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Books Review

1. *Advances in Artificial Intelligence-based Technologies – Selected Papers in Honour of Professor Nikolaos G. Bourbakis – Vol. 1*
   Editors: Virvou, Maria; Tsihrintzis, George A.; Tsoukalas, Lefteri H.; Jain, Lakhmi C.
   Springer 2022, pp. 241, ISBN 978-3-030-80570-8
   Vol. 22 in Springer Book Series entitled ***Learning and Analytics in Intelligent Systems*** (https://www.springer.com/series/16172)
2. *Advances in Machine Learning/Deep Learning-based Technologies – Selected Papers in Honour of Professor Nikolaos G. Bourbakis – Vol. 2*
   Editors: Tsihrintzis, George A.; Virvou, Maria; Jain, Lakhmi C.
   Springer 2022, pp. 237, ISBN 978-3-030-76793-8
   Vol. 23 in Springer Book Series entitled ***Learning and Analytics in Intelligent Systems*** (https://www.springer.com/series/16172)
3. *Advances in Assistive Technologies – Selected Papers in Honour of Professor Nikolaos G. Bourbakis – Vol. 3*
   Editors: Tsihrintzis, George A.; Virvou, Maria; Esposito, Anna; Jain, Lakhmi C.
   Springer 2022, pp. 317, ISBN 978-3-030-87131-4
   Vol. 28 in Springer Book Series entitled ***Learning and Analytics in Intelligent Systems*** (https://www.springer.com/series/16172)

The first two decades of the 21st Century have witnessed two trends that will be a harbinger of what the remainder of the century will bring, namely (i) explosive progress in research and development along several avenues within the artificial intelligence discipline; and (ii) improved life expectancy resulting in the world population increasing and pressure for subsequent needs for assistive technologies in support of elderly population and people in need.

Indeed, artificial intelligence-based technologies – including advances in theory and applications of machine learning/deep learning – are shaping human history and civilization in the 21st Century and profoundly affecting everyday life and human interactions both at the work place and in private life. Moreover, constantly arising new technological challenges lead to the safe prediction that, in the years and decades to come, the effect and impact of artificial intelligence will be felt in ever more aspects of human life and endeavors. In fact, societal demand and human ingenuity constantly press the entire field of artificial intelligence towards further research and

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development in essentially all sorts of human activities and professions, following important and evolving new scientific and technological advancements in big data, cloud computing, mobile software applications, networking and communication, smartphones and smart devices, internet of things, computer vision, businesses, manufacturing and other areas.

Particularly active is the artificial intelligence field of *machine learning*, first-named so by Arthur Samuel in 1959 [1], for the discipline which attempts to develop computer systems that automatically improve with experience, and to unearth the fundamental laws that govern all learning processes [2]. Indeed, machine learning and its sub-field of *deep learning* are research areas with great successful stories which are only feasible with the advancement on algorithms and computing power and the availability of data [3,4].

With the aforementioned scientific and technological advancement as the backdrop, both life expectancy and the World population are rising fast. While the current life expectancy stands at about 73 years for the entire World (and 80+ years for Europe, USA, Australia and Japan) [5], projections indicate that it may rise to over 83 years by the end of the 21st Century [6]. Moreover, the probability of someone reaching the age of 125 or even 130 years within this century is calculated to be at a non-negligible 13% [7]. On the other hand, the World population is also expected to rise significantly, from the current 7.8 billion [8] to almost 10 billion in 2050 [9,10] and, further, to about 11 billion by the end of the 21st Century [10]. Unfortunately, the rapid increase in both life expectancy and the World population is accompanied by the emergence of new diseases, while armed conflicts and violence are expected to continue. As a result, "in countries with life expectancies over 70 years of age, people spend on average about 8 years, or 11.5 per cent of their life span, living with disabilities" [11]. Meanwhile, the number of vulnerable people in need of assistance is expected to rise from the current figure of about 1 billion [12] (61 million in the USA alone [13]) to well over 2 billion within this century.

While the positive impact of artificial intelligence-based technologies on humankind can be tremendous, the very technologies also carry risks and potential threats in business, competition, the job market, as well as security, privacy, safety, transparency, fundamental rights, democracy or even human existence itself [14,15]. Thus, artificial intelligence-based technologies need to be developed under careful human supervision and by highly qualified scientists who understand the associated risks and threats. Moreover, the general public needs to have an – at least basic – understanding of the strengths of these technologies and the potential threats they pose.

On the other hand, there is also no doubt that ever more sophisticated assistive technologies need to be developed and made broadly available. Thus, governments need to be mobilized and researchers from both academia and industry need to get increasingly involved in related research and development.

Professor **Nikolaos G. Bourbakis** stands out as a World-leading researcher who has been working in the fields of artificial intelligence (including machine learning/deep learning) and assistive technologies for almost fifty years now. From various posts during his career, he has made significant contributions to both fields and to their intersection from various perspectives. He has advised and mentored generations of students and researchers. For his achievements, he has received broad recognition and many prestigious awards.

Recently, Profs. George A. Tsihrintzis, Maria Virvou, Anna Esposito, Lefteri H. Tsoukalas and Lakhmi C. Jain undertook a task of dual purposes: on the one hand, providing researchers with an extensive overview of advances in both artificial intelligence-based technologies and assistive technologies (and areas where they cross), and on the other hand, honouring Prof. Nikolaos G. Bourbakis for his numerous and influential contributions to both of these fields. Towards this dual target, Professors Tsihrintzis, Virvou, Esposito, Tsoukalas and Jain have just delivered a high quality trilogy in which they highlight a broad spectrum of current aspects and advances of these fascinating disciplines. The trilogy consists of a first volume devoted to *Advances in Artificial Intelligence-based Technologies*, a second volume devoted to *Machine Learning/Deep Learning-based Technologies* and a third volume devoted to *Assistive Technologies*. Each volume includes an introductory (editorial) chapter and is further divided into multiple parts, with each part grouping together chapters of related themes.

Specifically, *Advances in Artificial Intelligence-based Technologies* consists of an introductory chapter and an additional 11 chapters. In the introductory chapter, the editors guide the reader, especially the newcomer to this area, with major concepts, the approaches and some of the open challenges of this fascinating discipline. The remaining 11 chapters have been written by world-renowned researchers who have made significant contributions to their corresponding fields. In these chapters, artificial intelligence-based applications are presented in diversified areas, including *Advances in Artificial Intelligence Tools and Methodologies* (4 chapters), *Advances in Artificial*

Intelligence-based Applications and Services (5 chapters), and *Theoretical Advances in Computation and System Modeling* (2 chapters).

The second volume of *Advances in Machine Learning/Deep Learning-based Technologies* consists of an introductory chapter and an additional 10 chapters. Again, in the introductory chapter, the editors guide the reader, especially the newcomer to this area, with major concepts, the approaches and some of the open challenges of this fascinating discipline. The remaining 10 chapters have been written by world-renowned researchers who have made significant contributions to their corresponding fields. In these chapters, machine learning/deep learning-based applications are presented in five different areas, including *Machine Learning/Deep Learning in Socializing and Entertainment* (2 chapters), *Machine Learning/Deep Learning in Education* (2 chapters), *Machine Learning/Deep Learning in Security* (2 chapters), *Machine Learning/Deep Learning in Time Series Forecasting* (2 chapters) and *Machine Learning in Video Coding and Information Extraction* (2 chapters).

Finally, *Advances in Assistive Technologies* consists of an introductory chapter and an additional 12 chapters. Again, in the introductory chapter, the editors guide the reader, especially the newcomer to this area, with major concepts, the approaches and some of the open challenges of this fascinating discipline. The remaining 12 chapters have been written by world-recognized researchers who have made significant contributions to their corresponding fields. In these chapters, various assistive technologies are presented, including *Advances in Assistive Technologies in Healthcare* (3 chapters), *Advances in Assistive Technologies in Medical Diagnosis* (3 chapters), *Advances in Assistive Technologies in Mobility and Navigation* (5 chapters), and *Advances in Privacy and Explainability in Assistive Technologies* (1 chapter).

Editing a trilogy of books with the purpose to expose artificial intelligence-based technologies and assistive technologies to their full extents is not an easy task, especially as advances are continuously being made in these fields. The editors are required to be deeply involved in related research and well-versed in the corresponding state-of-the-art development in the field. Profs. Tsihrintzis, Virvou, Esposito, Tsoukalas and Jain have managed to impress us with the breadth of the topics covered in their three-volume book. They also dazzle us with the depth in which each topic is covered. The reader has a choice: he/she may choose to either concentrate on specific chapters that are of particular interest to him/her or he/she may prefer to read through several and diverse chapters and get informed on broader aspects of artificial intelligence-based technologies and assistive technologies. Thus, the trilogy is useful to either the specialized researcher seeking information on specific sub-areas within these disciplines or the newcomer who seeks to get involved in these disciplines. I am confident that both types of readers will benefit greatly from the books and both types of readers will be able to make use of and apply their readings in practice.

In summary, I warmly congratulate the editors for their superb work. I highly and wholeheartedly recommend the trilogy to professors, graduate students, practitioners and other specialists in artificial intelligence-based technologies and assistive technologies, and to general readers, all of whom, I am sure, will benefit greatly from it in their research endeavor.

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