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

Professional Experience

2024- **AI & ML Lead**, Peraton, Autonomy IRAD Team
2020-2024 **Graduate Research Assistant**, Oregon State University, Human Machine Teaming Lab
2017-2020 **Senior Software Engineer**, HERE Technologies
2015-2017 **Graduate Teaching Assistant**, EECS Department, University of Arkansas
2016 **Research Intern**, Dynamic Systems and Controls Branch, NASA Langley Research Center

Skills

- **Technical Skills:** Python | C++ | Java | C# | Scala | Pytorch | ROS | CUDA | Pyro | Pandas | Unity | AWS | Machine Learning | Bayesian Inference | Planning Algorithms | Reinforcement Learning |Wearable Sensors | Experimental Design | Human Factors
- **Soft Skills**: Effective Communication | Cross-functional Collaboration | Technical Writing | Critical Thinking | Time Management | Research Presentation | Mentoring | Leadership

Research Experience

Peraton — Herndon, VA

- Investigating AI/ML techniques to facilitate human-robot collaboration for large scale multi-robot systems.
- Robotics lead for the Autonomy IRAD team. Our team investigated interoperability of heterogeneous multi-robot systems with a emphasis on marine autonomy platforms and autonomous logistics applications.

Oregon State University - Robotics/Artificial Intelligence — Corvallis, OR

- Dissertation: “Adaptive Workload Estimation for Human-Robot Teams”
  - Created an novel human state estimation system that leverages wearable sensors and Bayesian meta-learning methods to model the dynamics of human workload for unknown tasks.
  - Led a team of five researchers in building real-time physiological signal processing software, conducting human-subject studies, creating machine learning models, and programming autonomous robots.

- “Multi Vehicle Management”, Sponsor: USRA
  - Collaborated to design and conduct human subject evaluations to establish appropriate performance parameters for human supervision of multiple uncrewed aircraft operating beyond visual line of sight.

- “Transparent Management of Hub-based Colonies using a Graph-based Dynamic Model”, Sponsor: ONR
  - Improved a Unity-based, human-swarm interface by incorporating a heuristic prediction algorithm that informed operators of the long-term impact of their actions.

- “Resilient Emergent Properties for Autonomous Agent InteRactions”, Sponsor: DARPA
  - Evaluated a novel swarm agent algorithm that utilized density estimation to evaluate behavioral characteristics of adversarial agents to prevent them from influencing a swarm’s decision making.

HERE Technologies Boulder, CO

- 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.

NASA Langley Research Center - Dynamic Systems and Controls Branch Hampton, VA

- Project: "Unmanned Aerial Vehicle Inspection of Electrical Transmission Structures"
- Research focused on UAV navigation methods, near the ground, that avoid fixed obstacles such as buildings, power lines and trees.

University of Arkansas - Computer Science Fayetteville, AR

- Thesis: "How neural networks learn from the experiences of peers through periodic weight averaging."
- Investigated the impact of communication topologies had on federated learning algorithms.

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 Engineer 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:

2023-2024 **Vivek Mallampati**, Robotics PhD Student, OSU
2023-2024 **Favour Aderinto**, Robotics PhD Student, OSU
2023 **Robert Lucas**, Undergraduates Research Assistant, OSU
2022 **Simone Angelo S. Toribio**, Research Experience for Undergraduates Student, OSU