8:30 AM - 12:00 PM

# Understanding and Applying the Human Readiness Level (HRL) Scale

Judi See

Pamela Savage-Knepshield

Holly Handley

Mica Endsley

This three-hour workshop supports knowledge and application of the Human Readiness Level (HRL) scale described in ANSI/HFES 400-2021 Human Readiness Level Scale in the System Development Process. The HRL scale is a simple nine-level scale designed to supplement the Technology Readiness Level (TRL) scale in order to evaluate, track, and communicate the readiness of a technology or system for safe and effective human use. Application of the HRL scale ensures proper attention to human systems design throughout system development, which minimizes or prevents human error and enhances the user experience.

Learning objectives for the workshop include:

1. Understand HFES 400-2021 development and contents - Instructors will describe evolution of the HRL concept to convey its significance and the rigor behind development of the technical standard. Instructors will walk through major sections of the standard and describe how to apply them.
2. Learn how the HRL scale is applied in current and historical acquisition programs - Instructors will describe real-world Army applications of the HRL scale, including a case study of a software modernization program.
3. Apply the HRL scale to practical real-world problems - Students will gain hands-on experience applying the HRL scale during group exercises that simulate teamwork during the system development process. Group exercises incorporate three different scenarios representing both hardware and software solutions at various stages of technological development. The hands-on exercises specifically address common questions regarding practical use of the HRL scale.

Workshop attendees do not need prior HF/E knowledge or expertise. The HRL scale is intended to be applied by human systems professionals with appropriate expertise and experience; however, recipients of HRL scale ratings include many other types of personnel in design, engineering, and acquisition as well as high-level decision makers, all of whom benefit from understanding the role of the HRL scale in the system development process. Before attending the workshop, students should download a free

copy of the ANSI/HFES technical standard at https://my.hfes.org/online-store/publications and bring it to the workshop in electronic or hard copy format. Laptops are not necessary for the workshop but may facilitate notetaking and completion of the group exercises.

9:00 AM - 4:30 PM

# Workshop on Applying Model-Based Systems Engineering in Human Systems Integration

Michael Miller

John McGuirl

Joseph Kristabum

Model Based Systems Engineering (MBSE) is being applied across the Department of Defense and Industry to improve the speed and robustness of engineering design and development. These models serve as the authoritative source when understanding the requirements, structure, and behavior of systems. While the languages, methods, and tools used in MBSE practices were designed with a software and hardware focus, these languages, methods, and tools can be readily adapted to include human-related information to aid system specification and communication which can benefit human operators, maintainers, and users.

This workshop is designed to provide attendees with an overview of the Systems Modeling Language, one of the more common MBSE languages, common modeling methods and a common modeling tool. Examples of human representations will be provided. Attendees will understand how MBSE is used to depict systems and how to interpret common modeling artifacts, be able to apply these tools to represent human interaction in MBSE models and analyze the utility of these models for understanding the robustness of human-machine interfaces and interactions.

9:00 AM - 4:30 PM

# Behavioral Data Analytics with R

John Lee

Linda Boyle

Tony McDonald

Data analytics, machine learning, and the increasing demand for experts in quantitative user experience present challenges and opportunities for behavioral scientists and human factors engineers. Data analytics and machine learning draw on techniques that are unfamiliar to many behavioral scientists, but data scientists may be unfamiliar with many important features of behavioral data. This workshop provides practical skills in behavioral data analytics and also addresses important issues specific to behavioral data. Participants will learn data manipulation and visualization techniques. They will apply these techniques to exploratory data analysis, machine learning, and model understanding. The workshop includes exercises and examples using the statistical package â€œRâ€• that include: complex data reduction, creation of machine learning models, selection of cross-validation techniques suited to behavioral data, and visualization of predictions, and techniques to make models understandable. The workshop also includes a survey of machine learning techniques, such as text analysis, and resources in R.

1:30 PM - 5:00 PM

# Trust, Implications, & Measurement

Theresa Kessler

Tracy Sanders

Alexandra Kaplan

Appropriately calibrated human trust is essential for optimal human-machine system performance. Various aspects of the machine may influence the human-machine trust relationship, including who developed and assembled it, its behaviors and attributes, and the information it provides. The human users' predispositions and perceptions, as well as behaviors from other humans within a system can also influence the trust relationship. Importantly, trust in the information provided by a machine affects overall shared performance.

Materials covered in this workshop will include definitions and descriptions of various types of trust, with a focus on trust calibration. Cognitive bias will be reviewed and its relationship to trust explained. Measurement methods will be discussed with examples provided. Participants will learn which factors contribute to human-human, human-robot, human-AI, and human-automation trust, how these types of trust are similar, and how they differ. In addition, we will demonstrate how these concepts interact,

with a strong focus on how human-human trust is related to human-systems trust. The impact of cognitive biases and shortcuts on trust calibration will be discussed. Through a hands-on exercise, participants will explore how various features can influence trust calibration. In a separate exercise, participants will identify commonly used methods of information presentation designed to manipulate trust using cognitive bias and shortcuts.

No knowledge or expertise is needed to attend the workshop (beginners and novices). The purpose of this workshop is to introduce the topic of trust to practitioners interested in measuring trust, how it influences system development, and how it can be manipulated. Handouts will be provided.