Editorial for the 30th anniversary special issue

Moonis Ali[1] · **Hamido Fujita**[2]

Artificial Intelligence started in the 1940s and it was in a very rudimentary form, but it evolved with time. Most of the research work performed was theoretical with unachievable goals. It resulted in a kind of downfall in the field. In the 1970s, the focus changed to Applied research and the Artificial Intelligence field started rising again. Applied aspects of Artificial Intelligence gave birth to a sister field termed Applied Intelligence, and a significant amount of applied research started growing in this new field. As a result, several new journals started in the field of Applied Intelligence publishing the applied research work. That also gave birth to the International Journal of Applied Intelligence in 1991 with Springer as its publisher and Dr. Moonis Ali as the Editor in Chief of the journal.

Those times were so different from the current time from a publication point of view. We started four issues per year of the Applied Intelligence journal and Springer had a very strict limit of one hundred pages per issue. Therefore, we were publishing approximately six papers per issue. A significant amount of the processing of papers was done manually causing inefficiencies in the processing and it was also time consuming. The system evolved over time leading to the current system, which has a significant amount of automation and is more efficient. We now publish fifteen issues per year and currently publish approximately fifty papers per issue.

As a part of celebrating the thirtieth anniversary of the journal, we decided to publish a special issue based on invited papers from well-known scientists in the field. Thirteen papers covering a broad spectrum of the field of Applied Intelligence are presented in this special issue. These papers were selected due to their authors' pioneering efforts in the subject in which they are invited:

{Summary of Thirteen papers}

The enlisted contributions by pioneering authors provide an overview on recent studies of hot topics that cover many theories and applications in Applied Intelligence. The thirteen papers are contributed to this special issue as a memorial of the thirtieth anniversary.

The Geometry of Three-Way Decision by **Yiyu Yao:** He provided an interesting outline in theory and application of three-way decision, a new innovative framework in Applied Intelligence in terms of uncertainty in decision making. Prof. Yiyu Yao is one of the pioneering researchers on these new concepts, on which he has published highly cited articles on such topic. This paper concerns the art, science, and practice of thinking, problem solving, and information processing in threes. A triad of these things is used to describe, represent, and process a whole in three parts.

Towards Bridging the Neuro-Symbolic Gap: Deep Deductive Reasoners by **Monireh Ebrahimi, Aaron Eberhart, Federico Bianchi, Pascal Hitzler:** They discuss the neural network and symbolic knowledge representation differences in the context of deep deductive reasoners, in term of accuracy, scalability, transferability, generalizability, speed, and interpretability. They apply models on Resource Description Framework.

Autonomous Flight Cycles and Extreme Landings of Airliners Beyond the Current Limits and Capabilities Using Artificial Neural Networks by **Haitham Baomar, Peter J. Bentley:** They presented the Intelligent Autopilot System (IAS), a fully autonomous autopilot capable of piloting large jets such as airliners by learning from experienced human pilots using Artificial Neural Networks. The system is imitating human pilots' skills through experiments

✉ Hamido Fujita
hfujita-799@acm.org

Moonis Ali
ma04@txstate.edu

[1] Texas State University, San Marcos, TX, USA

[2] Iwate Prefectural University, Takizawa, Japan

of planes landing in bad weather conditions. The paper is a good example of the state-of-art of Applied Neural network.

Evidential Fully Convolutional Network for Semantic Segmentation by **Zheng Tong, Philippe Xu, Thierry Denoeux:** They presented evidential fully convolutional network for feature extraction on image segmentation. Its new approach based on the combination of Dempster-Shafer theory and fully convolutional network for image semantic segmentation. Their model makes it possible to improve accuracy and calibration of fully convolutional network models by assigning ambiguous pixels to multi-class sets, while maintaining the good performance of the network in precise segmentation tasks.

Deep Learning in Multi-Object Detection and Tracking: State of the Art by **Sankar K. Pal, Anima Pramanik, J. Maiti, Pabitra Mitra**: They present an outstanding overview on object tracking and object detection relative to current state of art with comparative views.

The Hierarchical SMAA-PROMETHEE Method Applied to Assess the Sustainability of European Cities by **Salvatore Corrente, Salvatore Greco, Floriana Leonardi, Roman Slowinski:** They apply multiple criteria decision-making framework to assess the environmental, social, and economic sustainability of 20 European cities in the period going from 2012 to 2015. The model they presented provides more robust recommendations than a method based on a single instance of the considered preference model compatible with few preference information items provided by the Decision Maker. It is unique work in decision making approach from pioneers in decision making technology.

Automated Major Depressive Disorder Detection Using Melamine Pattern with EEG Signals by **Emrah AYDEMIR, Turker TUNCER, Sengul DOGAN, Raj Gururajan, U. Rajendra ACHARYA:** They presented automated major depressive disorder detection system using EEG (electroencephalogram) signals. They use a combination of different machine learning models for classification and automatic detection. Healthcare system is an important part of Applied Intelligence for deduction and prediction of sickness or diseases before it happens. These kinds of techniques use innovative machine learning models with their prediction accuracies.

Recent Advances in Evolutionary and Bio-inspired Adaptive Robotics: Exploiting Embodied Dynamics by Phil **Husbands, Yoonsik Shim, Michael Garvie, Alex Dewar, Norbert Domcsek, Paul Graham, James Knight, Thomas Nowtny, Andrew Philippides:** They discuss evolutionary and bio-inspired approaches to autonomous robotics,

exploring multi-objective evolutionary algorithm for evolved dynamical neural system-based robotics. The approaches they discussed are resilient and robust in terms of their behavior and analysis.

A Panoramic View and SWOT Analysis of Artificial Intelligence for achieving the Sustainable Development Goals by 2030: Progress and Prospects by **Iván Palomares, Eugenio Martínez-Cámara, Rosana Montes, Pablo García-Moral, Manuel Chiachio, Juan Chiachio, Sergio Alonso, Francisco J. Melero, Daniel Molina, Bárbara Fernández, Cristina Moral, Rosario Marchena, Javier Pérez de Vargas, Francisco Herrera**: This paper is reporting important hot topics in Applied Intelligence which are related to Sustainable Development Goals (SDGs) and Emerging Digital Technologies that become part of essential reform in any advanced infrastructure in system development or service provider. The paper is a comprehensive review of existing literature and an analysis of strengths, weaknesses, opportunities, and threats which has been considered to identify the inherent nature of artificial intelligence-driven technologies as facilitators of the positive shift to SDGs.

Modular Design Patterns for Hybrid Learning and Reasoning Systems by **Michael van Bekkum, Maaike de Boer, Frank van Harmelen, André Meyer-Vitali, Annette ten Teije**: They discuss modular design patterns for hybrid, neuro-symbolic Artificial Intelligence-based systems. These patterns, organized in a set of elementary patterns and a set of compositional patterns, proposed realistic applications of neuro-symbolic architectures.

30th Anniversary of Applied Intelligence Journal: A combination of bibliometrics and thematic analysis using SciMAT by **J.R. López-Robles, M.J. Cobo, M. Gutiérrez-Salcedo, M.A Martínez-Sánchez, N.K. Gamboa-Rosales, E. Herrera-Viedma**: They conducted bibliometric performance and conceptual structure analysis of Applied Intelligence from 1991 to 2020 using SciMAT by applying data obtained from SCOPUS, then they analyzed the journal using SciMAT visualization tool. This article demonstrates the growth of the journal in terms of topics and authors' citations.

Rational Verification: Game-theoretic Verification of Multi-Agent Systems by **Alessandro Abate, Julian Gutierrez, Lewis Hammond, Paul Harrenstein, Marta Kwiatkowska, Muhammad Najib, Giuseppe Perelli, Thomas Steeples, Michael Wooldridge:** They discuss the state of the art of rational verification which can be understood as a counterpart to the conventional model checking paradigm for automated verification and correctness in the context of multi-agent systems.

A comprehensive model and computational methods to improve Situation Awareness in Intelligence scenarios by **Angelo Gaeta, Vincenzo Loia, Francesco Orciuoli:** They presented model on Situation Awareness and Granular Computing for the development of methods and techniques of analysis to support intelligence. It is used as representation of an operational situation of description, relation, and behavior based on granular computing principles. The reasoning of real data situation is validated in different situational scenarios.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Dr. Moonis Ali has been a full professor of Computer Science since 1983. He completed his Ph.D. in 1969 in the area of Speech Recognition. Since then, Dr. Ali has been carrying out research in many areas including Pattern Recognition, Image Processing, Picture Grammars, Machine Translation, and Intelligent Systems for Fault Diagnosis in Jet and Rocket Engines. Dr. Ali has published thirty two edited books and over one hundred papers in journals and conference proceedings. Dr. Ali started the International Journal of Applied Intelligence as the Editor in Chief in 1991 and has continued on that position of the journal to date. In the same year, Dr. Ali started International Society of Applied Intelligence as its president in 1991 and has continued on that position of the society to date. Also, Dr. Ali started the International Conference on Industrial, Engineering & Other Applications of Applied Intelligent Systems in 1988 as the General Chair and has continued on that position of the conference to date. Dr. Ali also started the Applied Intelligence Newsletter in 2016 as its Editor in Chief and has continued on that position of the newsletter to date

Hamido Fujita He is a Professor with Iwate Prefectural University, Takizawa, Japan, as Director of Intelligent Software Systems. He is Highly Cited Researcher in Cross-Field for the year 2019 and 2020 in Computer Science field, respectively by Clarivate Analytics. He received Doctor Honoris Causa from Óbuda University, Budapest, Hungary, in 2013 and received Doctor Honoris Causa from Timisoara Technical University, Timisoara, Romania, in 2018, and a title of Honorary Professor from Óbuda University, in 2011. He is Distinguished Research Professor at the University of Granada, and Adjunct Professor with Stockholm University, Stockholm, Sweden; University of Technology Sydney, Ultimo, NSW, Australia; National Taiwan Ocean University, Keelung, Taiwan, and others. He has supervised Ph.D. students jointly with the University of Laval, Quebec City, QC, Canada; University of Technology Sydney; Oregon State University, Corvallis, OR, USA; University of Paris 1 Pantheon-Sorbonne, Paris, France; and University of Genoa, Italy. Dr. Fujita is the recipient of the Honorary Scholar Award from the University of Technology Sydney, in 2012. He has four international patents in software systems and several research projects with Japanese industry and partners. He is the Emeritus Editor-in-Chief for Knowledge-Based Systems, and currently Editor-in-Chief of Applied Intelligence (Springer), He headed a number of projects including intelligent HCI, a project related to mental cloning for healthcare systems as an intelligent user interface between human-users and computers, and SCOPE project on virtual doctor systems for medical applications. He collaborated with several research projects in Europe, and recently he is collaborating in OLIMPIA project supported by Tuscany region on Therapeutic monitoring of Parkison disease. He has published more 400 highly cited Papers.