Julia Santaniello

Somerville, MA 02144

julia.santaniello@tufts.edu https://github.com/your-profile (correct) julia-r-santaniello

Reinforcement Learning · Robotics · Neuroscience

First-Year Computer Science Ph.D. Student at Tufts University. Dedicated to leveraging implicit neural feedback to enhance Human-in-the-Loop Reinforcement Learning for artificial and robotic agent learning.

Education

Doctor of Philosophy in Computer Science **2024 - Present**
Tufts University, School of Engineering *Medford, MA*

Master of Science in Computer Science **2023 - 2024**
Tufts University, School of Engineering *Medford, MA*

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

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

Research Experience

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

- **Implicit Neural Feedback for RL (DREAM Fellow):** Initiated a collaborative project between the MuLIP and HCI labs, under the guidance of Dr. Jivko Sinapov and Dr. Robert Jacob. The research focuses on leveraging neuro/biofeedback to train robotic and artificial agents through human-in-the-loop reinforcement learning (HITL-RL). Developing a novel, implicit neural feedback framework that can be used to align robot actions with human goals and values.
- **Multi-Modal Tool Classification (Research Assistant):** Engaged in a robotics project in the MuLIP lab. Utilizing RL methodologies to teach a robot to select and use various tools for identifying substances within a container.

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 user-inputted genes.
- Pre-processed and cleaned genetic and biological data, employing statistical methods to predict gene function from the dataset.
- This work was presented by colleagues at ISMB 2022 (Intelligent Systems for Molecular Biology) under the title: "A General NLP Approach to Automatically Interpret Any Gene List Based on the Literature".

Lafayette College, BCI Lab **January 2019 – May 2022**
Student Researcher *Easton, PA*

- Utilized an EEG-based BCI to control a wheelchair, robot, drone, and computer cursor system using various neural signals.
- Collaborated with the National Center for Adaptive Neurotechnologies (NCAN) to classify articles for NCAN's comprehensive BCI database. Organized articles by specific topics to facilitate researchers in finding related works in one place.

Teaching Experience

Tufts University, Probabilistic Robotics **Sept 2024 – Present**
Teaching Assistant (TA) *Medford, MA*

- **Probabilistic Robotics for HRI:** Taught students techniques for probabilistic state estimation and helped apply them to problems such as robot localization, mapping, perception, and planning in the context of Human-Robot Interaction. Helped provide an introduction to relevant machine learning and computer vision techniques that are commonly used by robots while interacting with humans.

Posters

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. A description of this project can be found under **Research Experiences**.

Projects

Hide-and-Seek with Sphero | *ROS, Python* **Feb. 2024 - May 2024**

- **Hide-and-seek with Sphero:** Completed an interactive demo where a Sphero robot plays hide-and-seek with a LoCoBot. Utilized probabilistic methods to reduce uncertainty about Sphero's potential hiding spots. Through tracking and motion planning, the LoCoBot effectively rediscovered Sphero's location despite occlusion.

Awards

NSF DREAM Funding Recipient **June 2023 – Dec. 2023**

Funding Award 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.

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.

Community and Outreach

Boston Partners in Education **September 2024 - Present**

Academic Mentor *City of Boston Public Schools*

- Academic mentor for a small group of 10th-grade students learning Algebra 2, helping guide their educational and intellectual growth. I provide support both in class and beyond, offering encouragement and mentorship to students who face challenges at home, emotionally, or in school, aiming to inspire hope and confidence in their academic journey.

Medford High School Reverse Science Fair **October 2024 -Present**

Science Fair Mentor and Judge *City of Medford Public Schools*

- Medford High School's Reverse Science Fair offers a unique twist on the traditional format by allowing PhD mentors to judge high school student projects. The process unfolds in three phases: first, PhD students present their own research. Over the following months, they mentor high school students on their projects, providing guidance and support. Finally, the PhD students serve as judges for the fair, creating a more relaxed and encouraging environment, as the high school participants are already familiar with them as mentors.

Elementary School Outreach Program **Spring 2022**

Presenter/Tutor *City of Easton Public Schools*

- Tutored elementary school students and delivered engaging presentations on neuroscience topics designed to captivate young learners. The program aimed to inspire an early interest in STEM and brain health. Topics covered included: "How Your Brain Sees Illusions," "Exercise and the Brain," and "The Neuroscience Behind Pets and Service Animals."

Easton K-12 Summer Arts Program **Summer 2021**

Donation Facilitator *City of Easton Public Schools*

- Facilitated donations to Easton's Summer School Arts Program by donating art supplies and materials from the Lafayette Association of Visual Artists and Art Department. Supplies included paint, craft materials and various art tools to be used for K-12 summer art projects.

Leadership

Tufts CSGSA | *Vice President* **2024 - Present**

- Plan and run events and outreach programs for the Tufts Computer Science Graduate Student Association.
- Act as a representative for PhD students within the Computer Science Department and develop academic and outreach opportunities for doctoral students.

Lafayette Neuroscience Club | *President* **2020 - 2022**

- Led the primary Neuroscience Program-affiliated club at Lafayette College with 150+ members and 6 board members. Directed events including: guest speakers, community activities, internship networking and graduate school panels with successful attendance.

Lafayette Association of Visual Artists | *President* **2020 - 2022**

- Successfully led a visual arts club through COVID-19 with 100+ members and 5 board members. Directed art events for the entire campus and the surrounding community with overflowing attendance at most. Donated art supplies to community projects and led major annual events that were widely known by the student body and neighborhood.

Society of Women Engineers | *Treasurer* **2021 - 2022**

- Managed the budget for SWE-related events, like local activities and the SWE National Conference. Helped plan local events with the budget available, and prepared for success in following years by creating an annual budget and semester budget.

WJRH Lafayette Radio Station | *Head Sound Engineer* **2021 - 2022**

- **Lafayette College:** Led a group of engineers to fix radio station equipment and keep Lafayette students' shows on-air throughout the semester. Fixed WJRH station computers, off-air program malfunctions, radio broadcasting issues, and set up stages for campus musical groups.

Skills and Competencies

Languages: Python, C++, Java
Software: Pytorch, ROS, OpenCV, Simulink
Tools: Linux, Jupyter Notebook, Anaconda, Git
Other: AI/ML, RL, Neural Networks

Relevant Coursework

- Artificial Intelligence
- Reinforcement Learning
- Probabilistic Robotics
- Human-Robot Interaction
- Computer Vision
- Computational Neuroscience