Sunny Amatya
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Education

Arizona State University (ASU)
PhD in Systems Engineering
09/2018 - Present

European Masters for Advanced Robotics (EMARO+)
École Centrale de Nantes, France (first year)
Università degli Studi di Genova, Italy (second year)
09/2016 - 09/2018

Asian Institute of Technology (AIT)
B.Sc.E. Mechatronics Engineering (3.81/4 CGPA)
09/2011 - 05/2015

Professional Experience

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

- **Successor Feature for Transfer in Games** 05/2022 - Present
  - Implemented Successor Feature-based Reinforcement Learning Algorithm to test transfer in turn-based games.
  - Provided contraction proof for the proposed transfer in Markov game model.

- **Efficient Learning and Planning for Social Autonomous Vehicles** 05/2022 - Present
  - Implemented Frenet frame for motion planning and Successor Feature-based Tree Search Algorithms.
  - Verified proposed algorithms using the Interaction Dataset.

- **Reinforcement Learning for Collaborative Multi-Agent Environment** 01/2024 - 05/2024
  - Set up Multi-Agent Reinforcement Learning Algorithm in Overcooked-AI platform for baseline verification.

- **Latent Dynamics Identification in HRI** 06/2023 - 06/2024
  - Conducted literature review and identified latent dynamics in Human-Robot Interaction.
  - Identified models used for mutual adaptation and influence.

- **NSF-CCRI Working Group for Requirements HAT Testbed** 01/2023 - 10/2023
  - Performed thematic analysis from responses of industry, academia, and defense participants to identify requirements for a Human-Autonomy Teaming Testbed.

- **Intermittent Empathetic Intent Inference Algorithm for AVs** 05/2021 - 05/2022
  - Implemented reinforcement learning algorithm to test the costs and benefits of equilibrium parameter calculation in incomplete information dynamic games.
  - Developed platform-agnostic generalizable approach using Frenet frame.

- **Identification of Driving Primitives in Multi-Vehicle Interaction** 10/2020 - 05/2021
  - Implemented driving primitives in round-about scenario based on INTERACTION dataset.
  - Developed Monte Carlo Method for finite horizon Nash equilibrium solution for driving primitives.

- **Parameter Estimation of Empathetic Intent Inference Algorithm** 05/2020 - 10/2020
  - Implemented lane-changing scenario for generation of Hamilton-Jacobi-Bellman Solution for multi-agent interaction.

- **Physical Human-Human Interaction for Quantifying Human Learning** 05/2019 - 05/2020
  - Implemented and tested Dynamic Movement Primitives for learning human walking in a three-legged walking scenario.
  - Quantified human behavior using Bounded Rationality in upper limb pHRI.

Graduate Researcher
Bio-Inspired Robotics Laboratory, ASU
09/2018 - 05/2019

- **Anthropomorphic Robotic Ankle Prosthesis with Programmable Materials**
  - Fabricated and tested fabric-based soft robotic ankle mimicking human torque during walking.

Graduate Researcher
DIBRIS, UNIGE
12/2017 - 09/2018

- **Goal-Based Cooperation and Reasoning for Heterogeneous Robots**
  - Developed high-level planning using predicate logic for controlling aerial and mobile robots.
  - Created hybrid planning for cooperative task and motion planning using state-of-the-art PDDL+ planner.
  - Developed framework in ROS using C++.

Research Assistant
Vision and Graphics Lab, AIT
10/2015 – 07/2016

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

Bachelor's Thesis
Asian Institute of Technology
01/2015 – 05/2015

- **Actuation of Scorbot ER III using Hand and Finger Gestures**
  - Developed Visual C++ with Kinect Libfreenect Library and Robotics Toolbox in Matlab for real-time robotic arm manipulation.

Industrial Internship
Head Stack Assembly, Western Digital
05/2014 – 07/2014

- Worked on automatic displacement machine to test headstack in hard drives.

Research Internship
IDEAS Lab, Rajamangala University of Technology
05/2013 – 08/2013

- Developed a graphical interface for model platform screen door and model train using Visual C.

Publications

- **Amatya, S**., Zhang, W. "Successor Feature for Transfer in Games" IEEE Robotics and Automation Society (RA-L), 2024 (In submission)
- Smith, M., **Amatya, S**., Soltanian, S. Y., Bush, J., Zhang, W. "Mutual Adaptation and Influence: Survey of Latent Dynamics Models in Human-Robot Interaction" IEEE Transactions on Human-Machine Systems (THMS), 2024 (In Review)
- **Amatya, S**., Smith, M., Amresh, A., Gorman, J., Johnson, M., Cooke, N., Zhang, W. "Research Needs in Human-Autonomy Teaming: Thematic Analysis of Priority Features for Testbed Development" IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2024
- Wang, Y., Shintre, P., **Amatya, S**., Zhang, W. "Bounded Rational Game-theoretical Modeling of Human Cooperation under Incomplete Information" International Conference on Intelligent Robots and Systems (IROS), 2022

- **Amatya, S**., Ghimire, M., Ren, Y., Xu, Z., Zhang, W. “When Shall I Estimate Your Intent? Costs and Benefits of Intent Inference in Multi-Agent Interactions” American Control Conference (ACC), 2022
- Chen, Y., Zhang, L., Merry, T., **Amatya, S**., Zhang, W., Ren, Y. “When Shall I Be Empathetic? The Utility of Empathetic Parameter Estimation in Multi-Agent Interactions” IEEE International Conference on Robotics and Automation (ICRA), 2021
- Nguyen, P. H., Qiao, Z., Seidel, S., **Amatya, S**., Mohd, I. I. B., Zhang, W. “Towards an Untethered Knit Fabric Soft Continuum Robotic Module with Embedded Fabric Sensing” IEEE International Conference on Soft Robotics (RoboSoft), 2020
- **Amatya, S**., Rezayat Sorkhabadi, S. M., Zhang, W. “Human Learning and Coordination in Lower-limb Physical Interactions” American Control Conference (ACC), 2020
- Thomas, A., **Amatya, S**., Mastrogiovanni, F., Baglietto, M. "Task-assisted Motion Planning in Belief Space" Italian Conference on Robotics and Intelligent Machines (I-RIM), 2019
- **Amatya, S**., Lafmejani, A. S., Poddar, S., Sridar, S., Sugar, T., Polygerinos, P. “Design, Development, and Control of a Fabric-Based, Soft Ankle Module to Mimic Human Ankle Stiffness” International Conference on Rehabilitation Robotics (ICORR), 2019
- Nguyen, P. H., Sridar, S., **Amatya, S**., Thalman, C. M., Polygerinos, P. "Fabric Soft Grippers Capable of Selective Distributed Bending for Assistance of Daily Living Tasks" IEEE International Conference on Soft Robotics (RoboSoft), 2019
- Thomas, A., **Amatya, S**., Mastrogiovanni, F., Baglietto, M. “Towards Perception Aware Task and Motion Planning” AAAI 2018 Fall Symposium, 2018
- Thomas, A., **Amatya, S**., Mastrogiovanni, F., Baglietto, M. "Task-Motion Planning in Belief Space" RSS Workshop on Exhibition and Benchmarking of Task and Motion Planners, 2018
- **Amatya, S**., Petchartee, S. "Real-time Kinect based robotic arm manipulation with five degrees of freedom." IEEE Asian Conference on Defence Technology (ACDT), 2015

Skills

- **Deep Learning Platforms:** TensorFlow, PyTorch
- **Programming Languages:** Python, C++
- **Machine Learning:** Training and testing machine learning algorithms
- **Scene Understanding:** Behavior understanding, social cue recognition, intention prediction, action anticipation, important agent identification, motion forecasting, multi-modal event reasoning

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Awards

- Block Grant University Graduate Fellowship by The Polytechnic School, ASU (Spring 2020, Fall 2023)
- American Control Conference (ACC) Travel Award (2022, 2023)
- Graduate College Travel Award by the Graduate School, ASU (2022)

- Robotics Science and System (RSS) Inclusion Award (2020)
- European Masters in Advanced Robotics (EMARO+) scholarship (2016-2018)
- Asian Institute of Technology (AIT) fellowship (2012, 2013, 2014)
- Top 10 in Thai Ariel Mission Engineering Challenge (TAMECH), representing AIT