

Education

Boston University

Ph.D., Computer Science

Advisor: [Edward Chien](#)

Research Focus: Geometry Processing, Computer Graphics, Digital Fabrication

Sept 2021 - present

Trinity College, CT

B.Sc. Physics (honors), B.Sc. Computer Science (honors)

Summa Cum Laude, Phi Beta Kappa, Sigma Pi Sigma (Physics honor society) inductee

Advisor: [Kevin Huang](#)

Research Focus: Telerobotics, Haptic User Interfaces, Contact Sensing

Sept 2017 - May 2021

GPA: 3.95/4.00

Technical skills

Programming Software/Libraries

C++/C, Python, Java, Mathematica, MATLAB, OpenGL Shading Language (GLSL)
OpenGL (graphics programming), Blender/MeshLab (3D modelling), Gurobi (optimization), LibIGL, geometry-central, polyscope (geometric algorithms/3D visualization), Git

Publications (chronological)

- [1] **Mitra, Rahul**, Megan Hoffmann, Erick Jimenez Berumen, and Edward Chien. “Singular Foliations for Knit Graph Design” In ACM SIGGRAPH 2024 Conference Proceedings, pp. 1-11. 2024.
- [2] **Mitra, Rahul**, Liane Makatura, Emily Whiting, and Edward Chien. “Helix-Free Stripes for Knit Graph Design.” In ACM SIGGRAPH 2023 Conference Proceedings, pp. 1-9. 2023.
- [3] Huang, Kevin, Divas Subedi, **Rahul Mitra**, Isabella Yung, Kirkland Boyd, Edwin Aldrich, and Digesh Chitrakar. “Telelocomotion—remotely operated legged robots.” Applied Sciences 11, no. 1 (2020): 194.
- [4] **Mitra, Rahul**, Kirkland Boyd, Divas Subedi, Digesh Chitrakar, Edwin Aldrich, Ananya Swamy, and Kevin Huang. “Contact sensing via active oscillatory actuation.” In 2020 3rd International Conference on Mechatronics, Robotics and Automation (ICMRA), pp. 99-104. IEEE, 2020.
- [5] Huang, Kevin, Digesh Chitrakar, **Rahul Mitra**, Divas Subedi, and Yun-Hsuan Su. “Characterizing limits of vision-based force feedback in simulated surgical tool-tissue interaction.” In 2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), pp. 4903-4908. IEEE, 2020.
- [6] Chitrakar, Digesh, **Rahul Mitra**, and Kevin Huang. “Haptic interface for hexapod gait execution.” In 2020 Fourth IEEE International Conference on Robotic Computing (IRC), pp. 414-415. IEEE, 2020. (short paper)
- [7] Huang, Kevin, Yun-Hsuan Su, Mahmoud Khalil, Daniel Melesse, and **Rahul Mitra**. “Sampling of 3dof robot manipulator joint-limits for haptic feedback.” In 2019 IEEE 4th International Conference on Advanced Robotics and Mechatronics (ICARM), pp. 690-696. IEEE, 2019.

Work Experience

Graduate Researcher, Computer Graphics Group

Boston University

Sept 2021 - present

Boston, USA

- *Geometry Processing for Digital Fabrication*: I study how to apply tools from discrete differential geometry to tasks in digital fabrication, with a particular focus on computational knitting. My research spans areas such as vector field design, optimal singularity placement, meshing and optimization. See Pubs. [1] and [2].

Real-time Object Detection Aid for the Visually Impaired

Computer Science Senior Thesis, Trinity College

Sept 2020 - May 2021

Hartford, USA

- Implemented a system to provide real-time audio feedback on a white cane using NVIDIA's Jetson Nano microcomputer. Integrated 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 application for audio feedback and seamless bluetooth interfacing between user and Nano.
- Winner of best thesis award based on completeness, technical maturity and relevance.

Researcher, Perceptual Robotics & Automation Lab

Trinity College

Sept 2018 - May 2021

Hartford, USA

- *Vibration-based sensor*: Modelled contact-sensing as vibration-classification problem. Classified data using Gaussian mixture model clustering and logistic regression. Built system to interface sensor with Raspberry Pi microcomputer (used for data collection). Pub. [4].
- *Vision-based force-feedback in Robot-Assisted 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. [5].
- *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. [3] & Pub. [6].
- *Joint-limit haptic feedback*: Implemented point cloud generation/retrieval models for providing haptic feedback in teleoperated robots. Presented paper at ICARM. Pub. [7].

Teaching & Mentoring

Teaching Assistant, Geometric Algorithms

Mentor, Summer Geometry Initiative (SGI)

Fall '24, BU.

Program to introduce geometry processing research to qualified undergraduate and graduate student globally. Summer '23, MIT.

Teaching Assistant, Geometry Processing (Graduate Course) × 2

Spring '23, Spring '24, BU.

Teaching Assistant, Data Structures & Algorithms × 2

Spring '20, Spring '21, Trinity College.

Teaching Assistant, Classical Mechanics

Fall '20, Trinity College.

Teaching Assistant, Introduction to Computing

Spring '19, Trinity College.

Teaching Assistant, Mobile Robotics

Spring '19, Trinity College.

Robotics mentor, Tech Savvy

Program organized by the American Association of University Women (AAUW) to introduce careers in STEM to middle school girls. Spring '18, '19.

Volunteer Teacher, Hartford Teach the Teachers

Introductory robotics program designed for Hartford middle school teachers with the goal of introducing robotics curriculum in Hartford public schools. Summer '18, Trinity College.

Talks/Presentations

Singular Foliations for Knit Graph Design (Poster)

SGP

2024

Helix-Free Stripes for Knit Graph Design

SIGGRAPH

2023

Stripes Patterns for Computational Knitting

BU Graphics Seminar

2022

Sampling of 3DOF Robot Manipulator Joint-limits for Haptic Feedback

IEEE ICARM

2019

Awards

**Eurographics Widening Participation Scholarship
President's Fellow in Physics, Class of 2021**

Eurographics. 2024
Awarded to the strongest major in the graduating
class. Trinity College. 2021

**Best Computer Science Senior Thesis
President's Fellow in Physics, Class of 2021**

Trinity College. 2021
Awarded to the strongest major in the graduating
class. Trinity College. 2021

Albert J. Howard Jr. Prize in Physics

Awarded to the strongest major in the junior class.
Trinity College. 2020

Phi Gamma Delta Prize in Mathematics

Awarded for outstanding performance in mathe-
matics coursework. Trinity College. 2020

Faculty Honors

Trinity College. All Semesters

Full Tuition Scholarship

Trinity College. 2017