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Section
Artificial Intelligence



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Section Information

The Section Artificial Intelligence mainly covers topics of interest within unique hardware-based deep learning AI and algorithmic deep learning AI using machine learning. The purpose of this Section is to bring together researchers and engineers, from both academia and industry, to present novel ideas and solid research on the hardware and algorithmic aspects of advanced applications of deep-learning-based AI.

The primary focus of this Section is only unique hardware-based deep learning AI. This Section also focuses on the black box nature of deep neural networks and shallow NNs, transparency, interpretability and explainability of deep neural networks (DNNs), and algorithms and/or methods for the conversion of Gradient Boosting Decision Tree (GBGT) (e.g., XGBoost) and Decision Forest, e.g., Random Forest, into a single decision tree (DT) .

Note that papers on hardware-based deep learning AI using FPGA, and other popular techniques, are handled by the Editor-in-Chief for the hardware related subsections. Papers on algorithmic deep learning are handled by the Editor-in-Chief for the Section Artificial Intelligence. Unique combinations of evolutionary computation, fuzzy logic, and deep learning are also of interest.

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Deadline: 15 November 2026

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Selected Papers



A Comprehensive Review of DeepFake Detection Using Advanced Machine Learning and Fusion Methods

Authors: Gourav Gupta, Kiran Raja, Manish Gupta, Tony Jan, Scott Thompson Whiteside and Mukesh Prasad

Abstract: Recent advances in Generative Artificial Intelligence (AI) have increased the possibility of generating hyper-realistic DeepFake videos or images to cause serious harm to vulnerable children, individuals, and society at large with misinformation. To overcome this serious problem, many researchers have attempted to detect DeepFakes using advanced machine learning techniques and advanced fusion techniques. This paper presents a detailed review of past and present DeepFake detection methods with a particular focus on media-modality fusion and machine learning. This paper also provides detailed information on available benchmark datasets in DeepFake detection research. This review paper addressed the 67 primary papers that were published between 2015 and 2023 in DeepFake detection, including 55 research papers in image and video DeepFake detection methodologies and 15 research papers on identifying and verifying speaker authentication. This paper offers lucrative information on DeepFake detection research and offers a unique review analysis of advanced machine learning and modality fusion that sets it apart from other review papers. This paper further offers informed guidelines for future work in DeepFake detection utilizing advanced state-of-the-art machine learning and information fusion models that should support further advancement in DeepFake detection for a sustainable and safer digital future.

https://doi.org/10.3390/electronics13010095



Web Application for Retrieval-Augmented Generation: Implementation and Testing

Authors: Irina Radeva, Ivan Popchev, Lyubka Doukovska and Miroslava Dimitrova

Abstract: The purpose of this paper is to explore the implementation of retrieval-augmented generation (RAG) technology with open-source large language models (LLMs). A dedicated web-based application, PaSSER, was developed, integrating RAG with Mistral:7b, Llama2:7b, and Orca2:7b models. Various software instruments were used in the application's development. PaSSER employs a set of evaluation metrics, including METEOR, ROUGE, BLEU, perplexity, cosine similarity, Pearson correlation, and F1 score, to assess LLMs' performance, particularly within the smart agriculture domain. The paper presents the results and analyses of two tests. One test assessed the performance of LLMs across different hardware configurations, while the other determined which model delivered the most accurate and contextually relevant responses within RAG....

https://doi.org/10.3390/electronics13071361



KG-PLPPM: A Knowledge Graph-Based Personal Learning Path Planning Method Used in Online Learning

Authors: Bo Hou, Yishuai Lin, Yuechen Li, Chen Fang, Chuang Li and Xiaoying Wang

Abstract: In the realm of online learning, where resources are abundant, it is essential to customize recommendations and plans to meet individual learning needs. This involves not only identifying and addressing areas of weakness but also aligning the learning journey with each learner's cognitive preferences. However, existing methods for suggesting and structuring learning paths have notable limitations. To address these challenges, this paper introduces a knowledge graph-based personalized learning path planning method (KG-PLPPM). By leveraging a knowledge graph and refining cognitive diagnosis models, the proposed method tailors learning paths to individual needs. It evaluates knowledge concept similarity and learner mastery, and employs an algorithm for path planning. In the experiments, two metrics—the concept sequence degree and learning efficiency—are used to assess our work. Experimental results demonstrate that the method presented enhances the coherence and relevance of recommended learning paths, and achieves a higher concept sequence degree, indicating that knowledge concepts are arranged in a manner consistent with the learning sequence, which aligns more closely with learners' cognitive preferences. Moreover, across various learning progresses and path lengths, it effectively addresses weak knowledge areas, significantly enhancing learning efficiency.

https://doi.org/10.3390/electronics14020255



A Survey of Large Language Models: Evolution, Architectures, Adaptation, Benchmarking, Applications, Challenges, and Societal Implications

Authors: Seyed Mahmoud Sajjadi Mohammadabadi, Burak Cem Kara, Can Eyupoglu, Can Uzay, Mehmet Serkan Tosun and Oktay Karakuş

Abstract: This survey provides an in-depth review of large language models (LLMs), highlighting the significant paradigm shift they represent in artificial intelligence. Our purpose is to consolidate state-of-the-art advances in LLM design, training, adaptation, evaluation, and application for both researchers and practitioners. To accomplish this, we trace the evolution of language models and describe core approaches, including parameter-efficient fine-tuning (PEFT). The methodology involves a thorough survey of real-world LLM applications across the scientific, engineering, healthcare, and creative sectors, coupled with a review of current benchmarks. Our findings indicate that high training and inference costs are shaping market structures, raising economic and labor concerns, while also underscoring a persistent need for human oversight in assessment....

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