

## Education

### Boston University (BU)

Ph.D., Computer Science

Advisor: [Edward Chien](#)

Research Focus: Computer Graphics, Geometry Processing, Digital Fabrication

Sept 2021 - present

### Trinity College (TC), 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

C++/C, Python, Java, Mathematica, MATLAB, OpenGL Shading Language (GLSL)

### Software/Libraries

Blender, MeshLab (3D modelling), Gurobi (optimization), LibIGL, geometry-central (geometric algorithms), polyscope (3D visualization), Eigen (numerical linear algebra), OpenGL (graphics programming), Git

## Work/Research Experience

### Game Development and Research Intern, Lightspeed Studios

Tencent Americas

May 2024 - present

Los Angeles, USA

- *Quad-dominant meshing for rendering/knitting*: Implementing a pipeline that uses custom striping algorithms to generate quad elements over cut & sew patterns (and extends to general 3D models) with the goal of developing novel meshing techniques for rendering and knitting of yarn-level models.

### Graduate Research Assistant, Computer Graphics Lab

Boston University

Sept 2021 - present

Boston, USA

- Conducting research in applying geometry processing techniques for tasks in digital fabrication, vector field design and remeshing.
- *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. This perspective allows for more robust graph generation, 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 end-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 statistical analysis of 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). Telelocomotion—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 & Service**

<b>Reviewer</b>	SIGCHI, '25
<b>Teaching Assistant, Geometric Algorithms</b>	Fall '24, BU.
<b>Mentor, Summer Geometry Initiative (SGI)</b>	Program to introduce geometry processing research to students globally. Summer '23, MIT.
<b>Teaching Assistant, Geometry Processing (Graduate Course) × 2</b>	Spring '23, Spring '24, BU.
<b>Teaching Assistant, Data Structures &amp; Algorithms × 2</b>	Spring '20, Spring '21, TC.
<b>Teaching Assistant, Classical Mechanics</b>	Fall '20, TC.
<b>Teaching Assistant, Introduction to Computing</b>	Spring '19, TC.
<b>Teaching Assistant, Mobile Robotics</b>	Spring '19, TC.
<b>Robotics mentor, Tech Savvy</b>	American Association of University Women (AAUW) program introducing careers in STEM to middle school girls. Spring '18, '19.
<b>Volunteer Teacher, Hartford Teach the Teachers</b>	Introductory robotics program for Hartford middle schools.

## ***Talks/Presentations***

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<b>Singular Foliations for Knit Graph Design</b>	SIGGRAPH	<i>Jul, '24</i>
<b>Singular Foliations for Knit Graph Design (Poster)</b>	Eurographics SGP	<i>Jun, '24</i>
<b>Helix-Free Stripes for Knit Graph Design</b>	SIGGRAPH	<i>Aug, '23</i>
<b>Stripe Patterns for Computational Knitting</b>	BU Graphics Seminar	<i>'22 - '24</i>
<b>Sampling of 3DOF Robot Manipulator</b>	IEEE ICARM	<i>Jul, '19</i>
<b>Joint-limits for Haptic Feedback</b>		

## ***Awards***

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<b>Eurographics Widening Participation Scholarship</b>	Eurographics.	<i>2024</i>
<b>Best Computer Science Senior Thesis</b>	Trinity College.	<i>2021</i>
<b>President's Fellow in Physics, Class of 2021</b>	Awarded to the strongest major in the graduating class. Trinity College.	<i>2021</i>
<b>Albert J. Howard Jr. Prize in Physics</b>	Awarded to the strongest major in the junior class. Trinity College.	<i>2020</i>
<b>Phi Gamma Delta Prize in Mathematics</b>	Awarded for outstanding performance in mathematics coursework. Trinity College.	<i>2020</i>
<b>Faculty Honors</b>	Trinity College.	<i>All Semesters</i>
<b>Full Tuition Scholarship</b>	Trinity College.	<i>2017</i>