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Editors

Advances in Neuroergonomics and Cognitive Engineering

Proceedings of the AHFE 2020 Virtual Conferences on Neuroergonomics and Cognitive Engineering, and Industrial Cognitive Ergonomics and Engineering Psychology, July 16–20, 2020, USA

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Advances in Human Factors and Ergonomics 2020

AHFE 2020 Series Editors

Tareq Z. Ahram, Florida, USA
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11th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences

Proceedings of the AHFE 2020 Virtual Conferences on Neuroergonomics and Cognitive Engineering, and Industrial Cognitive Ergonomics and Engineering Psychology, July 16–20, 2020, USA

Advances in Neuroergonomics and Cognitive Engineering	Hasan Ayaz and Umer Asgher
Advances in Industrial Design	Giuseppe Di Bucchianico, Cliff Sungsoo Shin, Scott Shim, Shuichi Fukuda, Gianni Montagna and Cristina Carvalho
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Advances in Human Factors in Robots, Drones and Unmanned Systems	Matteo Zallio
Advances in Human Factors in Cybersecurity	Isabella Corradini, Enrico Nardelli and Tareq Ahram

(continued)

(continued)

Advances in Human Factors in Training, Education, and Learning Sciences	Salman Nazir, Tareq Ahram and Waldemar Karwowski
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Advances in Artificial Intelligence, Software and Systems Engineering	Tareq Ahram
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Advances in Creativity, Innovation, Entrepreneurship and Communication of Design	Evangelos Markopoulos, Ravindra S. Goonetilleke, Amic G. Ho and Yan Luximon

Preface

This book brings together a set of contributed articles on emerging practices and future trends in cognitive engineering and neuroergonomics both aiming at harmoniously integrating human operator and computational system, the former through a tighter cognitive fit and the latter through a more effective neural fit with the system in solving complex problems at the intersection of human and technology. The chapters in this book uncover novel discoveries and communicate new understanding and the most recent advances in the areas of cognitive neuroscience, mental workload and stress, human error and risk, mental state and systemic-structural activity theory. Further topics include neuroergonomic measures, neuroinformatics, cognitive computing and associated applications.

This book is organized into ten parts:

1 Machine Learning in Cognitive Neuroimaging
2 Cognitive Function Assessment
3 Understanding and Monitoring Human Performance
4 Teaming with Autonomous Systems for Medical System Design
5 Neurobusiness Applications
6 Systemic-Structural Activity Theory
7 Neurocomputing and Neuroinformatics
8 Brain–Machine Interface and Artificial Intelligence Systems
9 Cognitive Neuroscience and Neuroadaptive Technologies
10 Measurements, Methods and Industrial Ergonomics

Parts 1 to 6 include contributions to the International Conference on Neuroergonomics and Cognitive Engineering. Parts 7 to 10 include contributions to the International Conference on Industrial Cognitive Ergonomics and Engineering Psychology (ICEEP). The two conferences examine the cognitive ergonomic aspects of a workplace to understand a working task and solve a problem, thus making human–system interaction compatible with human cognitive abilities and limitations at work. It discusses optimal human-work parameters, such as mental workload, decision-making, skilled performance, human reliability, human–system design, human–computer interaction, work stress and training, as these may relate

to worker's ability to properly construe the task, in order to avoid hazard, errors, misperception, frustration and mental work overload.

Collectively, the chapters in this book have the goal of offering a deeper understanding of the couplings between external behavioral and internal mental actions, which can be used to design harmonious work and play environments that seamlessly integrate human, technical and social systems.

Each chapter of this book was either reviewed or contributed by members of the Scientific Advisory Board. For this, our sincere thanks and appreciation go to the Board Members listed below:

Neuroergonomics and Cognitive Engineering

T. Ward, Ireland
B. Winslow, USA
G. Zacharias, USA
L. Zeng, USA
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We hope that this book will offer an informative and valuable resource to professionals, researchers and students alike, and that it helps them understand innovative concepts, theories and applications in the areas of cognitive engineering and neuroergonomics. Beyond basic understanding, the contributions are meant to inspire critical thinking for future research that further establish the fledgling field of neuroergonomics and sharpen the more seasoned practice of cognitive engineering. While we do not know where the confluence of these two fields will lead, they will certainly transform the very nature of human–system interaction, resulting in a yet to be envisioned design that improves form, function, efficiency and the overall user experience for all.

This book is dedicated to Gregory Bedny for his pioneering work in the systemic-structural activity theory and for the outstanding scientific contribution to the field of neuroergonomics.

July 2020

Hasan Ayaz
Umer Asgher

Contents