Società Italiana di Ergonomia
e Fattori Umani

# H Factor:
# the research in ergonomics

*International Webinar Series*

## OBJECTIVES OF THE SEMINARS

The international seminar series "H Factor: The Research in Ergonomics" serves as a dynamic platform for discussing advancements in Applied Research in Ergonomics and Human Factors. Organized by the Lombardy-Liguria section of the Italian Society of Ergonomics, these webinars aim to bridge the gap between theory and practice by stimulating debate among researchers and practitioners. Each session focuses on a specific publication—whether chapters, books, articles, or posters—that has been published or is in progress. A moderator leads substantive reflection sessions, highlighting the practical implications of the research findings. This series not only fosters academic discourse but also enhances practical applications, making it an invaluable resource for anyone involved in the field of Ergonomics.

## SCHEDULE:

**HASAN AYAZ** -*19 September 2024*- 18:00-19:00 (in the Rome time zone)

**MARIA CHIARA LEVA** - *24 October 2024* -18:00-19:00 (in the Rome time zone)

**CARISA HARRIS** - *21 November 2024*-18:00-19:00 (in the Rome time zone)

**1° Webinar: *19th September, 18:00-19:00***

Chair: **Francesco Draicchio,** President Italian Society Ergonomics
Guest Speaker: **HASAN AYAZ** PhD, School of Biomedical Engineering, Science & Health Systems, Drexel University.
Title: **"Neuroergonomics and optical brain imaging: Towards Ubiquitous and Continuous Measurement of Brain Function during Everyday Life"**
**Zoom link: https://us06web.zoom.us/meeting/register/tZYrc-6orj8iHtTF6Q9l1SR-fMFJhrPRPzWB**

SPEAKER BIO

---

*Hasan Ayaz, PhD is a Provost Solutions Fellow and Associate Professor at Drexel University's School of Biomedical Engineering, Science, and Health Systems, brings expertise at the intersection of neuroscience, and biomedical technologies. He holds affiliations with the Department of Psychological and Brain Sciences, AJ Drexel Autism Institute, and Solutions Institute of Drexel University; he serves as an Adjunct Faculty at the Johns Hopkins Applied Biomedical Engineering and an Associate Fellow at the Center for Injury Research and Prevention of Children's Hospital of Philadelphia. Dr. Ayaz has spent over 20 years advancing miniaturized continuous wave near-infrared spectroscopy systems for neuroimaging. His innovations have led to widespread use of brain monitoring systems in various research and clinical settings. He notably developed the Infrascanner, the first mobile optical-brain-monitoring tool for traumatic brain injury, used globally in civilian and military hospitals for early hematoma detection.His research focuses on Neuroergonomics, exploring brain function in everyday tasks, particularly within human-machine systems. He studies attention, memory, and vigilance using techniques like fNIRS, EEG, fMRI, tDCS, and rTMS. His work spans real-world applications, from aerospace to healthcare, and involves collaborations with experts and clinical partners.*

*Dr. Ayaz is the co-founding Field Chief Editor of "Frontiers of Neuroergonomics." He holds a B.S. in Electrical and Electronics Engineering from Boğaziçi University and a Ph.D. in Biomedical Engineering from Drexel University.*

**Abstract "Neuroergonomics and optical brain imaging: Towards Ubiquitous and Continuous Measurement of Brain Function during Everyday Life"**

---

The understanding of the brain functioning and its utilization for real world applications is the next frontier. Existing studies with traditional neuroimaging approaches have accumulated overwhelming knowledge but are limited in scope, i.e. only in artificial lab settings and with simplified parametric tasks. As an interdisciplinary new field, *neuroergonomics* aims to fill this gap: Understanding the brain in the wild, its activity during unrestricted real-world tasks in everyday life contexts, and its relationship to action, behaviour, body, and environment. Functional near infrared spectroscopy (fNIRS), a non-invasive brain monitoring technology that relies on optical techniques to detect changes of cortical hemodynamic responses to human perceptual, cognitive, and motor functioning, is an ideal candidate tool. Ultra-portable wearable and wireless fNIRS sensors are already breaking the limitations of traditional neuroimaging approaches that imposed limitations on experimental protocols, data collection settings and task conditions at the expense of ecological validity. This talk will discuss emerging trends for fNIRS applications, from aerospace to medicine, with diverse populations and towards clinical solutions. We will review recent studies with industry partners from diverse sectors. Studies include mental workload assessment during complex cognitive tasks and the development of expertise during the practice of complex cognitive and visuomotor tasks (ranging from usability assessment of financial investment tools to operation of coffee machines). Various recent synergistic fNIRS applications for human-human and human-machine interaction, interpersonal neural synchronization and brain computer interfaces, highlight the potential use and are ushering the dawn of a new age in applied neuroscience and neuroengineering.

**2° Webinar: 24th October, *18:00-19:00***

Chair: **Paolo Trucco,** School of Management of Politecnico di Milano
Guest Speaker: **CHIARA LEVA**, coordinator of the Marie curie Porject CISC, Lead of the Human factors in Safety and sustainability Research Group HFISS, Technological University Dublin, Ireland.
Title: **"Human Factors at the core of collaborative intelligence application in safety critical systems: lessons learnt from the Marie curie Project CISC"**
**Zoom link: https://us06web.zoom.us/meeting/register/tZItf-Cqrz0jH9bGxc2WrnrlsjZfucuqCKaF**

SPEAKER BIO

---

*Maria Chiara Leva is the Lead of the Human factors in Safety and Sustainability (HFISS) research group in Technological University Dublin and a Senior Lecturer in the School of Environmental Health for the same institution. She is a visiting research Fellow in the Centre for Innovative Human systems in Trinity College Dublin. She is the co-founder of Tosca Solutions (www.toscasolutions.com) a Spin out campus company based in NDRC and Trinity College Dublin to offer support for implementing risk management tools customised specifically to the needs of highly regulated environments. Her area of Expertise is Human factors and Safety Management Systems. Chiara holds a PhD in Human factors conferred by the Polytechnic of Milano Department of Industrial Engineering. She is the former chair of The Irish Ergonomics Society and current co-chair of the technical committee for Human factors in the European Safety and Reliability Association. She is coordinator of the Marie curie Porject CISC, Lead of the Human factors in Safety and sustainability Research Group HFISS, Technological University Dublin, Ireland.*

**Abstract "Human Factors at the core of collaborative intelligence application in safety critical systems: lessons learnt from the Marie curie Project CISC"**

---

" Organizations that use machines merely to displace workers through automation will miss the full potential of AI…Tomorrow's leader will instead be those that embrace collaborative intelligence, transforming their operations, their industries and –no less important-their workforces." H.J. Wilson and P.R. Daugherty (Human + Machine: Reimagining Work in the Age of AI Harvard Business Review Press, 2018) The need for human in the loop automation is particularly relevant for safety critical industry where industrial accidents related to technological malfunctioning have been diminishing leaving the human error responsible for up to 80% of the accidents (Stanton et al., 2009). However, even if one of the main aims of introducing automation is often to improve safety by reducing or eliminating human errors; it is often argued that this may simply induce new types of errors. To take full advantage of human machine collaboration, companies must understand how humans can most effectively augment machines, how machines can enhance what humans do best, and how to redesign business processes to support the partnership. The opportunity is that the proliferation of wearable sensors that can track human factors in a non-intrusive manner coupled with the abilities of modern AI systems to integrate heterogeneous data to identify anomalies and safety critical situation can now transform the role of the human in the loop for safety critical systems also. To address this changing and exciting landscape there is a need to consider the followings multidisciplinary aspects: 1) Capability to understand our own limitation as human being and cope/use them as another element of live data for Industry 4.0 (to understand what aspect of human performance can be assessed and monitored considering the new capabilities offered by Neuroergonomics tool such as EEG and Eye tracking and what can be considered a legitimate and ethical aspect to assess. Whether for mutual performance monitoring in a teaming environment or for also self-monitoring and feedback). 2) Capability to harness and analyse live data from for industry 4.0 for control of safety critical process to train new AI algorithms to anticipate safety critical scenarios. 3) Capability to create novel hybrid collaborative intelligence frameworks to combine the two main key live data sources to support decision and or anticipate critical scenarios in Human-machine Performance optimizations, whereby the human and the intelligent and or autonomous agents can really work as a team. In the present talk we will just briefly present some areas of application and the key challenges and opportunities they raise in terms of function allocation, dependability and overall system performance. In this sense a collaborative intelligent creative gesture is an innovation that required a combined effort from an intelligent, robotic or autonomous agent and a human.

**3° Webinar: 21st November, *18:00-19:00***

Chair: **Prof. Giovanni Devito**, MD, Director of the Department of Medicine & Insubria University, Italy
Guest Speaker: **CARISA HARRIS**, PhD, CPE,
Title: **"From the lab to construction sites: a five-year project to develop application guidelines for the implementation of arm support exoskeletons in construction. "**
**Zoom link: https://us06web.zoom.us/meeting/register/tZwvf-6tqTMiGdZ2g4BFEAremNXQaneCXZre**

SPEAKER BIO

---

*Professor in the Department of Medicine at the University of California at San Francisco. She is the Director of the Northern California Center of Occupational & Environmental Health in the School of Public Health at the University of California at Berkeley, Associate Director of Research for the California Labor Lab, a NIOSH Total Worker health Center, and Director of the UCSF/UCB Human Factors and Ergonomics Research Lab. She received her PhD in Environmental Health Sciences at the University of California, Berkeley and teaches a variety of classes including Occupational Biomechanics and Human Factors in Industrial Design*. Dr. Harris and her team performs research in a variety of areas focused on understanding and preventing work related injuries and improving human performance, productivity, and health. Her epidemiological research evaluates the relationship between physical, personal, and work psychosocial factors associated with musculoskeletal disorders and subsequent work disability. Her team applies machine learning to wearable device data for primary and secondary prevention purposes and performs various intervention studies on occupational tasks with high risk of musculoskeletal injuries. She and her team also engage in applied research for high injury sectors such as construction, medical, hotel, janitorial, warehousing and manufacturing sectors.

**Abstract "From the lab to construction sites: a five-year project to develop application guidelines for the implementation of arm support exoskeletons in construction"**

---

Construction workers have higher incidence of work-related musculoskeletal disorders of the shoulder than most other industry sectors. Arm support exoskeletons (ASEs) have been proposed as one approach to augment a worker's capacity to meet the high physical demands of a task. This five-year project used a mixed methods approach to first determine the facilitators and barriers of ASE use among construction workers, then addressed those concerns in a variety of laboratory studies. The development of algorithms to predict fit and normalize support level of ASEs based on a worker's sex, height and weight was developed and used for three laboratory studies. The first evaluated common safety such as the impact of ASEs on balance, , ambulation and climbing. The second study evaluated optimal torque settings when performing a common drilling task overhead and on a wall for two minutes at varying levels of support, normalized to each worker, where 100% support floated the arm when flexed at 90° of elbow and shoulder flexion. Next, optimal support torque was evaluated during three common construction tasks, including wire stapling, surface grinding and dry wall installation. General findings from each study were summarized into application guidelines which were evaluated in the field. An overview of this project and its primary findings will be provided. of elbow and shoulder flexion. Next, optimal support torque was evaluated during three common construction tasks, including wire stapling, surface grinding and dry wall installation. General findings from each study were summarized into application guidelines which were evaluated in the field. An overview of this project and its primary findings will be provided. The project aimed to reduce shoulder musculoskeletal disorders in construction workers using arm support exoskeletons (ASEs). Over five years, it identified facilitators and barriers to ASE use and developed fit and support level algorithms based on worker lab studies were conducted to assess ASE impact on safety aspects like balance and , determine optimal torque settings for overhead drilling with tailored support levels, and evaluate support torque for tasks like wire stapling, surface grinding, and drywall were compiled into guidelines and tested in real field conditions, providing practical application insights for the construction industry.installation. Results were compiled into guidelines and tested in real field conditions, providing practical application insights for the construction industry.