

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHW-21-07

SCIENCE OF UNDERSTANDING

PROJECT DESCRIPTION: As we imagine future technologies, we often make claims that machines will understand their users and users will understand their machine teammates. But what does it mean to establish or promote a mutual understanding between humans and machines? This research explores the definitions of understanding (e.g., comprehension, common ground, shared mental models, and coordination) and seeks to develop empirical methods and metrics for assessing that we have achieved capabilities for mutual understanding. A particular emphasis in this work is developing evaluation approaches that are grounded in formal models of cognition. We also explore the ways that cognitive models can augment a variety of machine learning algorithms to enhance artificial intelligence for teaming and adaptive interfaces. Interns have the opportunity to implement experimental tasks or contribute to a larger testbed, develop and test cognitive models, develop interactive human-machine teaming software, run and analyze human subjects experiments, contribute to novel analytics development and applications, and contribute to publications. Interns in the Science of Understanding research will have the opportunity to collaborate with a world class cross-disciplinary team including researchers in cognitive science, robotics, and artificial intelligence from Air Force Research Laboratory, Army Research Laboratory, Naval Research Laboratory, and Carnegie Mellon University.

ACADEMIC LEVEL: Bachelors, Masters, PhD (preferred Masters or PhD)

DISCIPLINE NEEDED: Cognitive Science or Psychology, Statistics, Visual Analytics, Data Science, Machine Learning, Artificial Intelligence, Human-Computer Interaction

RESEARCH LOCATION: Carnegie Mellon University, Pittsburgh, PA

RESEARCH ADVISER: Leslie Blaha, PhD
Cognitive Science and Psychology, Indiana University, 2010

Dr. Leslie Blaha is a Senior Research Psychologist in the 711th Human Performance Wing, Warfighter Interactions & Readiness Research Division, Continuous Learning Branch and lead for the AFRL Carnegie Mellon University Operating Location. Dr. Blaha imagines a future where intelligent machines use cognitive models of human teammates to transform the ways we work and make decisions. She leads fundamental science collaborations with academic partners in areas of cognitive modeling and cognitive science for human-autonomy teaming. Her current research interests emphasize laying a rigorous, measurable foundation for mutual understanding between humans and machines, advancing cognitive modeling capabilities for operator state assessment, interactive task and machine learning, and methods for validating learning systems. Dr. Blaha has 10 years of experience in national security and defense research, emphasizing cognitive modeling for human-machine teaming, visual analytics, and decision-making systems. Dr. Blaha was awarded an Early Career Impact Award from the Federation of Associations for Brain and Behavioral Sciences in 2018. She serves as the Secretary/Treasurer of the Society for Mathematical Psychology and is a co-founder of the Women of Mathematical Psychology. She has mentored over 20 early career researchers, from high school students to postdoctoral research fellows. Since 2018, Dr. Blaha has been embedded on the campus of Carnegie Mellon University to

foster strong collaborations with academic partners in the Cognitive Sciences of Human-Autonomy Teaming.