

SUNNY AMATYA

sunnyamatya@gmail.com, 602-517-8295, www.linkedin.com/in/sunny-amatya-709a99154,
<https://sunamatya.github.io/>

Summary:

Research engineer modeling humans in human-robot interaction, working with ideas such as primitive, intermittency, and transfer, which are common human qualities with strong mathematical and control backing. Strong background in reinforcement and deep learning, intent inference, and planning algorithms

Education:

- | | |
|--|--------------------------------------|
| • PhD in Systems Engineering Arizona State University (ASU) | 09/2018 - estimated (11/2024) |
| • MSc in Robotics Università degli studi di Genova, Italy | 09/2017 - 09-2018 |
| • MSc in Advanced Robotics École Centrale de Nantes, France | 09/2016 - 07/2017 |
| • BSE in Mechatronics Engineering Asian Institute of Technology (AIT) | 09/2011 - 05/2015 |
-

Technical Skills

- **Programming Language / Framework:** Python, C++, MATLAB, ROS
 - **Libraries:** Tensorflow, PyTorch, Keras, Numpy
 - **Miscellaneous:** Simulation tools (Gazebo, Meta-Drive, Commonroad-RL, Overcooked-AI), Linux (Ubuntu)
-

Professional Experience:

Graduate Researcher - Robotics and Intelligent Systems Laboratory, ASU 05/2019- Present

Developed algorithms in intent inference, motion planning, and value transfer to address the research problem of modeling human behavior in human-robot interaction. Worked as a part of a larger team and ensured project completion in the following projects.

Transfer learning | Deep Learning, Multi-Agent Reinforcement Learning, Planning

- Applied Successor Feature-based Multi-Agent Reinforcement Learning (MARL) Algorithm to test transfer in a turn-based game. Successfully conducted transfer experiment with reduced cost function in transfer between models. Contraction proof for the proposed transfer in the Markov game model.
- Implemented Successor feature for transfer learning in planning algorithms like MCTS to perform multi-step inference and verified in Interaction Dataset.

Efficient Human Modeling | Reinforcement Learning, Intent Inference, Optimization

- Programmed RL algorithm to test the cost and benefits of calculating equilibrium parameters in incomplete information dynamic games. Using a two-vehicle uncontrolled intersection case, this algorithm reduces the computation cost of updates by 59%.
- Introduced a lane-changing scenario for the generation of the Hamilton-Jacobi-Bellman solution for multi-agent interaction.
- Published two papers in top venues for control and robotics: the American Control Conference (ACC) 2022 titled, "When Shall I Estimate Your Intent? Costs and Benefits of Intent Inference in Multi-Agent Interactions" and IEEE International Conference of Robotics and Automation (ICRA), 2021 titled "When Shall I Be Empathetic? The Utility of Empathetic Parameter Estimation in Multi-Agent Interactions"

Tightly Coupled Interaction | Motion Primitive, Human Learning, pHRI

- Implemented and tested Dynamic Movement Primitives (DMP) for learning human walking in a three-legged walking scenario. This algorithm predicts human gait between interactions as well as within interactions with 45% higher accuracy than the baseline algorithm.

- Quantified human behavior using Bounded Rationality in upper limb pHRI using NOVIT Falcon.
- Published two papers titled “Human Learning and Coordination in Lower-limb Physical Interactions” at ACC 2020 and “Bounded Rational Game-theoretical Modeling of Human Cooperation under Incomplete Information” at the International Conference on Intelligent Robots and Systems (IROS), 2022

Identification of Research Needs and SOTA in HRI | Thematic Analysis, Literature Review

- Studied Latent Dynamics in HRI and conducted a literature review. Identified models used for Mutual Adaptation and Influence. Work titled “Mutual Adaptation and Influence: Survey of Latent Dynamics Models in Human-Robot Interaction” submitted in IEEE Transactions on Human-Machine Systems (THMS) 2024.
- Conducted thematic analysis from responses from participants of industry, academia, and defense on the requirements for a Human-Autonomy Teaming Testbed. Work titled “Research Needs in Human-Autonomy Teaming: Thematic Analysis of Priority Features for Testbed Development” published in the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2024

Graduate Researcher - Bio-Inspired Robotics Laboratory, ASU

09/2018- 05/2019

Fabricated and tested soft robots. This included fabricating soft robots using fabric and silicone. Characterized soft robots to build control models for the soft robots and tested in real-life applications.

Soft Robots | Rapid Prototyping, Sensor Characterization

- Fabricated an anthropomorphic soft ankle prosthesis and tested a fabric-based soft robotic ankle mimicking human torque during walking. Fabricated and characterized soft sensors.
- Published three research papers titled “Towards an Untethered Knit Fabric Soft Continuum Robotic Module with Embedded Fabric Sensing” in the IEEE International Conference of Soft Robotics (RoboSoft), 2020, “Design, Development, and Control of a Fabric-Based, Soft Ankle Module to Mimic Human Ankle Stiffness” in International Conference on Rehabilitation Robotics (ICORR), 2019 and "Fabric Soft Grippers Grippers Capable of Selective Distributed Bending for Assistance of Daily Living Tasks" in IEEE International Conference of Soft Robotics (RoboSoft), 2019

Graduate Researcher - DIBRIS, UNIGE

12/2017- 09/2018

Developed planning and prediction model for task and motion planning in multi-agent systems.

Goal-Based Cooperation and Reasoning for Heterogeneous Robots | Planning, Reasoning

- Developed High-level planning using predicate logic for controlling aerial and mobile robots Developed hybrid planning for cooperative task and motion planning using SOTA PDDL+ planner in ROS using C++.
- Papers presented in the AAAI Fall Symposium titled “Towards Perception Aware Task and Motion Planning”, and I-RIM titled "Task-assisted Motion Planning in Belief Space" and RSS workshop on Exhibition and Benchmarking of Task and Motion Planners, 2018 titled "Task-Motion Planning in Belief Space"

Research Assistant - Vision and Graphics Lab, AIT

10/2015 – 07/2016

Developed Vision-based algorithm for object detection and tracking in low-frame rate videos

Computer Vision

- Completed a project on HOG detection and tracking models for low-frame rate videos. Conducted research on supervised learning methods: SVM, pattern recognition, feature-keypoint detection, and mathematical modeling.

Awards

- Block Grant University Graduate Fellowship by The Polytechnic School, ASU for Spring 2020, Fall 2023
- American Control Conference (ACC) Travel Award 2022, 2023
- Graduate Collage Travel Award by the Graduate School, ASU for 2022
- Robotics Science and System (RSS) Inclusion Award 2020
- European Masters in Advanced Robotics (EMARO+) scholarship for 2016-2018
- Asian Institute of Technology (AIT) fellowship on a merit basis for 2012, 2013, and 2014 with 6 dean’s list.