

Lecture Notes in Electrical Engineering 1029

Subhas Chandra Mukhopadhyay
S. M. Namal Arosha Senanayake
P. W. Chandana Withana *Editors*

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Preface

Systems mimicking the human brain have a long history. The recent advancements brought about by the Industry Revolution 4.0 and Smart Society 5.0, however, have led to unprecedented volumes of *Innovative Technologies in Intelligent Systems and Industrial Applications*. These mostly depend on the design of new algorithms applied to existing historical patterns and decision-making solutions such as building critical (time VS space) systems using artificial intelligence (AI) and machine learning (ML). Over the past decade, this has produced innovative technologies for smart manufacturing to better satisfy global needs and demands. However, despite these recent advancements, there is still an urgent need to find optimal solutions for real-world applications, in particular mission-critical systems in terms of reliability, precision, and repeatability. Furthermore cross-disciplinary research engagement is vital to solving cross-domain problems encountered during daily life for which embedded hybrid intelligence (AI and human intelligence) is vital if we are to develop hybrid intelligent systems to build a truly smart society.

Thus, complex processes and data-driven models are paramount for innovative technologies that minimize human intervention to minimize or even eliminate human error during manufacturing and general daily processes. Production of mission-critical systems is still facing challenges due to the latency inherent in communication technologies (i.e., the latency in 5G mobile communication is around 1 ms). Minimizing such latency and thus optimizing processes are generally addressed using mixed reality from the active engagement of humans in critical processes and data signals from the environment. However, challenges remain in terms of achieving real-time processes due to the nature of occurrences and events in highly complex situations such as those taking place in nuclear plants, cockpits of flights, and space vehicles, for drones. Not only automatic re-configuration and re-installation of processes are required, it is mandatory to embed programmable systems on board in order to adjust and to re-configure critical parameters that change the nature of the execution of processes in real time. Thus, innovation under catastrophic conditions in real time is still a serious challenge in smart manufacturing.

Furthermore, business processes involved in the production of smart products and services are seriously impacted by unpredictable environmental conditions in

the form of sudden atmospheric changes such as changes in weather patterns and pandemics. Yet, state-of-the-art AI and ML are capable of positively impacting mission-critical processes and thus resolve a significant range of cross-discipline processes in different domains. Designing and building such multidimensional processes equates to the development of novel hybrid models embedding information fusion, smart decision-making models, and information visualization processes using smart devices. Innovative technologies in intelligent systems and industrial applications provide this vital research through adaptation and development for the benefit of humanity through improvements in lifestyle. Thus, future industrial revolutions and societal evolutions heavily depend on the innovation and invention of smart processes and information fusion for the development of mission-critical systems.

This book focuses on cross-disciplinary research impacting industry and smart society—ultimately leading to smart manufacturing, management of critical processes, and information fusion. It contains chapters from authors presented during the International Conference on Innovative Technologies in Intelligent Systems and Industrial Applications (CITISIA) 2022 which was held in Sydney, Australia, on November 14–16, 2022. This book familiarizes the reader with new dimension of innovation designed for future generations to be inspired by and to learn from and to retain as a valuable library. In the current context, the book addresses Industry Revolution 4.0 and Smart Society 5.0 impacting technological evolution and transformations in the years to come. Chapters are categorized by main topics so that readers are guided to their areas of interest:

Topic 1 addresses the contributions that impact on society through novel neural network architectures and machine learning algorithms.

Topic 2 explores novel mixed reality approaches for real-world applications.

Topic 3 introduces hybrid data security models for a smart society.

Topic 4 analyzes synergy of signal processing, AI, and ML for systems.

Topic 5 discusses advanced system modeling for industry revolution.

Topic 6 explores IoT and cybersecurity for smart devices.

Topic 7 describes recent advances in AI for digital innovations.

Topic 8 introduces AI and IoT for industry applications.

Topic 9 explores knowledge-based IoT and intelligent systems.

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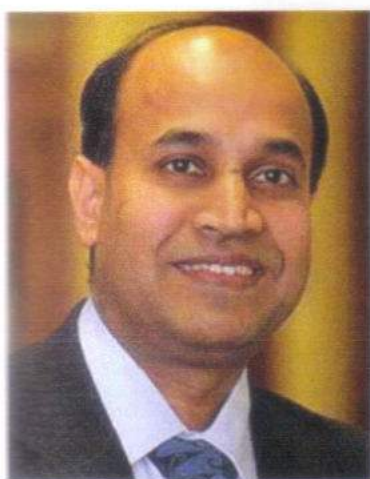
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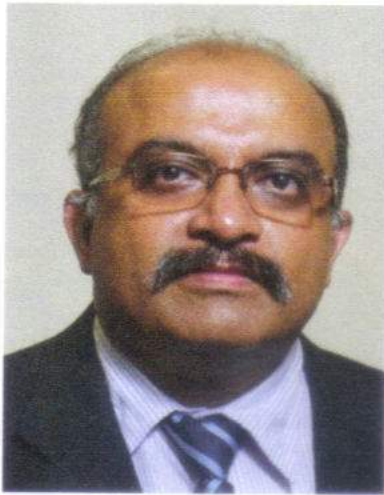
He has authored/co-authored over 500 papers in different international journals, conferences, and chapters. He has edited eighteen conference proceedings. He has also edited twenty-five special issues of international journals as Lead Guest Editor and thirty-five books with Springer-Verlag.

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