



## Special issue on information, intelligence, systems and applications

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Received: 19 October 2022 / Accepted: 19 October 2022 / Published online: 25 October 2022  
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Information is widely available and accessible, but frequently leads to information overload and overexposure, while the effort for coding, storing, hiding, securing, transmitting and retrieving it may be excessive. Intelligence is required to manage information and extract knowledge from it, inspired by biological and other paradigms. Information and multimedia systems, with an increasing level of intelligence, are being developed that incorporate these advances. As a result, new methods and technologies are emerging, aiming at developing methodologies and tools for the solution of complex problems in the context of applications of artificial intelligence, biology, neuroscience, security, monitoring, surveillance, healthcare, sustainability in energy sources, governance, education, commerce, automation, robotics, optimization, image, speech, and natural language processing.

This special issue includes extended and revised versions of the best papers presented in the 10th International Conference on Information, Intelligence, Systems and Applications (IISA 2019) and papers submitted especially for this issue after an open CFP, related to the above objectives.

Karlos et al. propose a framework that combines active and semi-supervised learning approaches to fuse their advantages during the main core of a learning process. They conduct an empirical evaluation of such a combinatory approach over three problems, which stem from various fields but are all tackled using acoustical signals, operating under the pool-based scenario: gender identification, emotion detection and automatic speaker recognition. The benefits of adopting such kind of semi-automated approaches are shown.

Moustakidis et al. explore the use of DNN and machine learning (ML) models in addressing the diagnosis problem

of knee osteoarthritis classification, which is a complex problem. A hybrid criterion, including accuracy and confusion matrix, and two fairness metrics (demographic parity and balanced equalized odds) are used to validate the performance of the proposed methodology. The results show promising.

Zafeiriou and Kalles present the analysis, design, implementation and evaluation of an ultra-short-term frequency trading system for the foreign exchange (FOREX) market, which features all stages of the trading process. It is achieved by substantially exploiting artificial intelligence techniques, like neural networks. They aim to simulate the judgment and decision making of the human expert (technical analyst or broker) with a system that responds in a timely manner to changes in market conditions.

Troussas et al. in their paper present a multilayer inference engine developed to provide individualized instruction to students in the context of an intelligent tutoring system for programming in Java. The engine incorporates a set of algorithmic methods (artificial neural network, fuzzy logic model) in different layers promoting personalization in the tutoring strategies.

Gong and Jin propose a fast convergence zeroing neural network (BFCZNN) model with a new activation function (AF) for solving dynamic nonlinear equations (DNEs) and apply it to kinematic control of a robot manipulator. The proposed BFCZNN model not only finds the solutions of DNE in a fixed time, but also has better robustness than most of the previously reported studies.

Meimetis et al. introduce a real-time multiple object tracking framework that is based on a modified version of the Deep SORT algorithm. The modification concerns the process of initialization of objects; its rationale is to consider an object as tracked if it is detected in a set of previous frames. The modified Deep SORT is coupled with YOLO detection methods, and a concrete and multi-dimensional analysis of the performance of the framework is performed in the context of real-time multiple tracking of vehicles and pedestrians in various traffic videos.

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Schirmer and Mporas show that, based on the aggregated energy consumption signal acquired from a smart meter outside the house, privacy- and security-sensitive information related to the residents of a house, such as occupancy information, multimedia watching and preferences as well as socioeconomic and health-related information, can be extracted.

Fevgas et al. propose HyR-tree, a hybrid variant of R-tree that persists a part of the tree in the high-performing 3D XPoint storage. HyR-tree identifies repeated access pattern to the data and uses these patterns to locate the most important nodes. The importance of a node is determined by the performance gain that derives from its placement within a 3D XPoint-based device, certified by experimental results.

Spatharis et al. investigate the use of hierarchical multi-agent reinforcement learning methods for the computation of policies to resolve congestion problems in the air traffic management domain. To address cases where the demand of airspace use exceeds capacity, they consider agents representing flights, who need to decide on ground delays at the pretactical stage of operations, towards executing their trajectories while adhering to airspace capacity constraints.

Ntourmas et al. propose and evaluate a way of building supervised models in the context of MOOCs, by using the semantic similarities of the forum transcripts with the

dynamically created corpora from a MOOC environment as training features, aiming at facilitating transferability of the model to other MOOCs. They reveal the main benefits and trade-offs of the proposed approach as far as transferability is concerned via experiments.

Panteli and Boutsinas show that the application of a facility location model to recommender systems, first studied in their paper, provides effectiveness and flexibility in terms of similarity of the recommending set when compared to the target query and diversity between the recommended cases with each other.

Finally, Margaris et al. present a novel collaboration filtering (CF) algorithm, namely experiencing period criterion (CFEPC), which considers the information of the users' experiencing period in the CF prediction process, in order to improve rating prediction accuracy.

**Acknowledgements** The guest editors would like to thank the Editor-In-Chief of Neural Computing and Applications, Prof. John Macintyre, the Production Editor Deepika Sureshkumar, the Senior Editor Rachel Moriarty, and the JEO Assistants Rashmi Jenna and Ramya Balu for their help and support on the submission and publication. The guest editors would also like to thank all the reviewers for their time and effort in providing high-quality reviews.

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