Julia Santaniello

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Reinforcement Learning · Robotics · Neuroscience

Third-Year Computer Science and Human-Robot Interaction Joint Ph.D. Student at Tufts University. Dedicated to utilizing implicit neural signals to enhance Human-in-the-Loop RL for autonomous agent training.

Education

Tufts University, School of Engineering **2024 – Present**
Joint Doctor of Philosophy in Computer Science and Human-Robot Interaction ***Medford, MA***

Tufts University, School of Engineering **2024 – 2025**
Master of Science in Computer Science ***Medford, MA***

Tufts University, School of Engineering **2022 – 2024**
Post-Baccalaureate Certificate in Computer Science ***Medford, MA***

Lafayette College, School of Arts and Sciences **2018 – 2022**
Bachelor of Science in Neuroscience ***Easton, PA***

Publications

1. **Julia Santaniello**, Madelaine Brower, Benson Jiang, Donatello Sassaroli, Chenyuan Zhang, Robert Jacob, Jivko Sinapov. **Neuro-Loop: A Framework for Brain-Guided Reinforcement Learning (UNDER REVIEW)**, 2027. This paper introduces an offline approach to Human-in-the-Loop Reinforcement Learning from implicit fNIRS signals.

2. **Julia Santaniello**, Matthew Russell, Benson Jiang, Donatello Sassaroli, Robert Jacob, Jivko Sinapov. **Towards Reinforcement Learning from Neural Feedback: Mapping fNIRS Signals to Agent Performance** (17.6% Acceptance Rate). *In Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, 2026. Mapped fNIRS signals to artificial and robotic agent performance, a critical first step in the NEURO-LOOP framework. NEURO-LOOP is an implicit Human-in-the-Loop Reinforcement Learning framework that leverages brain signals to improve autonomous agent training.

3. **Julia Santaniello**, Madelaine Brower, Benson Jiang, Donatello Sassaroli, Chenyuan Zhang, Robert Jacob, Jivko Sinapov. **An offline approach to fNIRS-guided reinforcement learning for robot behavior (Workshop)**. *To Appear in the Proc. IROS Workshop on Nonverbal Cues for Human-Robot Cooperative Intelligence (IROS)*, 2026. A first look at guiding robot behavior with implicit fNIRS data via RL.

4. **Julia Santaniello**, Matthew Russell, Benson Jiang, Donatello Sassaroli, Robert Jacob, Jivko Sinapov. **Mapping Neural Signals to Agent Performance: A Step Towards Brain-Driven Human-Agent Interactions (Extended Abstract)**. In *Conference on Reinforcement Learning and Decision Making (RLDM)*, 2025. Explored the use of fNIRS as an implicit feedback mechanism for evaluating artificial agent performance.

5. Matthew Russell, Qing Zhong, Kenneth Zheng, Kuangyi Hu, **Julia Santaniello**, Robert Jacob. **LLM-Tools' Effects on Users During Complex Decision-Making with fNIRS (Extended Abstract)**. *4th Neuroadaptive Technology Conference*, 2025. Explored the effects of Large Language Models (LLMs) on human users with fNIRS during a complex decision-making task while using Microsoft Copilot 365.

Research Experience

Tufts University, MuLIP/HCI Lab **May 2023 – Present**
Graduate Researcher *Medford, MA*

- **Reinforcement Learning from Neural Feedback:** Initiated an interdisciplinary project between two labs focused on utilizing implicit neural and biofeedback to train robotic and artificial agents via human-in-the-loop reinforcement learning. **Advisors**: Dr. Jivko Sinapov and Dr. Robert Jacob.

Michigan State University, Krishnan Lab **May 2021 – August 2021**

Research Intern *East Lansing, MI*

- Collaborated on a project to apply Natural Language Processing (NLP) techniques to extract genetic links from millions of published research papers, ranking terms that correlate most with certain genes. **Advisor**: Dr. Arjun Krishnan.

Lafayette College, BCI Lab **January 2019 – May 2022**

Student Researcher *Easton, PA*

- Studied EEG-based Brain-Computer Interfaces (BCI) and its application to brain-controlled wheelchairs, robots, drones, and computer cursors. **Advisors**: Dr. Lisa Gabel and Dr. Yih-Choung Yu.

Grants & Fellowships

Emotiv Discovery Grant **2026**

Lead Proposal Writer | Funded *Emotiv*

- Primary co-author of a funded grant proposal, co-written with a fellow lab member. This grant proposal won $\$5,000$ in hardware and up to $\$20,000$ in support from Emotiv Neurotechnologies. PIs: Dr. Robert Jacob, Dr. Jaylin Herskovitz and Dr. Jivko Sinapov.

NSF DREAM Fellowship **June 2023 – Dec. 2023**

Fellowship Recipient *Colorado School of Mines / NSF*

- Awarded six months of funding from the Colorado School of Mines and the National Science Foundation (NSF) to conduct part-time research on a computational project at a partner institution. This funding has contributed to the evolution of my current doctoral thesis.

Awards & Honors

AAAI 2026 Travel Award Recipient **January 2026**

Travel Award *NSF/AAAI*

- Received a competitive travel award to attend the AAAI 2026 conference in Singapore.

Tufts BRIDGE Scholarship **Sept. 2022 – May 2024**

Scholarship Recipient *Tufts University*

- Awarded the BRIDGE Scholarship, which supports applicants from small liberal arts colleges with strong academic records to pursue a STEM graduate certificate or degree at Tufts University. The scholarship aims to bridge the gap between smaller institutions that offer a well-rounded liberal arts education with R1 research-oriented training and resources.

Teaching Experience

Tufts University, Lecturer **Summer 2025 - Present**

Graduate Course Lecturer *Medford, MA*

- **CS 138 - Reinforcement Learning:** Currently leading instruction for the graduate level reinforcement learning course at Tufts University for the Fall 2025 and Fall 2026 semester.
- **EN 47 - Exploring Computer Science** Co-instructor alongside Dr. Diane Souvaine: teaching computer science fundamentals to undergraduates at Tufts University (Fall 2026).
- **CS 131 - Artificial Intelligence:** Led instruction for a graduate level artificial intelligence course. Taught material, created and graded exams, initiated class discussion and led Teaching Assistants during the Summer 2025 semester.

Tufts University, Teaching Assistant **Sept 2024 – Present**

Teaching Assistant (TA) *Medford, MA*

- **CS 141 - Probabilistic Robotics for HRI:** Taught students techniques related to robot localization, perception, and planning.
- **CS 131 - Artificial Intelligence:** Helping students learn the history, theory, and computational methods of AI.

Talks

Tufts Human-Robot Interaction Colloquium **March 2025**

- Presented current results and future work accepted at RLDM 2025: **Mapping Neural Signals to Agent Performance, A Step Towards Reinforcement Learning from Neural Feedback**.

Posters

Mapping fNIRS Signals to Agent Performance **TIAI Discovery Event 2025**

- A poster outlining early research on human-in-the-loop reinforcement learning frameworks driven by implicit Brain-Computer Interfaces.

Mapping Neural Signals to Agent Performance **RLDM 2025**

- A poster outlining early research on human-in-the-loop reinforcement learning frameworks driven by implicit Brain-Computer Interfaces.

Correlating Implicit Neural Data to RL Task Statistics for Artificial Agent Learning **DREAM 2024**

- A poster highlighting preliminary research possible through the NSF DREAM Fellowship.

A General NLP Approach to Automatically Interpret Any Gene List Based on the Literature **ISMB 2022**

- After my research internship at Michigan State University, my colleagues at the Krishnan Lab presented the resulting work at ISMB 2022.

Service & Leadership

Academic Mentor: Boston Partners in Education | *Boston Public Schools* **2024 – Present**

- Academic mentor for a small group of 10th-grade students learning AP Calculus and Algebra 2. Helping guide their educational and intellectual growth.

Tufts Computer Science Graduate Student Association (CSGSA) | *President* **2024 – Present**

- Plan and execute events, activities and outreach programs.

Tufts Association for Computing Machinery's Council for Women (ACM-W) | *Treasurer* **2025 – 2026**

- Manage budgeting for club programming.

Tufts Graduate School Council (GSC) | *Student Life Chair* **2025 – 2026**

- Initiate, manage and execute events and activities for graduate students in the Art, Science and Engineering Schools at Tufts University.

Reverse Science Fair Judge: Medford High School | *Medford Public Schools* **October 2024**

- Medford High School's Reverse Science Fair offers a unique twist on the traditional format by allowing PhD mentors to present their own research to high school mentees before they begin their own science fair projects.

Skills & Competencies

Languages: Python, C++, Java
Software: Pytorch, ROS, OpenCV, Simulink
Tools: Linux, Jupyter Notebook, Anaconda, Git