Joshua R. Bhagat Smith

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Education

Oregon State University — Corvallis, OR
PhD Robotics and AI (GPA: 3.9/4.0) — 2020-current
- Advisor: Dr. Julie A. Adams
- Dissertation: "Adaptive Workload Estimation for Human-Robot Teams"

University of Arkansas — Fayetteville, AR
MS Computer Science (GPA: 3.8/4.0) — 2015-2017
- Advisor: Dr. Michael Gashler
- Thesis: "How neural networks learn from the experiences of peers through periodic weight averaging."

University of Arkansas — Fayetteville, AR
BS Computer Engineering (GPA: 3.3/4.0) — 2011-2015
- Minors in Math, Physics

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
2016 **Research Intern**, Dynamic Systems and Controls Branch, NASA Langley Research Center

Skills

- **Technical Skills:** Python | C++ | Java | C# | Scala | Pytorch | ROS | Pandas | AWS | Scipy/Numpy | Git | CUDA | Machine Learning | Bayesian Inference | Distribution Shift | Meta-Learning | Deep Learning | Reinforcement Learning | Experimental Design
- **Soft Skills**: Time Management | Effective Communication | Collaboration | Critical Thinking | Technical Writing | Research Presentation | Mentoring | Leadership

Research Experience

Oregon State University - Robotics — Corvallis, OR
Advisor: Dr. Julie A. Adams — 2020-current
- Dissertation: "Adaptive Workload Estimation for Human-Robot Teams"
  - Created an innovative human state estimation system by applying non-IID machine learning to estimate a human's workload for unknown tasks (i.e., under distribution shift) in real-time.
  - 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.
  - Lab Lead:

- "Multi Vehicle Management", Sponsor: Universities Space Research Agency
  - Collaborated to design and conduct a 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 which monitoring for signs of early wildland fire.

- "Transparent Management of Hub-based Colonies using a Graph-based Dynamic Model", Sponsor: Office of Naval Research
  - Enhance a 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

- Lane Topology Optimization Team
  - Scaled HD mapping algorithms for self-driving cars to update all of North America every 5 minutes.

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"
  - Developed a clustering algorithms of light detection and ranging data to generate geofences around electrical power lines.

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.

Mentoring

Responsibilities

- Designed, planned, and supervised undergraduate research projects.
- Reviewed, edited, and provided guidance on research papers.
- Organized lab working groups to educate younger students on technical concepts, software engineering tools and best practices, and skills for navigating research projects efficiently.

Mentees:

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

Publications

UNPUBLISHED MANUSCRIPTS (IN PREP. AND UNDER REVIEW):

J. Bhagat Smith, J.A. Adams. "Towards Workload Estimation for Unknown Tasks: A Survey of Non-IID Machine Learning for HRI," in IEEE Transactions on Cognitive and Developmental Systems, 2024. (In Review).

J. Bhagat Smith, J.A. Adams. "Adaptive Workload Modeling with Probabilistic Meta-Learning", IEEE Transactions on Human-Machine Systems, 2024. (In Preparation).

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

J. Bhagat Smith, P. Baskaran, J.A. Adams. "Improving Transparency in Human-Collective Visualizations", IEEE Transactions on Human-Machine Systems, 2024. (In Preparation).

PEER REVIEWED CONFERENCE PAPERS:

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

SHORT PEER-REVIEWED CONFERENCE, WORKSHOP AND LATE BREAKING PAPERS:

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* Boulder, CO, USA, 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* Boulder, CO, USA, 2024