Understanding and Modeling Human Cognition

PROJECT DESCRIPTION: This opportunity involves foundational research aligned with Air Force strategic objectives aimed at better understanding cognitive processes and mechanisms of decision-making to predict, explain, and simulate human behavior. The internship would focus on one of two projects I am currently leading. The first project is focused on understanding how, when, and why cognitive vulnerabilities/biases could be exploited using misinformation to degrade decision-making. This includes developing experiments and cognitive models (e.g., ACT-R) to explore the: 1) interaction between cognitive, social and emotional factors, 2) qualities of misinformation that increase/decrease impact, 3) the extent that individual and cultural differences affect misinformation effects, 4) mitigations that are most likely to work in various contexts, and 5) spread of misinformation in groups. The second project involves how fatigue and cognitive workload affect performance in visual search. This includes development of experiments and cognitive modeling (e.g., ACT-R) to: 1) detect and mitigate fatigue during visual search, 2) the extent that specific visual search processes are affected by fatigue, and 3) the extent that individual differences affect visual search performance and susceptibility to fatigue effects.

A good project would be scoped appropriately and may include a combination of: 1) literature review, 2) reanalyzing previously collected data to test hypotheses, 3) designing an experiment, 4) analyzing behavioral and/or physiological data, and 5) developing or expanding on an existing cognitive model. Internships have the greatest benefit when an intern's interests align with the mentor's topic areas. Therefore, before applying, I recommend reaching out to me for a brief discussion of your interests and alignment with my research projects: alexander.hough.1@us.af.mil

LEARNING OBJECTIVES: Potential interns should have some research experience (e.g., literature review, experimental design, and data analysis), some coding experience (e.g., R, MatLab, Python), and preferably some modeling experience. Interns will learn about ongoing research at AFRL, and gain unique and additional scientific skills that will be dependent on previous experience and interests (e.g., coding, data analysis, ability to draw scientific conclusions from literature and data, computational modeling, and understanding of opportunities/careers with the DoD). Previous interns have led or contributed to conference papers that included features such as: 1) literature reviews, 2) data analyses, 3) experimental designs, 4) model development and validation, and 5) reanalysis of existing data.

ACADEMIC LEVEL: Masters; 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) to explain how, when, and why misinformation effects degrade decision-making in individuals and groups, and how to mitigate it.

Photo courtesy of the U.S. Air Force Research Laboratory