

# Joshua R. Bhagat Smith

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## Education

### Oregon State University

PhD Robotics and AI (GPA: 3.9/4.0)

- Advisor: Dr. Julie A. Adams
- Dissertation: "Adaptive Workload Estimation for Human-Robot Teams"

Corvallis, OR

2020-current

### University of Arkansas

MS Computer Science (GPA: 3.8/4.0)

- Advisor: Dr. Michael Gashler
- Thesis: "How neural networks learn from the experiences of peers through periodic weight averaging."

Fayetteville, AR

2015-2017

### University of Arkansas

BS Computer Engineering (GPA: 3.3/4.0)

- Minors in Math, Physics

Fayetteville, AR

2011-2015

## Professional Experience

2023- **Lab Lead**, Oregon State University, Human Machine Teaming Lab

2020- **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

### Oregon State University - Robotics/Artificial Intelligence

Advisor: Dr. Julie A. Adams

Corvallis, OR

2020-current

- Dissertation: "Adaptive Workload Estimation for Human-Robot Teams"
  - Research focusing on robust and flexible human-robot collaboration.
  - Created an novel human state estimation system that uses multi-modal machine learning 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: Universities Space Research Agency
  - 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.
  - Analyzed human factors and hardware considerations required to develop a Concept of Operations outlining criteria for a mutli-uncrewed aircraft system monitoring for signs of early wildland fire.

- “Transparent Management of Hub-based Colonies using a Graph-based Dynamic Model”, Sponsor: Office of Naval Research
  - 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: Defense Advanced Research Projects Agency
  - 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

Supervisor: Dr. Jake Anderson

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.

### NASA Langley Research Center - Dynamic Systems and Controls Branch

Hampton, VA

Advisor: Dr. Andrew Moore

Summer 2016

- 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

Advisor: Dr. Michael Gashler

2015-2017

- 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

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### UNPUBLISHED MANUSCRIPTS (IN PREP. OR UNDER REVIEW):

**J. Bhagat Smith**, J.A. Adams. “Workload Estimation for Unknown Tasks: A Survey of Machine Learning Under Distribution Shift”, in IEEE Transactions on Cognitive and Developmental Systems, 2024. (In Review).

**J. Bhagat Smith**, P. Baskaran, J.A. Adams. “Improving Transparency in Human-Collective Visualizations”, IEEE International Symposium on Robot and Human Interactive Communication, 2024. (In Submission).

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

**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, Emerging Frontiers in Human-Robot Interaction, 2024. (In Preparation).

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

### PEER REVIEWED PUBLICATIONS:

**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 Assessment’, 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