**Saurav Singh**

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**Rochester, NY 14620; Phone: +1 585-406-9183**

**Ph.D. Student | Robotics and AI Researcher | Machine Learning | Multimodal Fusion | Human-Robot Collaboration**

**Education**

* **Rochester Institute of Technology, Rochester, NY** *Aug 2020 – May 2025*

Ph. D. in Electrical and Computer Engineering *GPA: 4.0/4.0*

(Robotics, Artificial Intelligence & Human Factors)

Thesis: Human Aware Reinforcement Learning for Adaptive Human-Robot Teaming

Faculty Advisor: Jamison Heard

* **Rochester Institute of Technology, Rochester, NY** *Jan 2018 – July 2020*

M. S. in Electrical Engineering (Robotics) *GPA: 4.0/4.0*

Thesis: Push Recovery for Humanoid Robots using Linearized Double Inverted Pendulum

Faculty Advisor: Ferat Sahin

* **Guru Gobind Singh Indraprastha University, New Delhi, India** *Aug 2013 – May 2017*

B. Tech. in Electronics & Communication Engineering  *CPI: 81.85%*

**Relevant Skills**

* **Technical Skills**

Robotics | Human Factors | Human Robot Interaction | Reinforcement Learning | Deep Learning | Multimodal Data Fusion | Machine Learning | Cybernetics | Embedded Systems | Computer Vision | Generative AI | Large Language Models (LLMs) | Natural Language Processing (NLP)

* **Programming Skills**

Python [Advanced] | C/C++ [Intermediate] | MATLAB [Intermediate] | G-code [Basic] | MELFA Basic [Intermediate] | Fanuc TP Programming [Intermediate] | CNC-Machines [Basic]

* **Toolboxes**

PyToch| Keras | TensorFlow | Robot Operating System (ROS) | Moveit Motion Planning Framework (ROS) | OpenCV | Git | Version Control System (VCS/SCM) | Onshape (3D Modeling) | Fusion 360 (3D Modeling)

* **Soft Skills**

Leadership | Collaboration | Research | Time management | Adaptability | Lifelong learner | Curiosity | Critical Thinking | Communication

**Work Experience**

* **Rochester Institute of Technology, Rochester, NY** *May 2022 – Present*

*Graduate Research Assistant,* Department of Electrical & Microelectronics Engineering

* Developed a multimodal limited-data fusion method for Aerial Imagery.
* Developed a Modality Utilization metric for multimodal network, contributing towards the explainability aspect of the data fusion.
* Developed a Modality Utilization based training method for multimodal networks, promoting noise robustness in dominant modalities.
* **Emtech Foundation, New Delhi, India** *Jun 2017 – Dec 2017*

*Firmware Engineer*

* Developed embedded software for industry specific applications and systems including air cushion machine, Transcutaneous electrical nerve stimulation (TENS) machine, and water pump control system.
* Formulated a flow diagram for the system based on client requirement and implemented state-machine based firmware.

**Teaching Experience**

* **Rochester Institute of Technology, Rochester, NY** *Jan 2019 – May 2022*

*Graduate Teaching Assistant,* Department of Electrical & Microelectronics Engineering

* EEEE-536/636: Biorobotics/Cybernetics, Spring 2022.
* EEEE-585/685: Principles of Robotics, Fall 2020 & Fall 2019.
* EEEE-602: Random Signals and Noise, Spring 2020.
* EEEE-709: Advanced Engineering Mathematics, Spring 2020 & Spring 2019.
* EEEE-707: Engineering Analysis, Spring 2020 & Spring 2019.
* Multi-Agent BioRobotics Lab (MABL), Summers 2019.

**Publications**

**Journal Papers**

1. **S. Singh**, E. Rantanen and J. Heard, “Human-Robot Teaming: A Comprehensive Survey on Collaboration, Communication, and Cognition”, **submitted to** *ACM Transactions on Human-Robot Interaction.*
2. **S. Singh**, E. Saber, P. P. Markopoulos, and J. Heard, “[Regulating Modality Utilization within Multimodal Fusion Networks](https://www.mdpi.com/1424-8220/24/18/6054),” *Sensors, vol. 24*, no. 18, p. 6054, 2024.

**Conference Proceedings**

1. **S. Singh** and J. Heard, “[Measuring state utilization during decision making in human-robot teams](https://dl.acm.org/doi/abs/10.1145/3610978.3640676),” in *Companion of the 2024 ACM/IEEE International Conference on Human-Robot Interaction*, 2024, pp. 985–989.
2. K. Subramanian, **S. Singh**, J. Namba, J. Heard, C. Kanan and F. Sahin, “[Spatial and Temporal Attention-Based Emotion Estimation on HRI-AVC Dataset](https://ieeexplore.ieee.org/abstract/document/10394066),” *2023 IEEE International Conf. on Systems, Man, and Cybernetics (SMC)*, Honolulu, Oahu, HI, USA, 2023, pp. 4895-4900.
3. **S. Singh** and J. Heard, “[Probabilistic Policy Blending for Shared Autonomy using Deep Reinforcement Learning](https://ieeexplore.ieee.org/abstract/document/10309604),” *2023 32nd IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*, Busan, Korea, Republic of, 2023, pp. 1537-1544.
4. **S. Singh**, M. Sharma, J. Heard, J. D. Lew, E. Saber, and P. P. Markopoulos, “[Multimodal aerial view object classification with disjoint unimodal feature extraction and fully-connected-layer fusion](https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12522/1252206/Multimodal-aerial-view-object-classification-with-disjoint-unimodal-feature-extraction/10.1117/12.2664041.short#_=_),” in *Big Data V: Learning, Analytics, and Applications*, vol. 12522, p. 1252206, SPIE, 2023.
5. **S. Singh**, P. P. Markopoulos, E. Saber, J. D. Lew and J. Heard, “[Measuring Modality Utilization in Multi-Modal Neural Networks](https://ieeexplore.ieee.org/abstract/document/10195122),” *2023 IEEE Conference on Artificial Intelligence (CAI)*, Santa Clara, CA, USA, 2023, pp. 11-14.
6. A. Dust, C. Gonzalez-Lebron, S. Connell, **S. Singh**, R. Bailey, C. O. Alm, and J. Heard, “[Understanding differences in human-robot teaming dynamics between deaf/hard of hearing and hearing individuals](https://dl.acm.org/doi/abs/10.1145/3568294.3580146),” in *Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction*, pp. 552–556, 2023.
7. L. Nagahanumaiah, **S. Singh** and J. Heard, “[Diagnostic Human Fatigue Classification using Wearable Sensors for Intelligent Systems](https://ieeexplore.ieee.org/abstract/document/9812694),” *2022 17th Annual System of Systems Engineering Conference (SOSE),* 2022, pp. 424-429.
8. **S. Singh** and J. Heard, “[A Human-Aware Decision Making System for Human-Robot Teams](https://ieeexplore.ieee.org/abstract/document/9812641),” *2022 17th Annual System of Systems Engineering Conference (SOSE)*, 2022, pp. 268-273.
9. **S. Singh** and J. Heard, “[Human-aware reinforcement learning for adaptive human robot teaming](https://ieeexplore.ieee.org/abstract/document/9889530),” in *Proceedings of the 2022 ACM/IEEE International Conference on Human-Robot Interaction, ser. HRI ’22*. IEEE Press, 2022, p. 1049–1052.
10. R. Devasia, A. Gupta, S. Sharma, **S. Singh**, and N. Rathee, “[Electronic guitar midi controller for various musical instruments using charlieplexing method](https://link.springer.com/chapter/10.1007/978-981-13-7082-3_36),” in *Innovations in Computer Science and Engineering: Proceedings of the Sixth ICICSE 2018*, pp. 315–325, Springer, 2019.
11. N. Rathee, A. Gupta, **S. Singh**, R. Devasia, and A. Bansal, “[Digital resistance box: An approach to generate desired value of resistance by automatically varying the potentiometer](https://ieeexplore.ieee.org/abstract/document/7853694),” in *2016 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES)*, pp. 1–4, IEEE, 2016.

**Dissertations**

1. **S. Singh**, “[Push Recovery for Humanoid Robots using Linearized Double Inverted Pendulum](https://www.proquest.com/docview/2444376024?pq-origsite=gscholar&fromopenview=true&sourcetype=Dissertations%20&%20Theses),” Research Master Thesis, Rochester Institute of Technology, Rochester, NY, 2020.

**Presentations**

* Measuring State Utilization in Reinforcement Learning (*Invited Talk*)
  + Performance Engineering Laboratory (PEL) and Network Softwarization and Security Labs (NetsLab), University College Dublin; November 2023; Dublin Ireland.
* Probabilistic Policy Blending for Shared Autonomy using Deep Reinforcement Learning (*Presentation*)
  + 2023 32nd IEEE International Conference on Robot and Human Interactive Communication (RO-MAN); August 2023; Online (Held at Busan, Republic of Korea)
* Measuring Modality Utilization in Multi-Modal Neural Networks (*Poster*)
  + 2023 IEEE Conference on Artificial Intelligence (CAI), June 2023, Santa Clara, CA, United States
* Multimodal aerial view object classification with disjoint unimodal feature extraction and fully connected-layer fusion (*Presentation*)
  + Society of Photo-Optical Instrumentation Engineers (SPIE), Defense + Commercial Sensing Conference, May 2023, Orlando, FL, United States.
* Human-Aware Reinforcement Learning for Adaptive Human Robot Teaming (*Poster*)
  + AI@RIT Summit 2022; October 2022; Rochester, NY, United States
* A Human-Aware Decision-Making System for Human-Robot Teams (*Presentation*)
  + 2022 17th Annual System of Systems Engineering Conference (SOSE); June 2022; Rochester, NY, USA
* Human-Aware Reinforcement Learning for Adaptive Human Robot Teaming (*Presentation*)
  + 2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI); March 2022; Online (Originally Sapporo, Hokkaido, Japan).

**Professional Services**

* IEEE SMC 2023 Conference Core Volunteer for 2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC). Responsibilities included working on the registration desk, streaming the conference live, hosting/chairing virtual sessions, and preparing/managing the in-person events.
* Technical Program Committee member for System of Systems Engineering (SoSE) Conference, 2024
* Reviewer for:
* ACM/IEEE International Conference on Human-Robot Interaction, ACM/IEEE HRI
* System of Systems Engineering Conference, SoSE
* IEEE International Conference on Systems, Man, and Cybernetics, IEEE SMC
* IEEE International Conference on Robot and Human Interactive Communication, IEEE RO-MAN, Robotics and Automation Society

**Mentoring, Leadership and Activities**

* Served as the RIT AWARE-AI NRT Trainee Council Member for the 2nd Cohort (2023-2024). Responsibilities include representing the student body in the executive committee meetings, pursuing outreach activities and hosting cohort events.
* Student Mentor,NSF Research Experience for Undergraduates (REU), Rochester Institute of Technology, Summer 2022.
* Undergraduate Student Mentor, Head and Instructor for Embedded Systems & Robotics Special Interest Group (SIG), IEEE-MSIT chapter, Aug 2015 to July 2016, Guru Gobind Singh Indraprastha University, India.

**Honors and Awards**

* Dublin-Rochester International CRT-NRT Mobility Program Traineeship (Oct 2023 – Nov 2023). Selected as one of the four AWARE-AI NRT trainees at RIT to visit the ML-Labs (Science Foundation Ireland - Centre for Research Training in Machine Learning) in Ireland as a part of Dublin-Rochester International CRT-NRT Mobility Program.
* RIT AWARE-AI NSF Research Traineeship (NRT) (Aug 2022 – Present). Awarded a position as a trainee in an NSF-funded program to support underrepresented students in AI research. Conducted research work as a part of NRT AWARE-AI research, Hardware track (Track 2), developing and publishing work on image based emotion estimation system using transformers.
* 1st Runner Up at the Finals selection for World Skills Competition-Sao Palo, Brazil 2015, World Skills India, India, 2015.
* Winner of the National Selection for World Skills India, 2015 in the skill of Electronics (India)
* Winner of the Regionals Selection for World Skills India, 2015 in the skill of Electronics (India)

**Media Coverage**

* [AWARE-AI Newsletter – June 2024](https://www.rit.edu/emailcommunications/aware-ai-newsletter-june-2024-2/streamable), Trainee Spotlight. My efforts towards AWARE-AI research and improvement of the program were recognized.

**Certifications**

* [Introduction to Git and GitHub (Course Certificate)](https://coursera.org/share/c6ec2804b9712ab79ef6b99d0c57fa6b), an online non-credit course authorized by Google and offered through Coursera, 2024.
* [Generative AI Fundamentals (Specialization)](https://coursera.org/share/79e9e112aa8c969ded1783d580befb85) an online non-credit Specialization authorized by IBM and offered through Coursera, 2024. The specializations cover the following courses:
  + [Generative AI: Introduction and Applications (Course Certificate)](https://coursera.org/share/cf2db8d6fb34ff4e5e23fd6cad5b2b06)
  + [Generative AI: Prompt Engineering Basics (Course Certificate)](https://coursera.org/share/0fdbfac11337c6a58c75131c6268067a)
  + [Generative AI: Foundation Models and Platforms (Course Certificate)](https://coursera.org/share/6d73dc3e22b57126f234e66d97db253b)
  + [Generative AI: Impact, Considerations, and Ethical Issues (Course Certificate)](https://coursera.org/share/9888fa815a180d2a4988c182d508ad1c)
  + [Generative AI: Business Transformation and Career Growth (Course Certificate)](https://coursera.org/share/313a8acb1d6e4da397dcd23c877819fe)
* [Fundamentals of Reinforcement Learning (Course Certificate)](https://coursera.org/share/c820839a576e3740cfebc7174256c217), an online non-credit course authorized by University of Alberta, Alberta Machine Intelligence Institute and offered through Coursera, 2020.
* [Neural Networks and Deep Learning (Course Certificate)](https://coursera.org/share/e10cf594857ea309c211393a16872502), an online non-credit course authorized by DeepLearning.AI and offered through Coursera, 2020.
* FANUC CERT Handling Tool Operations and Programming, Fanuc, 2019.
* [Machine Learning (Coures Certificate)](https://coursera.org/share/f29961b60bebc4f774bbb7af1b53ea8a), an online non-credit course authorized by Stanford University and offered through Coursera, 2016.