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Editorial

Special Issue "Advance in Machine Learning"

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Machine learning has increasingly become the bridge between theoretical knowledge and practical applications, transforming countless aspects of modern life. With the development of advanced machine learning algorithms, we can now address complex real-world problems once reserved for human experts. Specifically, by leveraging vast amounts of data and powerful computing resources, machine learning algorithms can learn to recognize patterns and make predictions or decisions based on those patterns. In addition, in many cases, machine learning algorithms can outperform humans in these tasks by analyzing data more quickly and accurately than humans could. Machine learning enables new solutions to real-world problems and changes how we live, work, and interact with technology.

There have been significant advances in machine learning in recent years, driven by both improvements in algorithms and increases in computing power. Some of the major recent advances are outlined below:

1. Deep learning: Deep learning is a subfield of machine learning that uses neural networks with many layers to learn complex data representations. Deep learning has enabled breakthroughs in computer vision, speech recognition, and natural language processing.
2. Real-time analysis: Real-time analysis of big data by machine learning is a powerful combination that allows organizations to process and analyze massive amounts of data in real time to gain insights and make informed decisions. Real-time analysis refers to the ability to process and analyze data as they are generated or received without delay. Machine learning algorithms can be used to analyze big data in real time by processing data streams and making predictions or decisions based on patterns in the data. This enables organizations to detect and respond to trends, anomalies, and other patterns in real time, which can be critical for decision making in many industries, such as healthcare, finance, retail, and manufacturing.
3. Machine vision: Machine vision is a field of machine learning, computer science, and engineering that focuses on enabling machines to interpret and understand visual information from the world around them. It involves using computer algorithms and hardware to analyze and make sense of visual data, such as images and videos. Machine vision has become increasingly important in many industries, ranging from manufacturing to healthcare to transportation.
4. Natural language processing (NLP): NLP is an area of machine learning that focuses on enabling machines to understand and interpret human language. Machine learning has been critical in advancing the field of NLP as it allows machines to learn patterns and relationships in language data and use that knowledge to perform a wide range of tasks.

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These advances in machine learning are enabling new applications and improving the performance of existing applications, and they are likely to continue to drive progress in the field in the coming years.

In this Special Issue, we highlight research and case studies demonstrating the application of machine learning in various scientific fields, with an emphasis on its role in supporting applied research.

The eight published papers in this Special Issue span various applications, showcasing the power and potential of machine learning in various contexts. These papers include the following:

1. "Optimal Design of Computational Fluid Dynamics": this study leverages machine learning techniques to optimize the design of computational fluid dynamics simulations for aviation applications [1].
2. "Efficient Video-based Vehicle Queue Length Estimation": this study describes a computer vision and deep learning approach to estimate vehicle queue lengths in urban traffic scenarios without the need for onsite camera calibration information [2].
3. "Smooth Stitching Method for the Texture Seams of Remote Sensing Images": this study uses a novel technique for seamlessly stitching the texture seams of remote sensing images, thereby achieving improved stitching accuracy and efficiency [3].
4. "Deep-Sequence–Aware Candidate Generation for e-Learning Systems": this study outlines a deep learning model that improves prediction accuracy in e-learning platforms by utilizing user data, item data, and sequential information from user profiles [4].
5. "Designed a Passive Grinding Test Machine to Simulate Passive Grinding Process": this study describes a passive grinding test machine that provides experimental equipment support for investigating passive grinding behavior and processes [5].
6. "Pandemic Analytics by Advanced Machine Learning for Improved Decision Making of COVID-19 Crisis": this study delineates a data analytical system that employs advanced machine learning methods to support optimal real-time decision making and to aid in the development of medium-term forecasts for disease progression [6].
7. "Lifetime Prediction Using a Tribology-Aware, Deep Learning-Based Digital Twin of Ball Bearing-Like Tribosystems in Oil and Gas": this study uses a deep learning-based digital twin for accurately predicting the remaining useful life of ball bearing-like tribosystems in the oil and gas industry [7].
8. "A Study on Standardization of Security Evaluation Information for Chemical Processes Based on Deep Learning": this study provides a new deep learning framework for analyzing Chinese HAZOP documents to perform named entity recognition tasks, resulting in significant improvements in accuracy, recall rate, and F-value compared to other models [8].

These studies showcase the transformative power of machine learning in various scientific and technological fields. As machine learning algorithms continue to evolve and become more sophisticated, we can expect even greater advancements in applied research and problem-solving capabilities. The ongoing development and application of machine learning techniques will undoubtedly shape the future of science and technology.

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