Joshua R. Bhagat Smith

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Education

Oregon State University Corvallis, OR
PhD Robotics and AI 2020-2024

University of Arkansas Fayetteville, AR
MS Computer Science 2015-2017

University of Arkansas Fayetteville, AR
BS Computer Engineering 2011-2015

Skills

Software/Tools: C++ | Python | C# | Java | ROS | Pytorch | Pyro | Docker | DDS | ZeroMq | AWS | Protobuf | MATLAB

Technical Skills: Machine Learning | Bayesian Inference | Decision Making Under Uncertainty | Reinforcement Learning | Sensor Fusion | Optimization | Human-Robot Interaction | Multi-Robot Systems | Swarm Robotics

Soft Skills: Leadership | Cross-functional Collaboration | Effective Communication | Technical Writing | Critical Thinking | Time Management | Research Presentation | Mentoring

Professional Experience

AI & ML Lead Engineer, Peraton 2024-

- Autonomy R&D team. Our team investigated techniques to enable the interoperability of heterogeneous autonomy frameworks, with an emphasis on maritime, multi-robot systems and contested logistics applications.

Graduate Research Assistant, Oregon State University 2020-2024

- Led technical efforts for several projects focused on multi-robot systems and human-robot interaction.
- Adaptive Workload Estimation for Human-Robot Teams
  - Created an novel human state estimation system that leverages wearable sensors and Bayesian meta-learning to model the dynamics of cognitive workload.
  - Led a team of five researchers in training machine learning models, programming autonomous robots, and developing real-time physiological signal processing software.
- Transparent Management of Robot Swarm using Graph-based Dynamic Models
  - Developed human-swarm interface that allowed a single human to simultaneously control four robot swarms each containing 200 agents.
  - Investigated biologically inspired control algorithms and density estimation techniques for characterizing the behavior of adversarial agents, preventing them from impacting the swarm's decision making.
  - Enhanced transparency of the system by leveraging a heuristic prediction and a discrete-time Markov chain algorithm to inform users about the swarm's long-term behavior.
- Multi-Vehicle Management for Drone Delivery Systems
  - Collaborated to design and conduct human subject evaluations to establish appropriate performance parameters for human supervision of multiple uncrewed aircraft (i.e., 500+).

Senior Software Engineer, HERE Technologies 2017-2020

- Highly Autonomous Driving group. Our team built an automated, high-accuracy map to enable autonomous driving functionality from large scale vehicle sensor systems.
- Assisted in designing machine learning and statistical models of vehicle sensor data.
- Developed cloud infrastructure to scale data processing to analyze millions of kilometers daily.

Research Intern, NASA Langley Research Center Summer 2016

- Research focused on UAV navigation methods, near the ground, that avoid fixed obstacles such as buildings, power lines and trees.

Publications

UNPUBLISHED MANUSCRIPTS (IN PREP. OR UNDER REVIEW):

J. Bhagat Smith, J.A. Adams. "Adaptive Workload Modeling for Unknown Tasks", ACM Transactions on Human-Robot Interaction, 2024. (In Preparation).

J. Bhagat Smith, J.A. Adams. "Improving Cross-task Workload Estimation with Bayesian Meta-Learning", IEEE Transactions on Human Machine Systems, 2024. (In Review).

J. Bhagat Smith, P. Baskaran, J.A. Adams. "Influence of Honeybee Inspired Drifter Agents." PloS one, 2024. (In Review).

J. Bhagat Smith, J.A. Adams. "Workload Estimation for Unknown Tasks: A Survey of Machine Learning Under Distribution Shift", in Journal of Cognitive Engineering and Decision Making, 2024. (In Review).

PEER REVIEWED PUBLICATIONS:

J. Bhagat Smith, M.R. Giolando, V. Mallampati, P. Baskaran, J.A. Adams. "Experimental Design Principles for Develop Machine Learning Models for Human-Robot Interaction", Springer Nature, Discovering Frontiers in Human-Robot Interaction, 2024.

J. Bhagat Smith, P. Baskaran, J.A. Adams. "Improving Transparency in Human-Collective Visualizations", *IEEE International Symposium on Robot and Human Interactive Communication*, Pasadena, CA, USA, pp. 1-7 2024.

J. Bhagat Smith, V. Mallampati, P. Baskaran, M.R. Giolando, J.A. Adams, 'Design Principles for Building Robust Human-Robot Interaction Machine Learning Models'," in *Companion of the ACM/IEEE International Conference on Human-Robot Interaction*, Late Breaking Report, 2024

F. Aderinto*, **J. Bhagat Smith***, M.R. Giolando, P. Baskaran, J.A. Adams, 'Improving Human-Robot Team Transparency with Eye-tracking based Situation Awareness Assessmen'," in *Companion of the ACM/IEEE International Conference on Human-Robot Interaction*, Late Breaking Report, USA, 2024 **[Best LBR Nominee]**

J. Bhagat Smith*, S.A Toribio*, P. Baskaran, J.A. Adams. "Uncertainty-Aware Visual Workload Estimation for Human-Robot Teams" in *Conference on Cognitive and Computational Aspects of Situation Management (CogSIMA)*, Philadelphia, PA, USA, 2023, pp. 1-8

J. Bhagat Smith, P. Baskaran and J. A. Adams, "Decomposed Physical Workload Estimation for Human-Robot Teams," IEEE International Conference on Human-Machine Systems (ICHMS), Orlando, FL, USA, 2022, pp. 1-6

P. Baskaran, , **J. Bhagat Smith**, J.A. Adams. "Visual Task Recognition for Human-Robot Teams" in *IEEE International Conference on Human-Machine Systems*, Orlando, FL, USA, 2022, pp. 1-6

A. Moore, M. Schubert, T. Fang, **J. Smith**, N. Rymer. "Lidar-derived Navigational Geofences for Low Altitude Flight Operations," in *AIAA AVIATION FORUM*, Virtual Event, 2020.

A. Moore, M. Schubert, S. Balachandran, M. Consiglio, C. Munoz, **J. Smith**, D. Lewis, P. Schneide. "Inspection of Electrical Transmission Structures with UAV Path Conformance and Lidar-based Geofences," in *2018 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT)*, Washington, DC, USA, 2018, pp. 1-5. 2018.

J. Smith, M. Gashler. "An Investigation of How Neural Networks Learn from the Experiences of Peers Through Periodic Weight Averaging," in *IEEE International Conference on Machine Learning and Applications (ICMLA)* Cancun, Mexico, 2017, pp. 731-736

Mentoring

Mentees:

2023 **Robert Lucas**, Undergraduates Research Assistant, OSU

2022 **Simone Angelo S. Toribio**, Research Experience for Undergraduates Student, OSU