

RAHUL MITRA

Computer Science PhD student

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EXPERIENCE

Modelling for digital fabrication, Research Project

Boston University, Department of Computer Science

📅 Sept 2021 – Present 📍 Boston, MA

- Developed and implemented, in C++, a pipeline for converting 3D shapes into digitally fabricable structures.
- Designed a novel optimization model to reduce distortion in final fabricated product. Formulated and solved model in Python using the Gurobi solver.

Real-time object detection aid for the visually impaired

Trinity College, Department of Computer Science

📅 Sep 2020 – May 2021 📍 Hartford, CT

- Implemented a system to provide real-time audio feedback on a white case using NVIDIA's Jetson Nano microcomputer. Integrated, using Python, the Raspberry Pi V2 Camera with the Nano for real-time video input.
- Used the `ssd-inception-v2` model and tensorflow for image classification.
- Developed iOS application (Swift) for audio feedback and seamless bluetooth interfacing between user and microcomputer.
- Winner of best thesis award based on completeness, technical maturity and relevance.

Researcher, Perceptual Robotics & Automation Lab

Trinity College, Department of Engineering

📅 Sep 2018 – May 2021 📍 Hartford, CT

- *Vibration-based sensor*: Modelled contact-sensing as vibration-classification problem. Classified data using Gaussian mixture model clustering and logistic regression. Wrote code in C and Python to interface sensor with Raspberry Pi microcomputer (used for data collection). Pub. [2].
- *Vision-based force-feedback in Robot-Assited surgery*: Examined deviation of haptic feedback from ground truth for acceptable performance in Robot-Assisted Surgery. Explored models for node-to-node interaction in simulated tissue surface. Pub. [3].
- *Haptic Interface for Robot Locomotion*: Developed software and experimental protocol to compare a haptic interface vs keyboard and joystick interface for legged robot-locomotion. Conducted user-studies and statistically interpreted results. Pub. [1] & Pub. [4].
- *Joint-limit haptic feedback*: Implemented point cloud generation/retrieval models for providing haptic feedback in teleoperated robots. Presented paper at ICARM. Pub. [5].

PROJECTS

- **Machine Learning**: Implemented perceptron algorithm, gradient descent (stochastic, adaptive, adaptive momentum), neural network, minimax algorithm from scratch. [code available on request]
- **Hardware**: (1) Implemented Wi-Fi localization model for robotic swarms. (2) Led a team of 3 undergrads in building an autonomously navigated wheeled robot.

SKILLS AND COMPETENCES

C/C++	●●●●●
Python	●●●●●
Java	●●●●●
Git	●●●●●
Matlab	●●●●●
Blender/MeshLab	●●●●●
Mathematica	●●●●●
Gurobi Optimizer	●●●●●
SQL	●●●●●

EDUCATION

Ph.D. in Computer Science

Boston University

📅 Sept 2021 – ongoing

Focus: Geometry Processing, Computer Graphics, Digital Fabrication, Optimization.

B.Sc. in Computer Science & Physics

Trinity College

📅 Sept 2017 – 2021

GPA: 3.95/4.0

AWARDS

- President's Fellow in Physics (class of '21)
- Graduated Summa Cum Laude
- Phi Beta Kappa & Sigma Pi Sigma (physics honor society) inductee
- Full tuition scholarship to attend Trinity College

INTERESTS

- Teaching: 6x undergrad and grad TA, Teach the teacher's program (volunteer), Tech Savvy (volunteer)
- Sports: Soccer, Biking, Formula 1
- Mint-chip ice cream

PUBLICATIONS

1. K.Huang, **R. Mitra**, I. Yung, D. Chitrakar, "Telelocomotion - Remotely Operated Legged Robots", MDPI Applied Sciences, 2021.
2. **R. Mitra**, K. Boyd, D. Subedi, D. Chitrakar, E. Aldrich, A. Swamy, K. Huang, "Contact Sensing via Active Oscillatory Actuation", IEEE International Conference on Mechatronics, Robotics and Automation (ICMRA), Shanghai, China, 2020.
3. K. Huang, D. Chitrakar, **R. Mitra**, D. Subedi, Y.H. Su, "Characterizing Limits of Vision-Based Force Feedback in Simulated Surgical Tool-Tissue Interaction", Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Montreal, Canada, 2020.
4. D. Chitrakar, **R. Mitra**, K. Huang, "Haptic Interface for Hexapod Gait Execution", IEEE International Conference on Robotic Computing (IRC), Taichung, Taiwan, 2020.
5. K. Huang, Y.H. Su, M. Khalil, D. Melesse, **R. Mitra**, "Sampling of 3DOF Robot Manipulator Joint-Limits for Haptic Feedback", 2019 IEEE International Conference on Advanced Robotics and Mechatronics (ICARM), Osaka, Japan, 2019.