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Section

Artificial Intelligence

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Section Editor-in-Chief

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Artificial Intelligence Lab, Department of Computer Science, Meiji University, Kawasaki, Japan

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) .

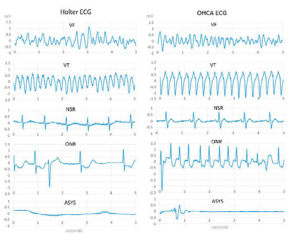
Note that papers on hardware-based deep learning AI using FPGA, and other popular techniques, are handled by the Editor-in-Chief for the hardware related subsections. Papers on algorithmic deep learning are handled by the Editor-in-Chief for the Section Artificial Intelligence. Unique combinations of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

Featured Papers

DOI:10.3390/electronics11213593

Overview of Machine Learning and Deep Learning Approaches for Detecting Shockable Rhythms in AED in the Absence or Presence of CPR

Authors: Kamana Dahal and Mohd. Hasan Ali

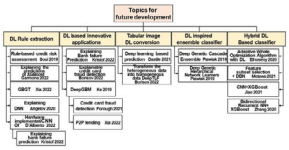


Abstract: Sudden Cardiac Arrest (SCA) is one of the leading causes of death worldwide. Therefore, timely and accurate detection of such arrests and immediate defibrillation support for the victim is critical. An automated external defibrillator (AED) is a medical device that diagnoses the rhythms and provides electric shocks to SCA patients to restore normal heart rhythms. Machine learning and deep learning-based approaches are popular in AEDs for detecting shockable rhythms and automating defibrillation. There are some works in the literature for reviewing various machine learning (ML) and deep learning (DL) algorithms for shockable ECG signals in AED. Starting in 2017 and beyond, different DL algorithms were proposed for the AED. This paper provides an overview of AED, including its circuit diagram and application to SCA patients. It also presents the most up-to-date ML and DL approaches for detecting shockable rhythms in AEDs without cardiopulmonary resuscitation (CPR) or during CPR. It also provides a performance comparison of these approaches and discusses other researchers' results that lay the foundation for researchers to delve in-depth. Furthermore, the research gaps and recommendations for future research provided in this review paper will be helpful to the researchers, scientists, and engineers in conducting further research in this critical field.

DOI:10.3390/electronics11193181

Emerging Trends in Deep Learning for Credit Scoring: A Review

Author: Yoichi Hayashi

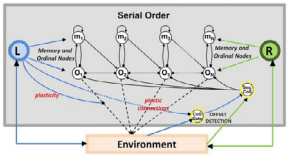


Abstract: This systematic review aims to provide deep insights on emerging trends in, and the potential of, advanced deep learning techniques, such as machine learning algorithms being partially replaced by deep learning (DL) algorithms for credit scoring owing to the higher accuracy of the latter. This review also seeks to explain the reasons that deep belief networks (DBNs) can achieve higher accuracy than shallower networks, discusses the potential classification capabilities of DL-based classifiers, and bridges DL and explainable credit scoring. The theoretical characteristics of DBNs are also presented along with the reasons for their higher accuracy compared to that of shallower networks. Studies published between 2019 and 2022 were analysed to review and compare the most recent DL techniques that have been found to achieve higher accuracies than ensemble classifiers, their hybrids, rule extraction methods, and rule-based classifiers. The models reviewed in this study were evaluated and compared according to their accuracy and area under the receiver operating characteristic curve for the Australian, German (categorical), German (numerical), Japanese, and Taiwanese datasets, which are commonly used in the credit scoring community. This review paper also explains how tabular datasets are converted into images for the application of a two-dimensional convolutional neural network (CNN) and how "black box" models using local and global rule extraction and rule-based methods are applied in credit scoring. Finally, a new insight on the design of DL-based classifiers for credit scoring datasets is provided, along with a discussion on promising future research directions.

DOI:10.3390/electronics11050707

From Biological Synapses to “Intelligent” Robots

Author: Birgitta Dresp-Langley

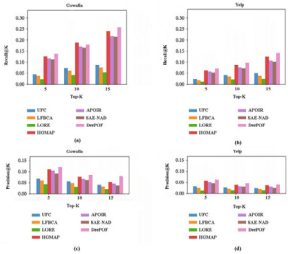


Abstract: This selective review explores biologically inspired learning as a model for intelligent robot control and sensing technology on the basis of specific examples. Hebbian synaptic learning is discussed as a functionally relevant model for machine learning and intelligence, as explained on the basis of examples from the highly plastic biological neural networks of invertebrates and vertebrates. Its potential for adaptive learning and control without supervision, the generation of functional complexity, and control architectures based on self-organization is brought forward. Learning without prior knowledge based on excitatory and inhibitory neural mechanisms accounts for the process through which survival-relevant or task-relevant representations are either reinforced or suppressed. The basic mechanisms of unsupervised biological learning drive synaptic plasticity and adaptation for behavioral success in living brains with different levels of complexity. The insights collected here point toward the Hebbian model as a choice solution for “intelligent” robotics and sensor systems.

DOI:10.3390/electronics11131998

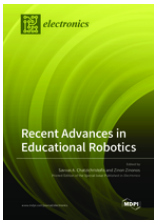
Toward Point-of-Interest Recommendation Systems: A Critical Review on Deep-Learning Approaches

Authors: Sadaf Safavi, Mehrdad Jalali and Mahboobeh Houshmand



Abstract: In recent years, location-based social networks (LBSNs) that allow members to share their location and provide related services, and point-of-interest (POIs) recommendations which suggest attractive places to visit, have become noteworthy and useful for users, research areas, industries, and advertising companies. The POI recommendation system combines different information sources and creates numerous research challenges and questions. New research in this field utilizes deep-learning techniques as a solution to the issues because it has the ability to represent the nonlinear relationship between users and items more effectively than other methods. Despite all the obvious improvements that have been made recently, this field still does not have an updated and integrated view of the types of methods, their limitations, features, and future prospects. This paper provides a systematic review focusing on recent research on this topic. First, this approach prepares an overall view of the types of recommendation methods, their challenges, and the various influencing factors that can improve model performance in POI recommendations, then it reviews the traditional machine-learning methods and deep-learning techniques employed in the POI recommendation and analyzes their strengths and weaknesses. The recently proposed models are categorized according to the method used, the dataset, and the evaluation metrics. It found that these articles give priority to accuracy in comparison with other dimensions of quality. Finally, this approach introduces the research trends and future orientations, and it realizes that POI recommender systems based on deep learning are a promising future work.

Special Issue Books:



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