

Education

Boston University

Ph.D., Computer Science

Advisor: [Edward Chien](#)

Research Focus: Computer Graphics, Geometry Processing, 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), Eigen (numerical linear algebra), Git

Work/Research Experience

Game Development and Research Intern, Lightspeed Studios

Tencent Americas

May 2024 - present

Los Angeles, USA

- *Quad meshing for rendering/knitting*: Implemented a pipeline that uses custom striping algorithms to generate quad elements over dress patterns drawn from the [GarmentCode](#) dataset with the goal of developing novel meshing techniques for rendering and knitting of yarn-level models.

Graduate Researcher, Computer Graphics Lab

Boston University

Sept 2021 - present

Boston, USA

- Conducting research in geometry processing techniques for tasks in digital fabrication, vector field design and meshing.
- *Stripe Patterns for Computational Knitting*: Designed and implemented a striping algorithm for generating machine-knittable graphs over input models. Our approach introduces several key techniques that allows for user-design choices while ensuring machine-knittability. See Pub. [2].
- *Foliations for Computational Knitting*: Enhanced the method of Pub. [2] by abstracting stripe patterns as foliations (integral curve lines) of a vector field. Allows for more robust graph generation, thereby further expanding the user-design space and diversity of input models. See Pub. [1].

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.

- *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].

Publications (chronological)

- [1] **Mitra, R.**, Jimenez Berumen, E., Hofmann, M., & Chien, E. (2024, July). Singular Foliations for Knit Graph Design. In ACM SIGGRAPH 2024 Conference Papers (pp. 1-11).
- [2] **Mitra, R.**, Makatura, L., Whiting, E., & Chien, E. (2023, July). Helix-Free Stripes for Knit Graph Design. In ACM SIGGRAPH 2023 Conference Proceedings (pp. 1-9).
- [3] Huang, K., Subedi, D., **Mitra, R.**, Yung, I., Boyd, K., Aldrich, E., & Chitrakar, D. (2020). Telocomotion—remotely operated legged robots. *Applied Sciences*, 11(1), 194.
- [4] **Mitra, R.**, Boyd, K., Subedi, D., Chitrakar, D., Aldrich, E., Swamy, A., & Huang, K. (2020, October). Contact sensing via active oscillatory actuation. In 2020 3rd International Conference on Mechatronics, Robotics and Automation (ICMRA) (pp. 99-104). IEEE.
- [5] Huang, K., Chitrakar, D., **Mitra, R.**, Subedi, D., & Su, Y. H. (2020, July). 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.
- [6] Chitrakar, D., **Mitra, R.**, & Huang, K. (2020, November). Haptic interface for hexapod gait execution. In 2020 Fourth IEEE International Conference on Robotic Computing (IRC) (pp. 414-415). IEEE.
- [7] Huang, K., Su, Y. H., Khalil, M., Melesse, D., & **Mitra, R.** (2019, July). 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.

Teaching & Mentoring

Teaching Assistant, Geometric Algorithms
Mentor, Summer Geometry Initiative (SGI)

Teaching Assistant, Geometry Processing (Graduate Course) × 2
Teaching Assistant, Data Structures & Algorithms × 2
Teaching Assistant, Classical Mechanics
Teaching Assistant, Introduction to Computing
Teaching Assistant, Mobile Robotics
Robotics mentor, Tech Savvy

Volunteer Teacher, Hartford Teach the Teachers

Fall '24, BU.
Program to introduce geometry processing research to students globally. Summer '23, MIT.
Spring '23, Spring '24, BU.
Spring '20, Spring '21, TC.
Fall '20, TC.
Spring '19, TC.
Spring '19, TC.
American Association of University Women (AAUW) program introducing careers in STEM to middle school girls. Spring '18, '19.
Introductory robotics program for Hartford middle schools.

Talks/Presentations

Singular Foliations for Knit Graph Design	SIGGRAPH	2024
Singular Foliations for Knit Graph Design (Poster)	Eurographics SGP	2024
Helix-Free Stripes for Knit Graph Design	SIGGRAPH	2023
Stripe 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	Eurographics.	2024
President's Fellow in Physics, Class of 2021	Awarded to the strongest major in the graduating class. Trinity College.	2021
Best Computer Science Senior Thesis	Trinity College.	2021
President's Fellow in Physics, Class of 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 mathematics coursework. Trinity College.	2020
Faculty Honors	Trinity College.	All Semesters
Full Tuition Scholarship	Trinity College.	2017