Rohit Mallick

rmallic@clemson.edu — ro.mallick@gmail.com

Education

2020–2024 **Ph.D. Human-Centered Computing**, *Clemson University*, South Carolina
Advisor: **Dr. Nathan McNeese**

2016–2020 **B.S. Brain and Behavioral Sciences**, *Purdue University*, West Lafayette, Indiana
Minor: Computer Science

Current Appointment

2020–Present **Clemson University** *Graduate Research Assistant (GRA)*, **Team Research Analytics in Computational Environments (TRACE)**

Lab Director(s): **Drs. Nathan McNeese & Christopher Flathmann**

Senior Ph.D. student with a research focus on the utility of emotion in human-AI teams and its ability to facilitate social support. Additional interests include investigations into human-AI collaborative decision-making to enhance team cognition and AI communicative strategies to clarify its interpretability to human teammates. Further illustrated in *Active Projects* section of CV.

Prior Work Experience

Summer 2020 **Oak Ridge Institute of Science and Education** *Summer Journeyman Fellow*, U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor: **Dr. Nick Waytowich**

- Due to the worldwide COVID-19 pandemic, I worked from home to refine my computer science knowledge and skills. As such, I developed complex reinforcement learning algorithms for robotic manipulation based on a variety of literature and various classwork found online.

2018–2020 **Purdue University** *Undergraduate Research Assistant (URA)*, **Computational Cognitive Neuroscience Lab (CCN)**

Lab Director: **Dr. Sébastien Hélie**

- Project lead on a computational approach to compare reinforcement learning algorithms with human neural visual processing with Dr. Sébastien Hélie as the acting advisor/principal investigator.
- Worked under doctoral student Pallavi Mishra to conceptualize and construct a study that investigates human cognition in estimating 3D visual perception from 2D images. Human participant data informed the development of an artificial deep convolution neural network capable of mimicking human visual perception.

Summer 2019 **Oak Ridge Institute of Science and Education** *Journeyman Fellow*, U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor: **Dr. Nick Waytowich**

- Project: Design supervised and unsupervised AI algorithms for a drone to autonomously land on a moving target. This is a high priority for AI development research as it improves its ability to adapt to a dynamically changing task as dictated by situational changes.
- Created a 3D simulation of drones as a platform to demonstrate proof of concept ideas to minimize potential damage to real-world drones.
- Developed an imitation learning algorithm that would concurrently work alongside novel reinforcement learning algorithms implemented by the group.

Summer 2018 **Oak Ridge Institute of Science and Education** *Summer Journeyman Fellow*, U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor: **Dr. Nick Waytowich**

- Project: Our group investigated the design of new human-in-the-loop learning algorithms for physical ground robots.
- I applied Dr. Waytowich's novel reinforcement learning algorithm, originally designed for virtual Atari Bowling, to a novel context: a physical ground robot.
- Established a multi-purposed physical testing environment for the ground robot.

Summer 2017 **College Qualified Leaders (CQL)**, *Summer Student* at U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor: **Dr. Anthony Ries**

- Project: Investigated the relationship between reaction time and fixation onset asynchrony in humans.
- To test this, I created a psychopy experiment in Python in conjunction with a Tobii eye tracker to compile eye metrics with reaction time. Varying the perceptual difficulty with gabors and their respective spatial frequency.
- Results: We found that reaction time does vary as a function of stimulus onset asynchrony.

Summer 2016 **Oak Ridge Institute of Science and Education** *Summer Journeyman Fellow*, U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor(s): **Drs. Anthony Ries, Jon Touryan, Brent Lance**

- Published a conference paper on the use of eye metrics to index cognitive workload in video games.
- This summer was dedicated to completing statistical analyses of the previous summer's data and writing the publication as the first author.

Summer 2015 **Science and Engineering Apprenticeship Program** *Summer Student*, U.S. Army Research Laboratory - Human Research and Engineering Directorate

Mentor(s): **Drs. Anthony Ries, Jon Touryan, Brent Lance**

- Project: Researched the relationship between eye metrics and cognitive workload.
- This project was a subset of an overarching exploration of the relationship between eye tracking and electroencephalography (EEG) for improvising visual search and user interfaces.
- I was personally responsible for structuring the code that processed a large amount of data and compiling it into a comprehensible format for analysis.

Summer 2014 **Science and Engineering Apprenticeship Program** *Summer Student*, U.S. Army Research Laboratory - Sensors and Electron Devices Directorate (SEDD)

Mentor: **Dr. William Nothwang**

- Project: Focused on developing an autonomous micro-quadcopter capable of surveillance and reconnaissance through SLAM mapping and more.
- Reviewed Wi-Fi modules to study frequency's impact on radio propagation in diverse environments, ensuring data transmission for quadcopters in varied settings like forests and buildings.

Active Projects

Promoting Human Teammate Well-Being and Task Motivation through Socially Supportive Artificial Intelligent Teammates in Human-AI Teams

Dissertation:

- Focuses on understanding the role of emotional displays by an AI teammate and the perceptual implications it has on their human teammates in completing mutual tasks. This research project aims to understand:
  1. The emotional needs humans have when placed in teams with AI teammates
  2. The performative and perceptual impact emotional tone has on the AI's behavioral decision-making
  3. The ability of an AI teammate to provide artificial emotional support and how it compares to the other levels of social support
  4. Whether the facets of social support can augment human capability through dimensions of creativity, motivation, and well-being

Office of Naval Research (ONR) subcontract through ARA, Human-Centered Dashboard Design and Development for Decision Aid Models *Current Funding Project*

PI: Nathan McNeese. $196,338. McNeese funding based on percentage credit (100%): $196,338.

Collaborators: Drs. Nathan McNeese, and Christopher Flathmann; Ph.D. Student Heba Aly

- Current funded project. TRACE and additional collaborators within the Human-Centered Computing department at Clemson University work alongside Applied Research Associates (ARA) Inc. to develop a human-centered dashboard for the U.S. Navy's Human Resource webpage.
  1. Develop an Enterprise strategic planning decision support capability validated and accepted by MPTE stakeholders as a common operational picture
  2. Capture interconnections and time delays and enable rapid 'what if' analysis on readiness outcomes
  3. Integrate with analytic capability in the Manpower, Personnel, Training, and Education (MPTE) Authoritative Data Environment (ADE)

Virtual Prototyping in Ground Systems (VIPR-GS): 1.2 Enhanced Situational Intelligence for Off-Road Depot Vehicle through Collaborative Perception and Human-Centered Algorithmic Intent

PI: Zoran Filipi. $18,450,281. McNeese funding based on percentage credit (4.6%): $851,244

Collaborators: Drs. Nathan McNeese, Kapil Chalil Madathil, Yue Wang, Goutam Koley, Bing Li, Yunyi Jia,

- Funded project from Fall 2020 to Summer 2023. The Ground Systems and Vehicles Center (GVSC) of the United States Army Combat Capabilities Development Command (CCDC) works alongside Clemson University to create the next-generation combat vehicle. As a sub-project within this overall goal, project 1.2 is tasked with researching situational intelligence through collaborative perception and human-centered algorithmic intent. In close collaboration with Dr. Kapil Chalil Madathil's team, our mutual goals include:
  1. understanding the barriers and facilitators towards artificial intelligence integration within existing soldier teams
  2. understanding human preferences for task efficiency in regards to the features of explainable AI and transparent AI
  3. development of a digital twin of the Clemson University experimental forest as a high-fidelity simulation environment for Human-Agent Team training and experimentation
  4. investigation of multi-modal communication devices to improve task efficiency

Skills and Technology Experience

Programming Python, Java, C, Robot Operating System (ROS), Matlab

Tools Robotics (Boston Dynamics Spot, Xaxxon Oculus Prime SLAM Navigator), Virtual Environment Building (Gazebo, Godot), GitHub, Tensorflow, Autodesk Inventor, Adobe Photoshop, Adobe Lightroom

Research Quantitative Analysis, Qualitative Analysis, Wizard of Oz, Experimental Design, Reinforcement Learning, Task Analysis

Publications

Journal Articles

[J.3] **Mallick R.**, Flathmann, C., Lancaster, C., Hauptman, A., McNeese, N. J., & Freeman, G., (2023). The Pursuit of Happiness: The Power and Influence of AI Teammate Emotion in Human-AI Teamwork. *Behaviour & Information Technology* (in-press) https://doi.org/10.1080/0144929X.2023.2277909

[J.2] Flathmann, C., Schelble, B. G., Rosopa, P. J., McNeese, N. J., **Mallick, R.**, & Madathil, K. C., (2023). Examining the Impact of Varying Levels of AI Teammate Influence on Human-AI Teams. *International Journal of Human-Computer Studies* (pp. 103061) https://doi.org/10.1016/j.ijhcs.2023.103061

[J.1] Schelble, B. G., Flathmann, C., McNeese, N. J., Freeman, G., & **Mallick, R.** (2022). Let's Think Together! Assessing Shared Mental Models, Performance, and Trust in Human-Agent Teams. *Proceedings of the ACM on Human-Computer Interaction. GROUP.* (Vol. 6, No. 13, pp. 1-29) Association of Computing Machinery (ACM). https://doi.org/10.1145/3492832

Conference Papers

[C.8] **Mallick, R.**, Sawant, S., Brady, C., McNeese, N. J., Madathil, K. C., & Bertrand, J., (2023). Can We Build it? Yes, We Can! Development Procedure of High-Fidelity Simulation Environments for Human-Agent Teams. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. Sage CA: Los Angeles, CA: SAGE Publications. https://doi.org/10.1177/21695067231192225

[C.7] Sawant, S. **& Mallick, R.**, Brady, C., Madathil, K. C., McNeese, N. J., Bertrand, J., & Rangaraju, N., (2023). Balancing the Scales of Explainable and Transparent AI Agents within Human-Agent Teams. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. Sage CA: Los Angeles, CA: SAGE Publications.

[C.6] Sawant, S., **Mallick, R.**, Brady, C., Madathil, K. C., McNeese, N. J., Bertrand, J., & Rangaraju, N., (2023). Human-AI teams in complex military operations: Soldiers' perception of intelligent AI agents as teammates in human-AI teams. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. Sage CA: Los Angeles, CA: SAGE Publications. https://doi.org/10.1177/21695067231192423

[C.5] Musick, G., Schelble, B. G., **Mallick, R.**, & McNeese, N. J., (2023). Selective sharing is caring: Toward the design of a collaborative tool to facilitate team sharing. *Proceedings of the 56th Hawaii International Conference on System Sciences* (pp. 428) https://hdl.handle.net/10125/102681

[C.4] Schelble, B. G., Lancaster, C., Duan, W., **Mallick, R.**, McNeese, N. J., & Lopez, J., (2023). The Effect of AI Teammate Ethicality on Trust Outcomes and Individual Performance in Human-AI Teams. *Proceedings of the 56th Hawaii International Conference on System Sciences* (pp. 322) https://hdl.handle.net/10125/102668

[C.3] **Mallick, R.**, Sawant, S., McNeese, N. J., & Madathil, K. C., (2022). Designing for Mutually Beneficial Decision Making in Human-Agent Teaming. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 66, No. 1, pp. 392-396). Sage CA: Los Angeles, CA: SAGE Publications. https://doi.org/10.1177/1071181322661358

[C.2] Sawant, S., **Mallick, R.**, Madathil, K. C., & McNeese, N. J., (2022) Mutually beneficial decision making in human-AI teams: Understanding soldier's perception and expectations of AI teammates in human-AI teams. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 66, No. 1, pp. 287-289). Sage CA: Los Angeles, CA: SAGE Publications. https://doi.org/10.1177/1071181322661355

[C.1] **Mallick, R.**, Slayback, D., Touryan, J., Ries, A.J., & Lance, B.J., (2016) The Use of Eye Metrics to Index Cognitive Workload in Video Games. *2016 IEEE Second Workshop on Eye Tracking and Visualization (ETVIS)* (pp. 60-64). Institute of Electrical and Electronics Engineers (IEEE). https://doi.org/10.1109/ETVIS.2016.7851168

Under Review

[UR.1] Flathmann, C., **Mallick, R.**, Brady, C., Srivastava, S., McNeese, N. J., Madathil, K. C., O'Neill, T. A., (Under Review). Team Composition and Interdependence: Empirically Linking Two Fundamental Teaming Considerations in Human-AI Teams *Human–Computer Interaction*

[UR.2] Macdonald, J., **Mallick, R.**, Wollaber, A., Peña, J., McNeese, N. J., Siu, H. C., (Under Review). Language, Camera, Autonomy! Prompt-engineered Robot Control for Rapidly Evolving Deployment. *In 2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE.

[UR.3] Hauptman, A., **Mallick, R.**, Flathmann, C., McNeese, N. J., (Under Review). Human Factors Considerations for the Context-Aware Design of Adaptive Autonomous Teammates. *Ergonomics*

[UR.4] **Mallick, R.**, Flathmann, C., Duan, W., Schelble, S., McNeese, N. J., (Under Review). What You Say vs What You Do: Utilizing Positive Emotional Expressions to Relay AI Teammate Intent within Human-AI Teams *International Journal of Human-Computer Studies*

Published Abstracts *(Not Peer-Reviewed)*

[PA.3] **Mallick, R.**, Pesce-Rodriquez, R., (2017) Quantifying Visual Perception Before, Upon, and After an Eye Fixation, *2017 ARL Summer Student Program, Volume II: Compendium of Abstracts (ARL-SR-0388)* (p. 95) Army Research Laboratory Adelphi.

[PA.2] **Mallick, R.** Pesce-Rodriquez, R., (2016) The Use of Eye Metrics to Index Cognitive Workload in Video Games, *2016 ARL Summer Student Program, Volume II: Compendium of Abstracts ARL-TM-2016a* (p. 31), Army Research Laboratory Adelphi.

[PA.1] **Mallick, R.** Pesce-Rodriquez, R., (2015) Correlations Between Tetris Fall Speeds and Eye Movement, *2015 ARL Summer Student Program, Volume II: Compendium of Abstracts ARL-TM-2015a* (p. 35), Army Research Laboratory Adelphi.

Works in Progress

[WP.1] **Mallick, R.**, Sawant, S., Brady, C., McNeese, N. J., Madathil, K. C., & Bertrand, J., Insights towards the development of Soldier-Centered AI Teammates for Acceptance and Improved Team Effectiveness within the Army *Venue TBD*

[WP.2] Sawant, S., **Mallick, R.**, Brady, C., Madathil, K. C., McNeese, N. J., & Bertrand, J., Development of High-Fidelity Simulation Environment to promote Soldier-AI Teaming Initiatives *Applied Ergonomics*

[WP.3] Lancaster, C. M., **Mallick, R.**, Flathmann, C., & McNeese, N. J. Put Me in Coach: From Training with AI Tools to Training for HAT Strategy. *Computer Supported Cooperative Work (CSCW)*

Professional Presentations

Conference Presentations

[CP.6] Macdonald, J., **Mallick, R.**, McNeese, N. J., Wollaber, A., Peña, J., & Siu, H. C., "Demonstration of the Context-observant LLM-Enabled Autonomous Robots (CLEAR) System," *Recent Advances in AI for National Security (RAAINS)*, Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Lexington, MA, 13-16 November 2023 *Upcoming*

[CP.5] Sawant, S., **Mallick, R.**, Brady, C., Madathil, K. C., McNeese, N. J., Bertrand, J., & Rangaraju, N., "Human-AI teams in complex military operations: Soldiers' perception of intelligent AI agents as teammates in human-AI teams", *67th Annual Meeting for the Human Factors and Ergonomics Society*, Washington Hilton, District of Columbia, 27 October 2023.

[CP.4] **Mallick, R.**, Brady, C., & McNeese, N. J., "Development of Soldier-Centered AI to enhance Situational Awareness within Human-Agent Teams" *VIPR-GS Student Symposium*, Clemson University International Center for Automotive Research (CU-ICAR), Greenville, SC, 1 March 2023

[CP.3] **Mallick, R.**, Sawant, S., McNeese, N. J., & Madathil, K. C., "Designing for Mutually Beneficial Decision Making in Human-Agent Teaming" *66th Annual Meeting for the Human Factors and Ergonomics Society*, Atlanta Marriott Marquis, Georgia, 12 October 2022.

[CP.2] Sawant, S., **Mallick, R.**, Madathil, K. C., & McNeese, N. J., "Mutually beneficial decision making in Human-AI teams under uncertainty: Understanding soldier's perceptions and expectations of AI teammates" *66th Annual Meeting for the Human Factors and Ergonomics Society*, Atlanta Marriott Marquis, Georgia, 11 October 2022.

[CP.1] **Mallick, R.**, Ries, A., Touryan, J., Slayback, D., & Lance, B., "The Use of Eye Metrics to Index Cognitive Workload in Video Games" *IEEE – Vis (ETVIS)*, Hilton Baltimore, Maryland, 23 October 2016.

Poster Presentations

[PP.10] Macdonald, J., **Mallick, R.**, McNeese, N. J., Wollaber, A., Peña, J., & Siu, H. C., "Context-observant LLM-Enabled Autonomous Robots (CLEAR)," *Recent Advances in AI for National Security (RAAINS)*, Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Lexington, MA, 13-16 November 2023

[PP.9] **Mallick, R.**, Sawant, S., Brady, C., McNeese, N. J., Madathil, K. C., & Bertrand, J., "Can We Build it? Yes, We Can! Development Procedure of High-Fidelity Simulation Environments for Human-Agent Teams," *67th Annual Meeting for the Human Factors and Ergonomics Society*, Washington Hilton, District of Columbia, 25 October 2023.

[PP.8] Sawant, S. **& Mallick, R.**, Brady, C., Madathil, K. C., McNeese, N. J., Bertrand, J., & Rangaraju, N., "Balancing the Scales of Explainable and Transparent AI Agents within Human-Agent Teams," *67th Annual Meeting for the Human Factors and Ergonomics Society*, Washington Hilton, District of Columbia, 25 October 2023.

[PP.7] **Mallick, R.**, Sawant, S., McNeese, N. J., & Chalil Madathil, K., "Enhancing Situational Intelligence through Explainable and Transparent AI Teammates," *VIPR-GS Student Symposium*, Clemson University International Center for Automotive Research (CU-ICAR), Greenville, SC, 1 March 2023

[PP.6] Sawant, S., **Mallick, R.**, Chalil Madathil, K., & McNeese, N. J., "Building multimodal interfaces to enhance team situation awareness," *VIPR-GS Student Symposium*, Clemson University International Center for Automotive Research (CU-ICAR), Greenville, SC, 1 March 2023

[PP.5] **Mallick, R.**, McNeese, N. J., Brooks, J., & Chalil Madathil, K., "Building bi-directional HCA frameworks for Human-Artificial Intelligent Teams," *VIPR-GS Student Symposium*, Clemson University International Center for Automotive Research (CU-ICAR), Greenville, SC, 24 September 2021

[PP.4] **Mallick, R.**, Mishra, P., & Hélie, S., "A Network for 3D Perception Using Psychophysical Constraints," *Center for Research on Brain, Behavior, and NeuroRehabilitation (CEREBBRAL) Symposium*, Purdue University, West Lafayette, IN, 17 April 2019

[PP.3] **Mallick, R.**, Waytowich, N., Asher D., Henthorn, B., & Cesar-Tondreau, B., "Human-in-the-Loop Reinforcement Learning in Ground Robots," *ARL Summer Symposium*, Human Research and Engineering Directorate (HRED), Army Research Laboratory (ARL), Aberdeen Proving Ground (APG), MD, 25 July 2018

[PP.2] **Mallick, R.**, Ries, A., Touryan, J., & Slayback, D., "Quantifying visual perception before, during, and after an eye fixation," *ARL Summer Symposium*, Human Research and Engineering Directorate (HRED), Aberdeen Proving Ground (APG), Maryland, 25 July 2017.

[PP.1] **Mallick, R.**, Green, S., & Nothwang, W., "Range and Throughput Assessment of Wireless Radios in Various Environments," *ARL Summer Student Symposium, Sensors and Electron Devices Directorate (SEDD)*, Adelphi, Maryland, 8 August 2014.

Intellectual Property

[IP.1] Madathil, K. C., Bertrand, J., McNeese, N. J., Sawant, S., **Mallick, R.**, Brady C., & Gramopadhye, A., "Suite for Human-AI Teaming Research", Clemson University: College of Engineering Computing and Applied Sciences, *Approved: 00657*

- Technology Disclosure: Digital Twin of Clemson Experimental Forest as a High-Fidelity Simulation Environment for Training/Experimentation of Human-AI Teams

Awards and Commendations

Human Factors Institute (HFI) Travel Award Recipient (Fall 2023) *Amount: $500*
Graduate Student Government (GSG) Travel Grant Recipient (Fall 2022) *Amount: $750*
Oak Ridge Institute of Science and Education Summer Journeyman Fellow (Summer 2020) (Summer 2018) (Summer 2016)
Oak Ridge Institute of Science and Education Journeyman Fellow (Summer 2019)

Teaching Experience

Student Mentoring as a Senior Ph.D. Student and the *TRACE Undergraduate Student Coordinator*
Camden Brady- Ph.D. Student, Industrial Engineering, Clemson University- *Fall 2022 to present*
Ethan Johnson- B.S. Student, Computer Science, Clemson University- *Spring 2023 to present*
Jennifer Hsu- B.S. Student, Computer Science, Clemson University- *Spring 2023 to present*

Jake Macdonald- B.S. Student, Computer Science, Clemson University- Fall 2022 to present
Noah Tavarez- B.S. Student, Computer Science, Clemson University- *Fall 2021 to present*
Alyssa Williams- B.S. Student, Computer Science, Clemson University- *Fall 2021 to present*
Christian Ihekweazu- B.S. Student, Computer Science, Clemson University- *Fall 2021 to present*
Siddharth Malladi- M.S. Student, Computer Science, Clemson University- *Fall 2022 to Spring 2023*
Richard Garcia- M.S. Student, Biomedical Data Science and Informatics, Clemson University- *Fall 2020 to Spring 2023*
Wesley "Houston" Everett- B.S. Student, Computer Science, Clemson University- *Fall 2020 to Fall 2021*

Professional Activities

Human Factors and Ergonomics Society Student Member, since 2023
Human Factors and Ergonomics Society Clemson Chapter Member, since 2023
TRACE Undergraduate Student Coordinator
NeoCities Virtual Research Platform Developer
Clemson Experimental Forest Virtual Environment Developer
Hosted United States Air Force Academy (USAFA) cadets at TRACE *Duration: Two Weeks*
TRACE Outreach to Clemson Elementary School for their *Science, Technology, Engineering, Arts, Mathematics (STEAM) Night* (23 February 2023)
Visiting Scholar at the U.S. Army Research Laboratory: Human Research and Engineering Directorate (Aberdeen Proving Ground, 4 March 2022)