Roumen Guha (perception engineer)

+1 (469) 328 3442
roumen.guha@gmail.com
roumenguha.github.io

Experience

Oct 2020 - Dec 2020 **Graduate Teaching Assistant**, *Department of Computer Science & Engineering*, UCSD.
- Assisted **Professor Ryan Kastner** in teaching two introductory High-Level Synthesis (HLS) courses: CSE/WES 237C.
- Created assignments and labs, graded student submissions, held office hours while taking three technical courses myself.

Sept 2019 - September 2020 **Graduate Research Assistant**, *CHEI Drone Lab*, Robotics Institute, UCSD.
- Created an HLS FPGA debayering + smoothing image processing pipeline for upstream feature extraction.
- Assisted in the hardware development of DevCAM, an open-source multi-camera FPGA-powered machine vision system developed at UCSD.

Dec 2016 - May 2018 **Controls & Electrical Team Lead**, *Wisconsin Hybrid SAE Vehicle Team*, Madison, WI.

Managed team to completion of converting a stock SUV into an **electric vehicle** with 35-mile range, in **under 4 months**.
- Developed motor control code for **driving and regenerative braking**, improving range on a single charge.
- Managed student team to **integrate a small ethanol engine** into our electric vehicle to achieve a range-extended hybrid.
- Planned, designed, built, wired and wrote code for a dynamometer over summer. Used by several vehicle teams for testing.
- Performed high-voltage wiring, built and debugged vehicle wiring-harness, and integrated power electronics.
- Worked with **Simulink**, **MotoHawk**, **MotoTune**, **CANoe**, **CANdb++** and other Woodward and Vector development tools and software.

Education

2019–2021 **M.S., Robotics Engineering**, *University of California, San Diego*, *Advanced courses: Robot Sensing & Estimation, Reinforcement Learning, Image Understanding, Computer Vision, FPGA High-Level Synthesis, GPU Programming*.
GPA: 3.3

2014–2018 **B.S., Electrical Engineering & Mathematics**, *University of Wisconsin-Madison*, Dean's Honors, AMCHAM Scholarship, *Advanced courses: Robotics, Machine Learning, Image Processing, Optimization, Artificial Intelligence*.
GPA: 3.4

Favorite Projects

Most of these (and more) can be found on my GitHub page.

December 2020 **Ensemble Learning: Training Agents to Walk**.
- Implemented an ensemble learning method called Multi-TD3 to teach agents in the OpenAI gym to walk.
- Evaluated this method against SUNRISE and TD3 against a suite of OpenAI agents.

July 2020 **Real-time American Sign-Language Recognition**.
- Implemented an ASL detector in PyTorch via transfer learning on ResNet50 and VGG16.
- Used the generated model to implement a live detector in OpenCV.

March 2020 **Visual-Inertial SLAM via the Extended Kalman Filter**.
- Wrote an EKF routine to filter noisy **IMU** data using **visual-keypoint** data extracted via **Harris Corners**.
- Achieved beautiful results. Animations compared to ground truth available on GitHub.

February 2020 **Particle Filter SLAM**.
- Wrote a particle filter routine to filter noisy **IMU** data and build an occupancy grid of the environment.
- Achieved passable results. Animations available on GitHub.

January 2020 **Stop Sign Detection Redux**.
- Made a red color classifier using **logistic regression** color classifier, and added various **shape heuristics** to make a stop-sign detector in **Python** and **OpenCV**.

Dec 2017 **Dancing Robot**.
- Built a dancing robot arm with a robotic arm, utilizing **inverse kinematics** and a **DSP-based beat-tracker**.
- Programmed using **ROS** in **Python** on a **Raspberry Pi**. Video demo available on GitHub.

Oct 2017 **Stop Sign Detection**.
- Coded a **Mathematica** image processing routine that **detected stop signs** in a class-provided dataset with 98% accuracy.
- Utilized classical techniques such as **segmentation, filtering, dilation and erosion, opening and closing**.
- **Won Silver in class competition.**

Skills

Advanced Python, OpenCV, Vivado HLS

Intermediate PyTorch, MATLAB, Java, ROS, C, Git