Pennsylvania, PA, USA

Sep 2017 – Sep 2018

Research Assistant

- Developed F1Tenth, a 1/10th size autonomous race car incorporating perception, planning, and control algorithms.
- Integrated localization, sensor fusion (IMU, LIDAR, visual odometry, wheel encoders), path planning, and control using ROS.

The Ford Motor Company, MI, USA

Jun 2017 – Sep 2017

Summer Intern – Product Development

- 3D scanned a booster child restraining seat to generate 3D CAD model.
- Fixed generated model in CAD software, and validated full working model against physical crash test data

PROJECTS

Real-Time Facial Detection, Cognitive Loading, and Driver Distraction Estimation

- Built a pipeline to detect faces in real-time using a webcam; Incorporating facial keypoint detection using deep learning.
- Working on estimating cognitive load and driver distraction for safer driving.

Behavioral Cloning

- Programmed a convolutional neural network (CNN) to train a car to drive in a simulator using Keras and OpenCV.
- Used optimization techniques to generalize driving on multiple tracks and achieved full performance in training environment.

Vehicle Detection and Tracking

- Trained a machine learning model (SVM) to differentiate vehicles from non-vehicles.
- Created a vehicle detection and tracking pipeline using heatmaps; Evaluated model on video data from a vehicle on a highway.

Advanced Lane Detection on Roads using Computer Vision

- Built a lane-finding algorithm using robust image processing (distortion correction, color transforms, and gradient threshold).
- Identified lane curvature and vehicle position relative to highway lane.

Localization of Lost Vehicle using a Particle Filter

- Implemented a 2D particle filter capable of localizing a vehicle within desired accuracy and time.
- Utilized noisy initial location, sensor and control data to make estimate of position.

Sensor Fusion: Unscented Kalman Filter (UKF)

- Incorporated a constant turn rate and velocity model to detect bicycle moving around vehicle.
- Combined LIDAR and RADAR data inputs to determine absolute position; Calculated error with respect to ground truth.

Autonomous Hockey Playing Robots

- Designed, built, and programmed three autonomous robots.
- Localized robot using infrared Wii remote cameras; Implemented PID control for path control.
- Added wireless controls to receive play commands during the game.

SKILLS

Programming: Python, C, C++, MATLAB

Other: OpenCV, Tensorflow, Keras, ROS, Arduino, Solidworks, 3D Printing, Laser Cutting, Prototyping

OS: Linux, Windows, OS X