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Editorial

Artificial Intelligence Applications and Innovations: Day-to-Day Life Impact

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1. Introduction

The idea of an intelligent machine has fascinated humans for centuries. But what is intelligence? Some define it as the capacity for learning, reasoning, understanding or, from a different perspective, the aptitude to grasp truths, relationships, facts, or meanings. All these perspectives require the capacity to acquire data from the surrounding world and, possibly, act over that environment. In short, the building of more or less autonomous agents, served with sensors and actuators, capable of learning and producing educated answers has been long foreseen.

New trends in intelligente systems comprise, among other aspects, pervasive robotization, ubiquitous online data access, empowered edge computing, smart spaces, and digital ethics. These trends build the research on "Artificial Intelligence Applications and Innovation", impacting our day-to-day life, our cities, and even our free time. Nevertheless, artificial intelligence (AI) is still closely associated with some popular misconceptions that cause the public to either have unrealistic fears about it or to have unrealistic expectations about how it will change our workplace and life in general. It is important to show that such fears are unfounded and that new trends, innovations, technologies, and smart systems will be able to improve the way we live, benefiting society without replacing humans in their core activities.

2. Artificial Intelligence Applications and Innovation

This Special Issue (SI) delves into mutually dependent subfields including, but not restricted to, machine learning, computer vision, data analysis, data science, big data, internet-of-things (IoT), affective computing, natural language processing, privacy and ethics, and robotics. The established set of papers form a comprehensive collection of contemporary "Artificial Intelligence Applications and Innovation" that serves as a convenient reference for AI experts as well as newly arrived practitioners, introducing them to different fields and trends.

In this context, the mentioned advancements and technologies have the potential to enhance our lifestyle; examples are presented by Iovane et al. [1], where a model for assessing the relevance of opinions in uncertainty and info-incompleteness conditions is proposed, and by Mndawe et al. [2], where a stock price prediction framework is introduced, supported by a sentiment classifier based on news headlines and tweets. The latter work uses four machine learning models for a fundamental analysis and six long short-term memory (LSTM) model architectures, including a developed LSTM encoder–decoder model for technical analysis. Data used in the experiments are mined and collected from news sites, tweets (from Twitter), and Yahoo Finance. A deep data assimilation (DDA) model is

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presented by Arcucci et al. in [3], where novel integration of data assimilation with machine learning through the use of a recurrent neural network is designed.

Other innovative advances include Domingo's deep learning and IoT application for beach monitoring [4], where a study of beach attendance prediction at Castelldefels beach is conducted. The evaluation of robotic solutions and their potential benefits, compared to conventional processes when adopted on construction, is presented by Marcher et al. [5].

Related to health and well-being, a model for differential diagnosis of Raynaud's phenomenon based on thermal hand patterns is presented by Filippini et al. [6], and the issues and needs of dyslexic students are studied by Zingoni et al. [7]. Silva et al. [8] introduce a tool for lung nodule malignancy assessment using computed tomography images.

Two studies relate to energy consumption optimization. Namely, Hong et al. [9] present a driving cycle-based state of charge prediction for electrical vehicles batteries using deep learning methods, and Hora et al. [10] introduce a metaheuristic for effective electric energy consumption prediction.

In the field of identification, again, two studies are presented, namely facial ID document validation in mobile devices addressed by Medvedev et al. [11] and a review of tools and methods for the (re-)identification in urban scenarios presented by Oliveira et al. [12].

Finally, more conceptual studies are also available. In particular, Turner et al. [13] present a modular dynamic neural network architecture for continual learning that can deal with the phenomenon of catastrophic forgetting, and Chen et al. [14] analyze the temporal structures in evolutionary networks. In the latter case, the authors propose a community detection algorithm based on graph representation learning that uses a Laplacian matrix to extract the node relationship data of the edges of the network structure that are directly connected at the preceding time slice. A deep sparse autoencoder learns to represent the network structure under the current time slice, and the K-means clustering algorithm is used to partition the low-dimensional feature matrix of the network structure under the current time slice into communities.

Despite the widespread use of AI in various applications, recent advancements indicate that the field is still in its early stages of development, with many opportunities for growth and innovation ahead.

3. Future of AI

Although the Special Issue is closed, much more in-depth and distinct research in AI applications is foreseeable. E.g., as AI systems become more complex, there is a growing need for transparency and interpretability, making the field of explainable AI (XAI) one of the present and also future trends. On other words, XAI focuses on making AI systems more understandable and accountable, allowing humans comprehension of the decision-making processes of AI algorithms.

AI ethics and bias mitigation, which concerns bias in AI algorithms and their ethical implications, is also a fundamental trend. This field leads to increased efforts to develop and implement ethical AI practices, addressing stricter regulations, better frameworks for ethical AI development, and increased awareness of bias issues.

Edge AI is both a current and a future area of interest. With the rise of the IoT, there is a growing trend toward deploying AI models directly on edge devices, like smartphones or IoT devices, rather than relying solely on centralized cloud servers. This can lead to faster response times, improved privacy, reduced bandwidth usage and more sustainable AI ecosystems.

Generative models, such as generative adversarial networks (GAN) and variational autoencoders (VAE), are presented in many models and becoming more sophisticated. These models are used for creating realistic synthetic data, generating content, and similar applications, with potential breakthroughs in areas like creativity and content creation.

AI in healthcare, as presented in some chapters of the SI, is currently playing and anticipated to continue playing a crucial role in personalized medicine, drug discovery,

and diagnostic tools. As evidenced, integrating AI into healthcare can actually result in better treatment plans, more precise diagnoses, and better patient outcomes.

Other present and future trends include natural language processing (NLP), autonomous systems, and AI applications on fields like cybersecurity or in finance. As a matter of fact, continued advancements in NLP could lead to more natural and context-aware interactions with AI systems. This trend includes improvements in language understanding, sentiment analysis, and language generation. The development of autonomous vehicles, drones, and robotic systems is ongoing. Advancements in machine learning and sensor technologies are expected to drive progress in making these systems safer and more reliable. With the increasing sophistication of cyber threats, AI is being used to enhance cybersecurity measures. AI systems can detect anomalies, identify patterns, and respond to security incidents in real time. In the financial sector AI is likely to continue making inroads for tasks such as fraud detection, algorithmic trading, and personalized financial advice.

Nevertheless, the integration of quantum computing and AI is probably the next "jump". There is growing interest in exploring how quantum computing can be integrated with AI to solve complex problems more efficiently.

Altogether, these trends validate a future where AI becomes more integrated into various aspects of our lives, solving complex problems and improving efficiency across different industries. Keeping in mind that the AI field is dynamic, and new trends may emerge as technology continues to evolve, it is therefore fundamental to keep up with the latest developments in the field to stay ahead of the curve.

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References

1. Iovane, G.; Landi, R.E.; Rapuano, A.; Amatore, R. Assessing the Relevance of Opinions in Uncertainty and Info-Incompleteness Conditions. *Appl. Sci.* **2022**, *12*, 194. [CrossRef]
2. Mndawe, S.T.; Paul, B.S.; Doorsamy, W. Development of a Stock Price Prediction Framework for Intelligent Media and Technical Analysis. *Appl. Sci.* **2022**, *12*, 719. [CrossRef]
3. Arcucci, R.; Zhu, J.; Hu, S.; Guo, Y.K. Deep Data Assimilation: Integrating Deep Learning with Data Assimilation. *Appl. Sci.* **2021**, *11*, 1114. [CrossRef]
4. Domingo, M.C. Deep Learning and Internet of Things for Beach Monitoring: An Experimental Study of Beach Attendance Prediction at Castelldefels Beach. *Appl. Sci.* **2021**, *11*, 10735. [CrossRef]
5. Marcher, C.; Giusti, A.; Matt, D.T. On the Design of a Decision Support System for Robotic Equipment Adoption in Construction Processes. *Appl. Sci.* **2021**, *11*, 11415. [CrossRef]
6. Filippini, C.; Cardone, D.; Perpetuini, D.; Chiarelli, A.M.; Gualdi, G.; Amerio, P.; Merla, A. Convolutional Neural Networks for Differential Diagnosis of Raynaud's Phenomenon Based on Hands Thermal Patterns. *Appl. Sci.* **2021**, *11*, 3614. [CrossRef]
7. Zingoni, A.; Taborri, J.; Panetti, V.; Bonechi, S.; Aparicio-Martínez, P.; Pinzi, S.; Calabrò, G. Investigating Issues and Needs of Dyslexic Students at University: Proof of Concept of an Artificial Intelligence and Virtual Reality-Based Supporting Platform and Preliminary Results. *Appl. Sci.* **2021**, *11*, 4624. [CrossRef]
8. Silva, F.; Pereira, T.; Frade, J.; Mendes, J.; Freitas, C.; Hespanhol, V.; Costa, J.L.; Cunha, A.; Oliveira, H.P. Pre-Training Autoencoder for Lung Nodule Malignancy Assessment Using CT Images. *Appl. Sci.* **2020**, *10*, 7837. [CrossRef]
9. Hong, S.; Hwang, H.; Kim, D.; Cui, S.; Joe, I. Real Driving Cycle-Based State of Charge Prediction for EV Batteries Using Deep Learning Methods. *Appl. Sci.* **2021**, *11*, 11285. [CrossRef]
10. Hora, S.K.; Poongodan, R.; de Prado, R.P.; Wozniak, M.; Divakarachari, P.B. Long Short-Term Memory Network-Based Metaheuristic for Effective Electric Energy Consumption Prediction. *Appl. Sci.* **2021**, *11*, 11263. [CrossRef]
11. Medvedev, I.; Shadmand, F.; Cruz, L.; Gonçalves, N. Towards Facial Biometrics for ID Document Validation in Mobile Devices. *Appl. Sci.* **2021**, *11*, 6134. [CrossRef]
12. Oliveira, H.S.; Machado, J.J.M.; Tavares, J.M.R.S. Re-Identification in Urban Scenarios: A Review of Tools and Methods. *Appl. Sci.* **2021**, *11*, 10809. [CrossRef]

13. Turner, D.; Cardoso, P.J.S.; Rodrigues, J.M.F. Modular Dynamic Neural Network: A Continual Learning Architecture. *Appl. Sci.* **2021**, *11*, 12078. [CrossRef]
14. Chen, D.; Nie, M.; Wang, J.; Kong, Y.; Wang, D.; Huang, X. Community Detection Based on Graph Representation Learning in Evolutionary Networks. *Appl. Sci.* **2021**, *11*, 4497. [CrossRef]