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Editorial

Further Empowering Humans in Specific Fields and Rethinking AGI Testing

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Artificial intelligence (AI) has emerged as a transformative force with the potential to positively impact every facet of society. One of its most profound applications lies in its ability to empower individuals within communities by leveraging their strengths, promoting independence, and aiding them in achieving their goals. Human uses for AI have grown across every aspect of society; from language generation to molecular synthesis, AI has begun to permeate every aspect of our lives.

Although generalized AI models have demonstrated impressive capabilities across a wide range of topics, they often lack the necessary depth and nuance required for specific domains; they also have a tendency to be uninterpretable. Every domain-specific AI model intrinsically encapsulates specialized knowledge of the terminology and expert experiences specific to particular use cases in order to ensure accurate comprehension of industry-specific concepts. Therefore, domain-specific models are designed to capture the essence of a specific industry or use case, with an understanding of its unique jargon, context, and intricacies.

To ensure the success of domain-specific AI models, humans must trust AI within our society. As a result, there is an obligatory responsibility to implement AI in a way that promotes privacy and ensures accountability, and to perform evaluations in order to make sure that AI has a positive impact on society. This special issue consists of recent research on domain-specific applications, secure federated evolutionary optimization, and the evaluation of AI.

In this issue, the article "From signal to knowledge: The diagnostic value of raw data in the artificial intelligence prediction of human data for the first time" develops an AI-based signal-to-knowledge diagnostic scheme for lung nodule classification directly from computed tomography (CT) raw data (the signal). Using the proposed method, the researchers find that the raw data achieves almost comparable performance with CT, indicating that it is possible to diagnose diseases without reconstructing images. Moreover, the incorporation of raw data through three common convolutional network structures greatly improves the performance of the CT models in all cohorts (with a gain of 0.01–0.12), demonstrating that raw data contains diagnostic information that CT does not possess.

The article titled "The group interaction field for learning and explaining pedestrian anticipation" proposes a novel group-aware representation—namely, the group interaction field (GIF)—to quantify pedestrian anticipation into a probability field of pedestrians' future locations and attention orientations. An end-to-end neural network, GIFNet, is tailored to estimate the GIF from explicit multidimensional observations. GIFNet quantifies the influence of group behaviors by formulating a group interaction graph with propagation and graph attention that is adaptive to the group size and dynamic interaction states. The experimental results show that the GIF effectively represents the change in pedestrians' anticipation under the prominent impact of group behaviors and accurately predicts pedestrians' future states.

The article "A dual-functional system for the classification and diameter measurement of aortic dissections using CTA volumes via deep learning" offers a dual-functional deep learning system called aortic dissections diagnosis-aiding system (DDAsys) that enables both accurate classification of aortic dissection and precise diameter measurement of the aorta. To this end, the researchers created a dataset containing 61 190 computed tomography angiography (CTA) images from 279 patients at the Division of Cardiovascular Surgery of Tongji Hospital, Wuhan, China. The dataset provides a slice-level summary of difficult-to-identify features, which helps to improve the accuracy of both recognition and

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classification. The proposed system achieves a recognition F_1 score of 0.984 and an average classification F_1 score of 0.935; the respective measurement precisions for ascending and descending aortic diameters are 0.994 and 0.767 mm root mean square error (RMSE).

The article "A survey of tax risk detection using data mining techniques" comprehensively sorts out the research on tax risk detection, divides the existing methods into two categories, and then lists and introduces the 14 kinds of methods identified. It also summarizes the advantages and disadvantages of each method.

The article "Secure federated evolutionary optimization—A survey" provides a survey on privacy-preserving optimization, with a focus on privacy-preserving data-driven evolutionary optimization. This article aims to provide a roadmap from secure privacy-preserving learning to secure privacy-preserving optimization by summarizing security mechanisms and privacy-preserving approaches that can be employed in machine learning and optimization. It concludes the survey by outlining open questions and remaining challenges in federated data-driven optimization.

The article titled "The Tong test: Evaluating artificial general intelligence through dynamic embodied physical and social interactions" proposes five critical characteristics to be considered as artificial general intelligence (AGI) benchmarks and suggests the Tong test as an AGI evaluation system. The Tong test describes a value- and ability-oriented testing system that delineates five levels of AGI milestones through a virtual environment with dynamic embodied physical and social interactions (DEPSI), allowing for infinite task generation. This article contrasts the Tong test with classical AI testing systems in various aspects and proposes a systematic evaluation system to promote standardized, quantitative, and objective benchmarks and evaluation of AGI.

We would like to express our appreciation to the reviewers of this special issue for their timely and professional comments. Most importantly, we extend our thanks to all the authors who submitted their manuscripts for consideration. At the same time, we thank the members of the Disruptive Information Technology research group of the Department of Information and Electronic Engineering at the Chinese Academy of Engineering.