

# Rohan Banerjee

Address: 349 Gates Hall, 107 Hoy Road, Cornell University, Ithaca, NY 14853

Phone: (703)-743-4178 E-Mail: rbb242@cornell.edu

## EDUCATION

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### Cornell University

Ithaca, NY

Ph.D. Candidate, Computer Science, GPA: 3.94/4.0

September 2020 – present (expected: December 2025)

*Relevant Coursework:* Model-Based State Estimation, Robot Manipulation, Machine Learning Theory, Deep Probabilistic and Generative Models, Matrix Computations

### Massachusetts Institute of Technology (MIT)

Cambridge, MA

M.Eng. in Electrical Engineering and Computer Science, GPA: 4.5/5.0

June 2019

S.B. in Electrical Engineering and Computer Science, GPA: 4.9/5.0

June 2018

*Relevant Coursework:* Statistical Learning Theory and Applications, Robotics: Science and Systems, Bayesian Modeling and Inference, Machine Learning, Inference and Information, Design and Analysis of Algorithms, Computational Cognitive Science, Discrete-Time Signal Processing, Elements of Software Construction, Computation Structures

### Thomas Jefferson High School for Science and Technology

Alexandria, VA

SAT: 2400, GPA (weighted): 4.538/4.0

September 2010 – June 2014

*Relevant Coursework:* Artificial Intelligence, Parallel Computing

## RESEARCH EXPERIENCE

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### Cornell University

Ithaca, NY

Ph.D. Student

September 2020 – present

- Principal Investigators: Prof. Sarah Dean and Prof. Tapomayukh Bhattacharjee (March 2023 – present)
- Conducting research as part of EmPRISE (Empowering People with Robots and Intelligent Shared Experiences) lab
- Research area: Developing human-in-the-loop interactive learning algorithms for robot-assisted bite acquisition
- Principal Investigator: Prof. Mark Campbell (September 2020 – October 2022)
- Conducted research as a member of the ASL (Autonomous Systems Laboratory) group
- Research area: Developing reinforcement learning (RL) algorithms for the autonomous navigation domain that are robust to variations in the surrounding environment

### Massachusetts Institute of Technology

Cambridge, MA

Research Engineer

June 2019 – June 2020

- Conducted research as a member of the DRL (Distributed Robotics Laboratory) group at CSAIL (Computer Science and Artificial Intelligence Laboratory)
- Refined autonomous driving simulation platform based on CARLA open-source driving simulator
- Validated research algorithms in simulation for vehicle navigation, dynamic obstacle avoidance, and end-to-end learning
- Supported research in language understanding and human-robot interaction involving the Toyota Human Support Robot platform

### Massachusetts Institute of Technology

Cambridge, MA

M.Eng. Researcher

March 2018 – June 2019

- Principal Investigator: Prof. Daniela Rus
- Conducted research as a member of the DRL (Distributed Robotics Laboratory) group at CSAIL (Computer Science and Artificial Intelligence Laboratory)
- Thesis Title: “Development of a Simulation-Based Platform for Autonomous Vehicle Algorithm Validation”
- Developed autonomous vehicle simulation platform based on CARLA open-source driving simulator
- Investigated learning algorithms for LIDAR-based rural road detection

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## Massachusetts Institute of Technology

UIROP (Undergraduate Research Opportunities Program)

Cambridge, MA

November – December 2017

- Principal Investigator: Prof. Jonathan How
- Conducted research as a member of the ACL (Aerospace Controls Laboratory) group
- Contributed to the development of a tripod-based sensor platform for pedestrian localization and intention recognition
- Calibrated webcams and LIDAR (Velodyne VLP-16), and investigated power management options for tripod platform

## Massachusetts Institute of Technology

SuperUIROP Advanced Undergraduate Research Program

Cambridge, MA

September 2016 – May 2017

- Principal Investigator: Dr. Jim Glass
- Conducted research as member of the SLS (Spoken Language Systems) group at CSAIL (Computer Science and Artificial Intelligence Laboratory)
- Contributed to the development of a conversational robotic system that can acknowledge speaking subjects
- Converted offline Voice Activity Detector module into real-time streaming module
- Researched techniques for integrating visual face detection and audio source localization

## George Mason University

Applied Mathematics Intern, Aspiring Scientists Summer Internship Program

Fairfax, VA

June – August 2012, June – August 2013

- Principal Investigator: Prof. Padmanabhan Seshaiyer
- Developed MATLAB simulation of 1D Euler-Bernoulli Beam PDE system (2012); Modeled deformation of 2D membrane PDE system in COMSOL (2013)
- Simulated lung tissue fluid-structure interaction in MATLAB and developed lung tissue edge detection Python program: Pneumothorax Modeling and Diagnosis (2012)

## THESES

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R. Banerjee, “Development of a Simulation-Based Platform for Autonomous Vehicle Algorithm Validation”. MIT, 2019.

## PUBLICATIONS

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### PREPRINTS

R. Banerjee, R.K. Jenamani\*, S. Vasudev\*, A. Nanavati, S. Deant, T. Bhattacharjeet, “To Ask or Not To Ask: Human-in-the-loop Contextual Bandits with Applications in Robot-Assisted Feeding”, *arXiv preprint arXiv:2405.06908*, 2024. Under submission.

### JOURNAL PAPERS

T. Ort, K. Murthy, R. Banerjee, S.K. Gottipati, D. Bhatt, I. Gilitschenski, L. Paull, and D. Rus, “MapLite: Autonomous Intersection Navigation Without a Detailed Prior Map,” *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 556–563, 2020.

A. Amini, I. Gilitschenski, J. Phillips, J. Moseyko, R. Banerjee, S. Karaman, and D. Rus. “Learning Robust Control Policies for End-to-End Autonomous Driving From Data-Driven Simulation,” *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 1143–1150, 2020.

R. Banerjee & P. Seshaiyer. “Computational Mechanics of a Coupled Flow-Structure Interaction Problem with Applications to Bio-Inspired Micro Air Vehicles,” *International Journal of Aerospace and Lightweight Structures (IJALS)*, vol. 3, no. 3, pp. 399–407, 2013.

A.R. Bhandarkar, R. Banerjee & P. Seshaiyer, “On the Stability of Lung Parenchymal Lesions with Applications to Early Pneumothorax Diagnosis,” *Computational and Mathematical Methods in Medicine*, vol. 2013, pp. 1–12, 2013.

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## WORKSHOP PAPERS

**R. Banerjee**, S. Dean, and T. Bhattacharjee, "To ask or not to ask: Robot-assisted bite acquisition with human-in-the-loop contextual bandits," in *First Workshop on Out-of-Distribution Generalization in Robotics at CoRL 2023*, 2023.

**R. Banerjee\***, P. Ray\*, M. Campbell. Improving Environment Robustness of Deep Reinforcement Learning Approaches for Autonomous Racing Using Bayesian Optimization-based Curriculum Learning, *IROS Workshop on Learning Robot Super Autonomy*, 2023.

## INDUSTRY EXPERIENCE

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### Autoliv (now Veoneer)

Lowell, MA

Intern, Advanced Sensing Group

June – August 2017

- Developed mapping algorithm for LIDAR data (Velodyne HDL-64) using point cloud registration to maintain coherent point cloud history and advance lane/object tracking algorithms
- Investigated mapping/registration techniques with lower-resolution (Velodyne VLP-32) LIDAR data to improve point cloud data resolution
- Investigated ego-motion estimation techniques with VLP-64 data to support vehicle localization

### Northrop Grumman

San Diego, CA

Intern, Systems Integration, Test & Evaluation

June – August 2016

- Supported Systems Integration, Test & Evaluation for the Triton UAV (Unmanned Aerial Vehicle) program
- Developed Python test automation script for Triton test-bench landing test
- Co-developed SQL database for automated processing of Triton System Test Requests
- Improved upon Excel database for tracking flight requirements and test points
- Researched test automation methods for future modular hot-bench

### NASA Goddard Space Flight Center

Greenbelt, MD

Intern, Mission Engineering and Systems Analysis Division

January 2015; June – August 2015; January 2016

- Contributed to the NICER (Neutron Star Interior Composition Explorer)/SEXTANT (Station Explorer for X-Ray Timing and Navigation) mission
- Updated 1PPS signal interrupt handler Linux kernel module for hardware timing and synchronization
- Co-developed simulator of bi-directional science and telemetry packet transmission with another intern

## HONORS AND AWARDS

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- Member, IEEE-HKN (Eta Kappa Nu), inducted 2018
- Fourth Place in Category: Mathematical Sciences, Intel International Science and Engineering Fair, Phoenix, 2013
- Regional Finals participant, Siemens Competition in Math, Science, and Technology, Atlanta, 2012

## TEACHING EXPERIENCE

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### Cornell University

Ithaca, NY

Teaching Assistant, Introduction to Reinforcement Learning (CS 4789)

February – May 2023

- Revised problem set questions and managed grading of assignments

### Cornell University

Ithaca, NY

Teaching Assistant, Foundations of Artificial Intelligence (CS 4700)

February – May 2021

- Developed problem set and exam questions
- Recognized by Prof. Haym Hirsh at Cornell CS Student Recognition Event (May 2021)

### Cornell University

Ithaca, NY

Teaching Assistant, Introduction to Machine Learning (CS 4780)

September – December 2020

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- Developed problem sets in coordination with undergraduate TAs
- Conducted office hours to assist students with concepts and problem sets

## Massachusetts Institute of Technology

Cambridge, MA

Teaching Assistant, Introduction to Probability (6.041/6.431)

September – December 2018, February – May 2018

- Taught weekly tutorial problem-solving sessions to small student groups
- Conducted office hours to assist students with concepts and problem sets

## Massachusetts Institute of Technology

Cambridge, MA

Lab Assistant, Introduction to Electrical Engineering and Computer Science I (6.01)

February – May 2015

- Assisted students with in-class Software Labs and engineering Design Labs

## SERVICE

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- Participated in Cornell Student-Applicant Support Program, assisting 2 prospective PhD applicants with preparing application materials (2022)
- Helped improve course materials for Cornell Foundations of Robotics class (CS 4750): Summer 2023

## PROJECTS

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### Generating Simulated Environments for 2D Path Planning Using Deep Conditional Generative Models

Ithaca, NY

Class Project, Deep Probabilistic and Generative Models (CS 6783)

February 2021 – May 2021

- Explored the application of deep generative models to the problem of generating simulated 2D map environments
- Experimented with conditional variational autoencoder (CVAE) and PixelCNN architectures on a synthetic 2D dataset

### 3D Point Cloud Clustering Using Small-Variance Asymptotics

Cambridge, MA

Class Project, Bayesian Modeling and Inference (6.882)

March 2018 – May 2018

- Explored Bayesian non-parametric clustering of 3D point cloud data using small-variance asymptotics approximate inference algorithms
- Implemented Kulis and Jordan (2012) small-variance asymptotics algorithm for DP-GMM and Straub et al. (2015) algorithm for DP-VMF-MM in Python

### MIT Unmanned Aerial Vehicle Team

Cambridge, MA

Student Participant

September 2014 – September 2017

- Developed refined 2D simulator of competition arena and agent dynamics for the International Aerial Robotics Competition as simulation team lead
- Managed development of computer vision gridline and circle detection Python programs as computer vision team lead
- Co-developed Python simulator of competition arena and contributed to UAV path planning algorithms as member of artificial intelligence team

## SKILLS

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**Programming Languages:** Python, MATLAB, C++, Java, C, HTML, LaTeX

**Frameworks/Libraries:** PyTorch, ROS, Scikit-learn