REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHW-27-04

Understanding and Modeling Cognitive Vulnerabilities and Biases

PROJECT DESCRIPTION: This research opportunity involves foundational research aligned with Air Force strategic objectives aimed at better understanding cognitive processes and decision-making mechanisms to predict, explain, and simulate human behavior. The opportunity will focus on understanding how, when, and why cognitive vulnerabilities and biases could be exploited using misinformation to degrade decision-making. This includes developing experiments and cognitive models (e.g., ACT-R) to explore:

1. Interactions between cognitive, social, and emotional factors.
2. Qualities of misinformation that increase or decrease its impact.
3. The extent to which individual and cultural differences affect the impact of misinformation.
4. Mitigation strategies most likely to be effective in various contexts.
5. The spread of misinformation within groups.

A project will be appropriately scoped and may include a combination of literature reviews, reanalysis of previously collected data to test hypotheses, experimental design, analysis of behavioral and/or physiological data, and development or expansion of an existing cognitive model.
Research opportunities are most beneficial when a participant's interests align with the mentor's research areas. Therefore, prospective participants are encouraged to contact the research mentor before applying to briefly discuss their interests and alignment with available research projects.

Research Mentor Contact: alexander.hough.1@us.af.mil

LEARNING OBJECTIVES: Under the guidance of a mentor, you will gain hands-on research experience to complement your education and support your academic and professional goals. Learning opportunities will depend on your previous experience and research interests and may include developing additional scientific skills in coding, data analysis, computational modeling, and drawing scientific conclusions from literature and data.

Potential research and learning activities may include:

1. Conduct literature reviews related to cognitive processes, decision-making, cognitive vulnerabilities, and misinformation.
2. Gain experience with experimental design to investigate cognitive vulnerabilities and biases.
3. Develop skills in data analysis, including the analysis and reanalysis of previously collected research data.
4. Gain experience in cognitive model development and validation.
5. Strengthen scientific research skills through participation in research activities and potential contributions to conference papers.

Participants may also gain an understanding of ongoing AFRL research and potential career opportunities within the Department of Defense (DoD).

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PREFERRED QUALIFICATIONS: Applicants should have some prior research experience, such as literature reviews, experimental design, and data analysis, along with some coding experience (e.g., R, MATLAB, or Python). Previous modeling experience is preferred.

ACADEMIC LEVEL: Master's; Doctoral
DISCIPLINES NEEDED: Cognitive Science, Psychology, Human Factors
RESEARCH LOCATION: Wright-Patterson Air Force Base, Dayton, Ohio
RESEARCH MENTOR: Alexander R. Hough, Ph.D.
Psychology, Wright State University, 2021



Dr. Hough is a Research Psychologist in the 711th Human Performance Wing, Warfighter Interactions & Readiness Research Division, Cognition and Modeling Branch. His background is in decision-making, problem-solving, reasoning, emotion, and computational cognitive modeling. He has published work related to: 1) individual and group behavior in difficult coordination scenarios (game theory), 2) identification of strategy use and detection of strategy switching in decision-making, 3) cognitive mechanisms of analogical reasoning and transfer, 4) cognitive models of complex visual tasks involving fatigue, and 5) how cognitive biases/vulnerabilities can be exploited to influence individuals and groups. His current efforts include using experiments and computational cognitive modeling (primarily ACT-R) to: 1) identify methods for detecting fatigue, understanding its cognitive mechanisms, and measuring its effects on performance; 2) identify cognitive processes underlying complex visual search in normal and low-light conditions with night vision goggles; 3) explain how, when, and why misinformation effects degrade decision-making in individuals and groups, and how to mitigate it.

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