Abstracts and Speaker Biographies

PSHFES 25th Annual Symposium
HFES Regional Meeting – West, Seattle
April 17, 2026

KEYNOTE – Human Factors Considerations for Enhancing Joint Human-AI Performance: From Function Allocation to Human-AI System Test and Evaluation

Emilie M. Roth, Ph.D. | Owner & Principal Scientist | Roth Cognitive Engineering

There is growing evidence that how functions are distributed across human and intelligent agents can strongly impact the quality of the joint human-AI system performance. For example, including a person in a decision can sometimes lead to poorer performance than the machine working alone. Similarly adding a (wrong) machine recommendation can sometimes lead to worse performance than a person working on their own. The design challenge is to identify ways to distribute the work across human and intelligent agents (and provide appropriate displays) so that the joint performance is superior to the performance of either working alone.

In this talk I will cover strategies for designing robust joint human-AI systems by identifying and leveraging complementary performance as part of the function allocation process as well as via test and evaluation methods that stress test proposed designs. I will draw on recent work I have participated in including a project developing an analytic framework for human-intelligent system function allocation for envisioned world applications, as well as a recent report I co-authored providing human-factors guidance for the integration of AI/ML in Federal Aviation Administration systems.

Dr. Emilie M. Roth is owner and principal scientist of Roth Cognitive Engineering, a small company founded in 1997 that conducts research and application in the areas of human factors and applied cognitive psychology (Cognitive Engineering). She has a Ph. D. in Cognitive Psychology, and has over 30 years of experience in cognitive analysis, design, and evaluation in a variety of domains including nuclear power plant operations, railroad operations, military command and control, and healthcare. Most recently, together with colleagues from Applied Decision Sciences, she developed an analytic framework for human-intelligent system function allocation for envisioned world applications. She also co-authored a report providing human factors guidance for the integration of AI/ML in FAA Systems (together with Phil Smith of The Ohio State University and others).

Dr. Roth is a fellow of the Human Factors and Ergonomics Society and a member of the advisory board for the *Journal of Cognitive Engineering and Decision Making.* She also served on the Board on Human-Systems Integration at the National Academies (2015-2022), and participated in several National Academies consensus studies including one on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U. S. Nuclear Plants (2012-2016) and most recently one on Human-AI Teaming (2021-2022).

Ergonomics Rulemaking is Back: First Stop – The Airport

Rick Goggins, M.S. | Washington State Department of Labor and Industries

After a more than 20-year hiatus, the Washington State Department of Labor & Industries has begun rulemaking for ergonomics again. This time around, rules will be written one at a time for specific industries with high rates of work-related musculoskeletal disorders (WMSDs). The first such industry prioritized for rulemaking is Scheduled Airlines, Ground Crews, with baggage handling being the leading cause of WMSDs for these workers. This session will explain why ergonomics rules are necessary, and how the process to develop rules is progressing. The presenter will briefly review the known hazards of baggage handling, analysis methods that can be applied to the work, and possible approaches to regulating the hazards.

Rick has been working as an ergonomist for the Washington State Department of Labor and Industries for the past 31 years. Prior to that, he worked with Hughes Space and Communications in El Segundo, California. He has a master's degree in ergonomics from the University of Southern California, and a bachelor's degree in biology from Columbia University. Rick is a Certified Professional Ergonomist.

From Biomechanics to Design: Inside the Human Factors Lab for Microsoft Hardware

Wen Hao Hsu, Sc.D. & Kali Shamaly, M.S. | Microsoft

This presentation introduces the biomechanics-driven approach to human-centered hardware design in the Microsoft Human Factors Lab. It outlines how kinematic and kinetic measurement methods – including motion capture, force sensing, and pressure mapping – are integrated with task analysis and controlled experimental protocols to quantify user-device interactions. These objective measures characterize movement patterns, force distribution, posture, and physical effort that are not discernible through subjective feedback alone. Using examples from Microsoft Hardware, the talk demonstrates how biomechanical studies are designed to evaluate performance and comfort outcomes, and how resulting data is translated into design decisions, engineering requirements, and product validation.

Wen Hao Hsu is a Human Factors Engineer at Microsoft with a background in rehabilitation. His work centers on biomechanics-informed analysis of human-device-environment interactions, with a focus on how kinematics, kinetics, and anthropometry influence performance and comfort.

Kali Shamaly is a Human Factors Specialist at Microsoft with a background in orthopedics and kinesiology. Her work focuses on biomechanics-informed analysis of human-device interaction, with an emphasis on how force, motion, and physical effort influence comfort, performance, and usability in input devices.

Beyond Automation: Designing Effective Human-AI Interactions in Safety-Critical Context

Cherin Lim, Graduate student | University of Washington

While advances in automation have largely focused on improving technical performance, far less attention has been given to how AI systems communicate and support humans in moments of uncertainty. This talk addresses this gap through the context of autonomous vehicles, where the absence of a human driver creates a profound interaction challenge. My presentation will examine how vehicle failures shape trust dynamics and identifies the informational and communicative needs that emerge in these high-stakes moments. Building on these findings, the talk outlines design principles for human-AI interactions that are capable of effective communication and meaningful human support during system failures.

Human Factors Considerations for Enhancing Joint Human-AI Performance: From Function Allocation to Human-AI System Test and Evaluation

Kim Meszaros, CRE-MSD | University of Waterloo, Canada

There is growing evidence that how functions are distributed across human and intelligent agents can strongly impact the quality of the joint human-AI system performance. For example, including a person in a decision can sometimes lead to poorer performance than the machine working alone. Similarly adding a (wrong) machine recommendation can sometimes lead to worse performance than a person working on their own. The design challenge is to identify ways to distribute the work across human and intelligent agents (and provide appropriate displays) so that the joint performance is superior to the performance of either working alone.

In this talk I will cover strategies for designing robust joint human-AI systems by identifying and leveraging complementary performance as part of the function allocation process as well as via test and evaluation methods that stress test proposed designs. I will draw on recent work I have participated in including a project developing an analytic framework for human-intelligent system function allocation for envisioned world applications, as well as a recent report I co-authored providing human-factors guidance for the integration of AI/ML in Federal Aviation Administration systems.

Kim Meszaros is a Canadian Certified Professional Ergonomist (CCPE) and holds a Master of Science in Kinesiology from the University of Waterloo. Her research in occupational biomechanics focused on overhead work and the impact of work organization on the onset of shoulder fatigue. She started her career in ergonomics consulting where she provided ongoing and consultative support for implemented ergonomics programs in different sectors and sizes of organizations. Kim is the Ergonomics Research Coordinator for the Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD) and supports the maintenance and continuous development of the MSD Prevention Guideline for Ontario. She is driven to increase awareness of the widespread impact of implementing evidence-based MSD prevention strategies in the workplace to improve employee health, safety and well-being.

From Vigilance Prediction to Adaptive Interventions: Data-Driven Approaches to Managing Fatigue in Safety-Critical Work

Junghoon Chung, Graduate student | University of Washington

Maintaining vigilance is essential in safety-critical environments such as healthcare monitoring, transportation, and other operational settings where lapses in attention can lead to serious errors. This research investigates data-driven approaches to understanding, detecting, and responding to changes in human vigilance. A literature review aims to identify practical sensing approaches, reliable indicators of vigilance decline, and key implementation challenges associated with deploying monitoring systems in real-world settings.

Physiological and Eye Tracking Sensor Methods for Measuring Vigilance

Elizabeth Higgins, Graduate student | University of Washington

Vigilance, or sustained attention, can be defined as the ability of observers to maintain their focus of attention and remain alert to stimuli over prolonged periods of time. It represents a crucial metric in assessing worker safety and performance in numerous settings. This study provides a review of physiological sensing and eye tracking technologies used to measure vigilance in order to better understand how certain sensors may better capture different aspects of vigilance. This data can support vigilance research and experimental design for both laboratory and real-world settings. Given that no sensor can individually represent a person's vigilance accurately or without discomfort to the user, researchers can utilize the results of this review to select sensors that may work well in conjunction to best assess vigilance in laboratory and field settings.

The Psychosocial Hierarchy of Controls

Asta Kjærgaard | Danish National Research Centre

The Hierarchy of Controls has proven to be a useful tool to assess the impact of measures targeted physical and chemical hazards at work. However, the traditional hierarchy seems to fall short when applied to psychosocial hazards at the workplace. To address this shortcoming, I will present the Psychosocial Hierarchy of Controls (P-HOC); a tool that can guide practitioners in choosing efficient solutions to improve the psychosocial work environment.

Asta Kjærgaard is a PhD student at the Danish National Research Centre for the Working Environment, enrolled at Aarhus University and affiliated with the University of the Sunshine Coast. I hold a Master's degree in Sociology, and my PhD research focuses on workplace violence.