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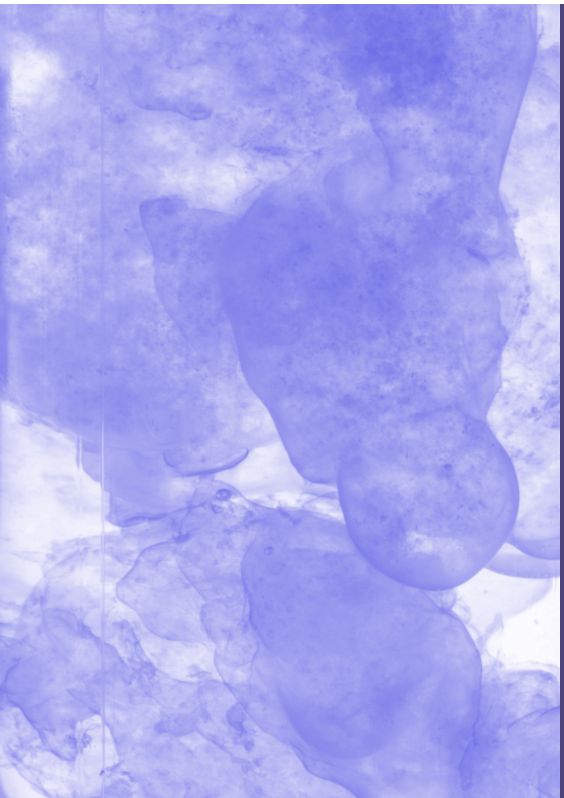

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Section Information

This section focuses on industrial smart and sustainable technologies and processes oriented towards practical applications.

It focuses on smart industrial systems, and related environmental and sustainability research and practice. Through our published articles, we aim at helping societies become more sustainable. It has the aims of waste valorization and increasing efficiencies in the uses of energy, water, and resources, within an industrial symbiosis and circular economy perspective, with special focus on the use of modern techniques aligned with the Industry 4.0 strategy. By contrast, works focusing on more theoretical developments should be addressed to more specialized journals.

The section publishes original papers, review articles, technical notes, and letters to the editor. Authors are encouraged to submit manuscripts that bridge the gaps between applied research, development, and implementation.

Section Editor-in-Chief
Dr. Alexandre Carvalho

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Selected Papers

A Perspective on Ethernet in Automotive Communications—Current Status and Future Trends

Authors: Lucia Lo Bello, Gaetano Patti and Luca Leonardi

Abstract: Automated driving requires correct perception of the surrounding environment in any driving condition. To achieve this result, not only are many more sensors than in current Advanced Driver Assistant Systems (ADAS) needed, but such sensors are also of different types, such as radars, ultrasonic sensors, LiDARs, and video cameras. Given the high number of sensors and the bandwidth requirements of some of them, high-bandwidth automotive-grade networks are required. Ethernet technology is a suitable candidate, as it offers a broad selection of automotive-grade Ethernet physical layers, with transmission speeds ranging from 10 Mbps to 10 Gbps. In addition, the Time-Sensitive Networking (TSN) family of standards offers several features for Ethernet-based networks that are suitable for automotive communications, such as high reliability, bounded delays, support for scheduled traffic, etc. In this context, this paper provides an overview of Ethernet-based in-car networking and discusses novel trends and future developments in automotive communications.

https://doi.org/10.3390/app13031278

How Does the Metaverse Shape Education? A Systematic Literature Review

Authors: Fabio De Felice, Antonella Petrillo, Gianfranco Iovine, Cinzia Salzano and Ilaria Baffo

Abstract: In recent years, the potential of the metaverse as a tool to connect people has been increasingly recognized. The opportunities offered by the metaverse seem enormous in many sectors and fields of application. However, on the academic side, although a growing number of papers have been found to address the adoption of the metaverse, a clear overview of the solutions in place and their impact on education has been largely neglected so far. In the context of increasing challenges found with the metaverse, this review aims to investigate the role of the metaverse as tool in education. This contribution aims to address this research gap by offering a state-of-the-art analysis of the role the metaverse plays in education in relation to the future of work. The study is based on a systematic review approach performed by means of the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) protocol. The findings of this research help us to better understand the benefits, potential and risks of the metaverse as a tool for immersive and innovative learning experiences. Implications are discussed and streams for future investigation are identified.

https://doi.org/10.3390/app13095682

A Vision Detection Scheme Based on Deep Learning in a Waste Plastics Sorting System

Authors: Shengping Wen, Yue Yuan and Jingfu Chen

Abstract: The preliminary sorting of plastic products is a necessary step to improve the utilization of waste resources. To improve the quality and efficiency of sorting, a plastic detection scheme based on deep learning is proposed in this paper for a waste plastics sorting system based on vision detection. In this scheme, the YOLOX (You Only Look Once) object detection model and the DeepSORT (Deep Simple Online and Realtime Tracking) multiple object tracking algorithm are improved and combined to make them more suitable for plastic sorting. For plastic detection, multiple data augmentations are combined to improve the detection effect, while BN (Batch Normalization) layer fusion and mixed precision inference are adopted to accelerate the model. For plastic tracking, the improved YOLOX is used as a detector, and the tracking effect is further improved by optimizing the deep cosine metric learning and the metric in the matching stage. Based on this, virtual detection lines are set up to filter and extract information to determine the sorted objects. The experimental results show that the scheme proposed in this paper makes full use of vision information to achieve dynamic and real-time detection of plastics. The system is effective and versatile for sorting complex objects.

https://doi.org/10.3390/app13074634

Effectiveness of Machine-Learning and Deep-Learning Strategies for the Classification of Heat Treatments Applied to Low-Carbon Steels Based on Microstructural Analysis

Authors: Jorge Muñoz-Rodenas, Francisco García-Sevilla, Juana Coello-Sobrino, Alberto Martínez-Martínez and Valentín Miguel-Eguía

Abstract: This work aims to compare the effectiveness of different machine-learning techniques for the image classification of steel microstructures. For this, we use a set of samples of hypoeutectoid steels subjected to three heat treatments: annealing, quenching and quenching with tempering. Logically, the samples contain the typical constituents expected, and these are different for each treatment. Images are obtained by optical microscopy at 400× magnification and from different low-carbon steels to generate the data with some heterogeneity. Learning models are created with an image dataset for classification into three classes based on the respective heat treatments. Likewise, we develop two kinds of models by using, on the one hand, classical machine-learning methods based on the "bag of features" technique and, on the other hand, convolutional neural networks (CNN) with a transfer-learning approach by using GoogLeNet and ResNet50. We demonstrate the superiority of deep-learning techniques (CNN) over classical machine-learning methods.

https://doi.org/10.3390/app13063479

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Guest Editors: Dr. Vittorio Solina, Dr. Antonio Cimino, Prof. Dr. Eugénio Miguel Rocha and Dr. Radu Godina

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