Shubhankar(Somi) Agarwal

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Education

University of Texas at Austin — M.S. 2022, PhD 2024
Electrical and Computer Engineering — GPA: 3.9/4
Research Focus: Robust Optimization and Game Theory.

University of Illinois at Urbana Champaign — August 2018
Bachelor of Science in **Computer Engineering** with minor in **Mathematics** — GPA: 3.7/4

Awards: D. B and H. S Creativity Award (1 ECE Undergrad every year), Deans List (Top 20% undergrads based on Academic Performance for 4 semesters), Hack MIT 2016 Top 10 Hacks and Winner of Google Prize, NSF Research Experiences for Undergraduates(REU), Wild-card finalist in International Robosub 2017, 2018 and 2019, Tau Sigma National Honor Society, NSF I-Corps.

Work Experience

Second Spectrum — Los Angeles, CA
AI Intern (all the work is under NDA) - Python, Pytorch — May 2021 - Aug 2021

- Developed a novel **generative model architecture** for interpolating and denoising sports player poses.
- Built a **SHAP values** module and used it to debug model biases.

Uber Advanced Technology Group - Self Driving Unit — Pittsburgh, PA
Motion Planning Engineer (all the work is under NDA) — Aug 2018 - Sept 2020
Python, C++, Pytorch, CVXPy, Bazel, Spark, CUDA

- Optimal Trajectory Forecasting using **Interior Point Methods**.
- **Continuous Uncertainty Handling** and Decision Making for actors around AV.
- Successive Convexification for handling non-convex constraints.

Research Work

Algorithms for Black-Box Local Saddle Point Optimization — *Under Submission*
Shubhankar Agarwal, *David Fridovich-Keil, Sandeep P. Chinchali*

Robust Forecasting for Robotic Control: A Game-Theoretic Approach — *ICRA 2023*
Shubhankar Agarwal, *David Fridovich-Keil, Sandeep P. Chinchali*
NeurIPS Workshop 2022 **[Best Paper]**

Synthesizing Adversarial Visual Scenarios for Model-Based Robotic Control — *CoRL, 2022*
Shubhankar Agarwal, *Sandeep Chinchali*

Solving the Traveling Salesman Problem with Unknown Edge Costs via Expert Demonstrations — *Under Submission*
Shubhankar Agarwal, *Jianhan Song, Ashutosh Shukla, Josiah Coad, Guni Sharon*

Imitative Planning using Conditional Normalizing Flow **[Best Paper]** — *IROS Workshop 2022*
Shubhankar Agarwal, *Harshit Sikchi, Colu Gulino, Eric Wilkinson*

Decentralized Data Collection for Robotic Fleet Learning: A Game-Theoretic Approach — *CoRL, 2022*
Oguzhan Akcin, Po-han Li, ***Shubhankar Agarwal***, *Sandeep Chinchali*

Technical Skills

- Production level languages: Python, C++, SQL, C, CUDA
- Software: Pytorch, CVXpy, Gurobi, ROS, Spark, Matlab

Relevant Coursework

- UT Austin: Learning-based Optimal Control, Statistical Machine Learning, Stochastic Optimal Control, Advanced Algorithms, Convex Optimization, Combinatorial Optimization, Online Learning and Data Mining.
- UIUC: Random Processes (Grad), Optimization for Computer Vision (Grad), Machine Learning, Advanced Data Science, and Numerical Methods.

Relevant Jobs, Research and Leadership Experiences

Oceancomm Champaign, IL
NSF REU - Research Experiences for Undergraduates Sept 2017 - July 2018

- Used high speed wireless underwater modems for wireless underwater communication.
- Simulated custom phased-array ultrasonic algorithms for bi-direction communication for modem. This proof-concept work was used to bring directional communication within two Oceancomm modems.
- Used three high-speed wireless modems, Kalman filters, and multilateration for accurate **3D state estimation**.

Founder of Illinois and Carnegie Mellon Autonomous Underwater Vehicle Team
Started Robotics teams at UIUC and CMU separately to compete in Robosub Competition August 2016 - Present

- Building an **autonomous submarine** from scratch to do various tasks underwater completely autonomously: Object Detection, Torpedo Shooting, Acoustic Sensing.
- Fusing **Visual Odometry** with **DVL** and **hydrophones** for accurate state estimation.
- Using Multi-Agent Deep Reinforcement Learning with multiple submarines for solving the competition tasks in collaboration.
- Implementing **Tensor RT** optimized **YOLO** for real-time object detection.
- Customized **Gazebo** based simulator for testing **vision** and **mapping**.

Short Projects

Autonomous Car Project - MAAV CS 598 Fall 2017

- Implemented braking based on pedestrian detection using **YOLO**
- Implemented braking for pedestrian using **Euclidean Clustering** on Lidar points

TourdeMarsVR Fall 2016

- A VR game where the player controls a spaceship in VR using an actual bike.
- Placed in **HackMIT 2016 Top 10 Hacks** and won **Best use of Google Cardboard**.

OpenSrcOS (A Unix based operating system built from scratch)- ECE 391 Fall 2016

- A minimalist, modern monolithic OS featuring virtualized memory(segmentation and paging), ext2fs filesystem support, keyboard/RTC/PIT, ELF-formatted user program execution, multiple shells, and round-robin scheduling.

Recreational Interests

I enjoy playing soccer, practicing Muay Thai (I have a black belt in karate), snowboarding and watching sports.