Aneri Muni

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Education

ETH Zurich (Eidgenössische Technische Hochschule) — Zurich, Switzerland
MSc. Robotics, Systems and Control — *May 2021*
- Machine Learning Summer School (MLSS), Tübingen — *July 2020*
- Robotics Summer School: '*Real World, Real Environments*' — *July 2019*

Georgia Institute of Technology — Atlanta, Georgia
BSc. Electrical Engineering, Minor in Robotics — *May 2018*
- Graduated with Highest Honors

Research Experience

Safe Learning-Based Control in High-dimensional Spaces — April 2020 – Present
Advisor: Prof. Dr. Andreas Krause — *ETH Zurich*
- Implemented safe Bayesian optimization algorithm for full position control of a quadrotor.
- Employed genetic algorithms to identify controllers that efficiently trade-off safety and performance.
- Proposed novel approach to generate new controllers to achieve desired performance and robustness.

Safe Model-Based Reinforcement Learning — Sept. 2019 – Jan. 2020
Advisor: Prof. Dr. Melanie Zeilinger — *ETH Zurich*
- Performed sample efficient learning based on Thompson sampling with open-loop Model Predictive Control.
- Augmented Model-based RL with Scenario-based Optimization arguments to obtain safety-certified algorithms.

Planning under Uncertainty — Sept. 2018 – Nov. 2018
Advisor: Dr. Andrea Censi — *ETH Zurich*
- Worked under *Duckietown* project with Duckiebot, a robotics outreach and educational platform.
- Implemented a path planner and velocity profiler while taking into account various sources of uncertainty.
- Ensured safety by incorporating a probabilistic model that anticipates obstacles in unobserved regions.

GT-MAB: Miniature Autonomous Blimps — May 2015 – April 2016
Advisor: Dr. Fumin Zhang — *Georgia Tech*
- Performed system identification and developed PID controllers to control 3D motion of a robotic helium blimp.
- Acquired light intensity data to map air current flow patterns.
- **Nano Blimp:** developed hardware and software for communication protocol for smaller version of blimp.

Work Experience

Visiting Student Researcher — Jan. 2021 – Present
MILA AI Institute, Quebec, Advisor: Dr. Pierre-Luc Bacon — *University of Montreal*
- Safe Reinforcement Learning and Optimal Control.

Visiting Student Researcher — June 2017 – August 2017
Autonomous Systems Lab, Advisor: Prof. Dr. Roland Siegwart — *ETH Zurich*
- Programmed ABB's YuMi robot to rebuild a block stack after scanning it.
- Developed pick-place routine using MoveIt! and object-detection routine using PCL and ASUS PrimeSense sensor.

Teaching Assistant for Differential Equations — Jan. 2016 – May 2016
School of Mathematics — *Georgia Tech*
- Tutored a class of 30 students by holding recitations twice a week.
- Held office hours, solved difficulties, and graded exams and homework.

Co-op intern: Robotics and Image Processing — August 2015 – May 2017
Georgia Tech Research Institute — *Georgia Tech*
- Developed 3D reconstruction methods to estimate weight distribution in farms based on volume of chicken scans.
- Implemented path-planning algorithms for an agricultural ground robot to autonomously navigate poultry houses.
- Worked with poultry scientist to develop novel obstacle (chicken) avoidance routine using point cloud data.
- Designed user friendly Windows GUIs in C# to run a pedestrian tracking software.
- Processed data and accessed results for Georgia Department of Transport using MySQL.

Academic Awards

- Best Oral Presentation, 3^{rd} position, Undergraduate Research Symposium — *Spring 2018*
- Best Overall Design Award, *MLH MakeHarvard* Hackathon — *Spring 2018*
- President's Undergraduate Research Award — *Spring 2018, Spring 2016, Summer 2015*
- ThinkSwiss Research Scholarship — *Summer 2017*
- James G. and Mary G. Wohlford Co-op Scholarship — *Spring 2017*
- IEEE Control System Society Video Contest, 3^{rd} position — *Summer 2015*

Poster/Presentations

- **A. D. Muni**, K. Wabersich, M. Zeilinger, *Learning-Based Control for Constrained Systems using Thompson Sampling and Scenario Optimization.* 2020 Machine Learning Summer School (MLSS), Tübingen. Available: YouTube video.
- **A. D. Muni** and Colin Usher, *3D Reconstruction of Live Chickens in Poultry Houses.* 13^{th} Annual Undergraduate Research Spring Symposium, 2018. Georgia Institute of Technology. Awarded: 3^{rd} Best Oral Presentation.

Publications

- Q. Tao, M. King-Smith, **A.D. Muni**, V. Mishra, S. Cho, J.P. Varnell, F. Zhang, *Control Theory – Autonomous Blimp.* 2015 [Online]. Available: YouTube video.
- S. Cho, V. Mishra, Q. Tao, P. Varnell, M. King-Smith, **A. Muni**, W. Smallwood, F. Zhang. *Autopilot Design for a Class of Miniature Autonomous Blimps.* 2017 IEEE Conference on Control Technology and Applications. Pages:841-846.
- C. T Usher, W. D Daley, B. P Joffe and **A. Muni**. Robotics for Poultry House Management. 2017 ASABE Annual International Meeting. 1701103.(doi:10.13031/aim.201701103).

Selected Projects

Project Hydra | *Underwater Robotic Swarm* — Nov. 2017 – May 2018

- Designed hardware and software for 3 AUVs and implemented decentralized consensus algorithm for the swarm.
- Each 'HydraBot' has 2D motion capability, transmits and receives data through infrared communication.
- Given specific colors, each agent uses neighbouring bots to calibrate its location.
- Presented this project during Senior Design Expo at Georgia Tech.

BlindEyes | *MLH MakeHarvard Hack-a-thon Project* — Feb 2018

- Developed a navigational tool for the visually impaired that provides haptic feedback to avoid obstacles.
- Auditory feedback describing the scene around the user using Google Vision.
- Integrated sonars, lidars, haptic feedback motors, EMIC2 with Embed and a Raspberry Pi 3 camera in 24 hours.
- Awarded the Best Overall Prize at hardware hackathon, among 37 teams, for our innovative design.

Quadruped Robot | *IVALabs, Georgia Tech* — Aug. 2016 – Dec. 2016

- Programmed a quadruped that emulates the locomotion gaits of quadrupeds found in nature.
- Designed 3D model of quadruped with an actuated spine using Autodesk Inventor.

Leadership

- Undergraduate Research Ambassador — *August 2017 – August 2018*
- Women in ECE (Electrical and Computer Engineering) — *Jan. 2015 – August 2018*
  - Newsletter Chair, Publicity Chair
- ECE (Electrical and Computer Engineering) Ambassador — *August 2014 – May 2015*

Technical Skills

Programming: Python, MATLAB, C++, Java, RobotC, HTML/CSS
Frameworks: ROS, OpenCV, PCL, MoveIt!, TensorFlow
Hardware: ARM Mbed micro-controller, Arduino, Raspberry Pi, LaunchPad, FPGAs, oscilloscope, logic analyzer
Software: MathCAD, Multisim, LTSpice, Autodesk Inventor, Quartus II, NI LabVIEW
Developer Tools: Git, PyCharm, Eclipse, Docker, Visual Studio
Communication: Design proposals, technical reports, instruction manuals, presentations (large and small audiences)
Languages: English (fluent), Hindi (native), Gujarati (fluent)
Community Service: Volunteered as a tutor for underprivileged students from K-5 th grade in Atlanta's communities