# Aakriti Upadhyay

## EDUCATION

2023 Ph.D., Department of Computer Science, University at Albany, State University of New York

Dissertation: *Near Optimal Motion Planning Algorithms via a Topological and Geometric Perspective.*

Research interests: Robotics, Computational Geometry, Applied Mathematics, Algorithms and Data structures, and Machine Learning.

2018 M.Sc., Department of Computer Science, University at Albany, State University of New York

Master's Project: *Investigating Heterogeneous Planning Spaces.*

2015 B.E., Department of Computer Science and Engineering, University Visvesvaraya College of Engineering (UVCE), Bangalore University.

## JOURNAL PUBLICATIONS

**Aakriti Upadhyay**, and Chinwe Ekenna. "A New Tool to Study the Binding Behavior of Intrinsically Disordered Proteins." *International Journal of Molecular Sciences (IJMS)*. MDPI, 2023; 24(14):11785.

## CONFERENCE PUBLICATIONS

Mukulika Ghosh, **Aakriti Upadhyay**, and Chinwe Ekenna. "Topology-Driven Recovery Path Planning in Dynamic Obstacle Environments." In Proceedings of the Sixteenth Workshop on the Algorithmic Foundations of Robotics (WAFR), 2024.

Sihui Li, Matthew Schack, **Aakriti Upadhyay**, and Neil Dantam. "A Sampling Ensemble for Asymptotically Complete Motion Planning with Volume-Reducing Workspace Constraints." International Conference on Intelligent Robots and Systems (IROS), IEEE/RSJ. 2024. (**47.5%** acceptance rate)

**Aakriti Upadhyay**, Mukulika Ghosh and Chinwe Ekenna. "Minimal Path Violation problem with application to Fault Tolerant Motion Planning of Manipulators." *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2023. (**43.3%** acceptance rate)

**Aakriti Upadhyay**, and Chinwe Ekenna. "A geometric and topological analysis of the binding behavior of Intrinsically Disordered Proteins." *2022 IEEE International Conference on Bioinformatics and Biomedicine (BIBM).* IEEE, 2022. (**20%** acceptance rate)

**Aakriti Upadhyay**, Boris Goldfarb and Chinwe Ekenna. "Incremental Path Planning algorithm via Topological Mapping with Metric Gluing." *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2022. (**48%** acceptance rate)

**Aakriti Upadhyay**, Boris Goldfarb, Weifu Wang, and Chinwe Ekenna. "A New Application of Discrete Morse Theory to Optimizing Safe Motion Planning Paths." In *Algorithmic Foundations of Robotics XV: Proceedings of the Fifteenth Workshop on the Algorithmic Foundations of Robotics*, pp. 18-35. Cham: Springer International Publishing, 2022. (**55.9**% acceptance rate).

**Aakriti Upadhyay**, Tuan Tran, and Chinwe Ekenna. "A topology approach towards modeling activities and properties on a biomolecular surface." *2021 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*. IEEE, 2021. (**20%** acceptance rate)

**Aakriti Upadhyay**, Boris Goldfarb, and Chinwe Ekenna. "A topological approach to finding Coarsely Diverse Paths." *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2021. (**45%** acceptance rate)

**Aakriti Upadhyay**, Weifu Wang, and Chinwe Ekenna. "Approximating C-free space topology by constructing Vietoris-Rips Complex." *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2019. (**48%** acceptance rate)

**Aakriti Upadhyay** and Chinwe Ekenna. "Investigating heterogeneous planning spaces." *2018 IEEE International Conference on Simulation, Modeling, and Programming for Autonomous Robots (SIMPAR)*. IEEE, 2018.

## WORKSHOP PUBLICATIONS

**Aakriti Upadhyay** and Chinwe Ekenna. "Rapidly Exploring Random Search Explorer." In proceeding of *2018 IEEE International Conference on Intelligent Robots and Systems (IROS)* Workshop on *Machine Learning in Robot Motion Planning* (MLMP), October 2018.

## DIVERSITY, EQUITY & INCLUSION CONFERENCE PRESENTATIONS

Aakriti Upadhyay. "*Dynamic Path Planning with uncertainty*."

Work presented at the *Association for Computing Machinery (ACM) Richard Tapia Conference*, Doctoral Consortium, Washington, D.C., September 2022.

Aakriti Upadhyay and Chinwe Ekenna. "*A Topology-Aware Sampling-Based Motion Planner*."

Work presented at the *National Center for Women & Information Technology (NCWIT)* Graduate Collegiate Award Showcase (Virtual), June 2022.

Work presented at the *Association for Computing Machinery (ACM) Richard Tapia Conference*, Doctoral Consortium (Virtual), September 2021.

Aakriti Upadhyay, Weifu Wang, and Chinwe Ekenna. "*Approximating Cfree space topology by constructing Vietoris-Rips Complex*."

Poster presented at the *Association for Computing Machinery (ACM) Richard Tapia Conference*, San Diego, CA, USA, September 2019.

Aakriti Upadhyay and Chinwe Ekenna. "*Rapidly Exploring Random Search Explorer*."

Poster presented at the *Computing Research Association-Widening Participation (CRA-WP) Grad Cohort Workshop*, Chicago, IL, USA, April 2019.

Poster presented at the *Intelligent Robots and Systems (IROS)* Workshop on *Machine Learning in Robot Motion Planning (MLMP)*, Madrid, Spain, October 2018.

Poster presented at the *Association for Computing Machinery (ACM) Richard Tapia Conference*, Orlando, FL, USA, September 2018.

Aakriti Upadhyay and Chinwe Ekenna. "*Robot Motion Planning in Heterogeneous Space*."

Poster presented at the *Association for Computing Machinery (ACM) New York Celebration of Women in Computing (NYCWiC)*, Rochester, April 2017.

## RESEARCH EXPERIENCE

Nov 2023 - Present — Postdoctoral Fellow, Department of Computer Science, Colorado School of Mines.
My research focuses on developing a complete motion planner that utilizes the extracted information of a robot's configuration space to prove infeasible motion plans for manipulator robots.

May – July 2023 — Senior Research Aide, Department of Computer Science, University at Albany, State University of New York.

1. I worked on new research ideas independently, e.g., integration of topology methods with machine learning techniques.
2. I mentored an undergraduate student for the University at Albany Summer Research Program (UASRP) project. The project aims to design an algorithm to classify graspable and non-graspable areas of a teacup for an articulated linkage robot.

2017-22 — Research Assistant, Department of Computer Science, University at Albany, State University of New York.

My responsibilities included:

1. Design and development of algorithms and manuscripts preparation for submission to conferences or journals (ref. to publications).
2. Assist in grant/scholarship proposal writing.
3. Mentor undergraduate/master students on capstone project work.

## TEACHING EXPERIENCE

Fall 2018 - Spring 2023 — Teaching Assistant, Department of Computer Science, University at Albany, State University of New York.

Duties included Teaching, Grading, and Proctoring.

*Principles of Programming Languages. 4 sections*
*Finite Automata. 1 section*
*Algorithms and Data Structures. 5 sections*

*Discrete Mathematics and its Application. 1 section*

## PROFESSIONAL EXPERIENCE

Summer 2020 — Technology Intern, Living Resources Corporation (LRC), Albany, NY.
I gained experience working on a home assistant robot (MISTY) and developed software to help in serving people with intellectual and developmental disabilities.
*Technologies*: JavaScript, REST API, Google Dialogflow, and GitHub/GitLab.

Summer 2019 — Summer Research Intern, Oak Ridge National Laboratory (ORNL), Oak Ridge, TN.
I worked in the Department of Computer Science and Mathematics Division (CSMD) for the Discrete Computing Sciences (DCS) group and developed algorithms with application in time-series graphs, semantic mapping, and combinatorial integer optimization.
*Programming languages*: Python, CUDA C/C++, and PyCUDA.

Spring 2018 — Web Technology Intern, Association for the Cooperative Advancement of Science and Education (ACASE), Saratoga Spring, NY.
I developed an online application on WordPress platform for teachers to help improve evaluation and assessment skills for high school level education.

2015-16 — Software Engineer, NetCracker Technology, Bengaluru, KA, India.
I worked in the Back-End Integration team for the Canadian Client project TELUS and was involved in the development of NetCracker's Integration and Mediation Interface product that is used primarily in customer services.
*Software used*: Java, JavaScript, PL/SQL, Regex, JSON/XML, SOAP/REST API, JIRA, and CI/CD processes.

## HONORS AND AWARDS

March 2022 — Honorable Mention, Aspirations in Computing (AiC) Community.
2022 National Center for Women & Information Technology (NCWIT) Collegiate Award.
My research project was recognized for the innovative technical project award.

September 2018 — Student Research Competition, Association for Computing Machinery (ACM).
Poster competition, Association for Computing Machinery (ACM) Richard Tapia Conference.
I was awarded 2nd prize in the competitions for the poster entitled "*Rapidly Exploring Random Search Explorer*."

April 2017 — Poster competition, Association for Computing Machinery (ACM) New York Celebration of Women in Computing (NYCWiC).
I was awarded 1st prize for the poster entitled "*Robot Motion Planning in Heterogeneous Space*."

## SCHOLARSHIPS

| | |
|---|---|
| January 2023 | Graduate Student Association (GSA) Professional Development Award, University at Albany, State University of New York. |
| January 2022 | 2022 National Center for Women & Information Technology (NCWIT) Collegiate Finalist Award. |
| December 2021 | IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2021 (virtual), NSF student scholarship. |
| September 2021 | Association for Computing Machinery (ACM) Richard Tapia Conference 2021 (virtual), Tapia scholarship. |
| April 2021 | Computing Research Association – Women (CRA-W) Grad Cohort for Women Workshop 2021 (virtual), Student scholarship. |
| Summer 2020 | Great Danes Internship Scholarship, University at Albany, State University of New York.<br>Received for the internship at Living Resources Corporation (LRC). |
| April 2020 | Graduate Student Employees Union (GSEU) Professional Development Award, University at Albany, State University of New York. |

## TRAVEL GRANTS

| | |
|---|---|
| October 2023 | 2023 IEEE International Workshop on Intelligent Robots and Systems (IROS) Student Travel Award. |
| December 2022 | IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2022, NSF student travel award. |
| September 2022 | Association for Computing Machinery (ACM) Richard Tapia Conference 2022, NSF student travel award. |
| May 2022 | 15$^{th}$ International Workshop on the Algorithmic Foundations of Robotics (WAFR) 2022, NSF student travel award. |
| December 2021 | IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2021 (virtual), NSF student award. |
| November 2019 | 2019 IEEE International Workshop on Intelligent Robots and Systems (IROS) Student Travel Award. |
| September 2019 | Association for Computing Machinery (ACM) Student Research Competition (SRC) 2019, Travel Award. |

September 2019 Association for Computing Machinery (ACM) Richard Tapia Conference 2019, Tapia Scholarship.

April 2019 Computing Research Association – Women (CRA-W) Grad Cohort for Women Workshop 2019, Travel award.

September 2018 Association for Computing Machinery (ACM) Richard Tapia Conference 2018, Tapia student travel award.

September 2018 Association for Computing Machinery (ACM) Student Research Competition (SRC) 2018, ACM student travel award.

## PROFESSIONAL, UNIVERSITY, AND DEPARTMENTAL SERVICE

2025-26 Treasurer, IEEE Denver Section, Region 5.
I assist in managing the organization's finances, including creating and monitoring budgets and reporting financial information.

2022-23 Graduate Ambassador, Graduate School, University at Albany, State University of New York.
Assisted in webinars or with creation of content for Social Media Outlets, attended virtual and in person meet-ups with graduate students, and participated in recruiting and engagement events.

2020-22 Social Media Chair, SAC (Student Activities Committee), *Institute of Electrical and Electronics Engineers (IEEE) Robotics Automation Society (RAS)*.
Worked on marketing and publicization of events on social media channels for society.
Membership: IEEE, IEEE RAS

2019–21 Chair, *Association for Computing Machinery-Women (ACM-W)* Student Branch, University at Albany, State University of New York.
Organized general meetings to promote ACM-W as an organization and bring awareness to ACM-W resources to student members.
Membership: ACM, ACM-W

2019 IEEEXtreme Ambassador, *Institute of Electrical and Electronics Engineers (IEEE).*
Volunteered to promote and organize the IEEEXtreme 13.0 programming competition for the IEEE Region 1 (USA and Canada).
Membership: IEEE, IEEE Computer Society, IEEE WIE (Women in Engineering)

2016-17 Cultural Chair, *Indian Student Organisation (ISO)* Student Branch, University at Albany, State University of New York.
Organized and promoted cultural events like ISO Diwali Night and ISO Holi. Voluntarily supported event-related activities.
Membership: GSA (Graduate Student Association), University at Albany, State University of New York

## TECHNICAL SKILLS

**Programming languages**: C/C++, Python, Unix/Shell, Latex, Java, MATLAB.
**Operating Systems**: Windows, Linux (Ubuntu, OpenSUSE), MacOS.
**Software skills**: ROS (Robotics Operating System), Gazebo, RViz, Gnuplot, Google Dialogflow, GitLab, Dropbox, GitHub, Overleaf, Docker, Apache Tomcat, Apache Maven, WordPress, Eclipse, Putty, REST API, TortoiseSVN.
**Web technologies**: HTML5, CSS, XML, JSON, MySQL/SQL, JavaScript.