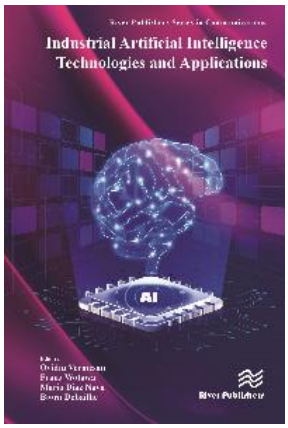

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Industrial Artificial Intelligence Technologies and Applications

Editors:
Ovidiu Vermesan, SINTEF, Norway
Franz Wotawa, TU Graz, Austria
Mario Diaz Nava, STMicroelectronics, France
Björn Debaillie, imec, Belgium
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Description:

The advances in industrial edge artificial intelligence (AI) are transforming the way industrial equipment and machine interact with the real world, with other machines and humans during manufacturing processes. These advances allow industrial internet of things (IIoT) and edge devices to make decisions during the manufacturing processes using sensors and actuators data.

Digital transformation is reshaping the manufacturing industry, and industrial edge AI aims to combine the potential advantages of edge computing (low latency times, reduced bandwidth, distributed architecture, improved trustworthiness, etc.) with the benefits of AI (intelligent processing, predictive solutions, classification, reasoning, etc.).

The industrial environments allow the deployment of highly distributed intelligent industrial applications in remote sites that require reliable connectivity over wireless and cellular connections. Intelligent connectivity combines IIoT, wireless/cellular and AI technologies to support new autonomous industrial applications by enabling AI capabilities at the edge and allowing manufacturing companies to improve operational efficiency and reduce risks and costs for industrial applications.

There are several critical issues to consider when bringing AI to industrial IoT applications considering training AI models at the edge, the deployment of the AI-trained inferencing models on the target reliable edge hardware platforms and the benchmarking of the solution compared with other implementations.

The next-generation trustworthy industrial AI systems offer dependability by design, transparency, explainability, verifiability, and standardised industrial solutions to be implemented into various applications across different industrial sectors.

New AI techniques like embedded machine learning (ML) and deep learning (DL) capture edge data, employ AI models and deploy them to hardware target edge devices from ultra-low-power microcontrollers to embedded devices, gateways, and on-premises servers for industrial applications. These techniques reduce latency, increase scalability, reliability, and resilience, and optimise wireless connectivity, greatly expanding IIoT capabilities.

The book overviews the latest research results and activities in industrial artificial intelligence technologies and applications based on the innovative research, developments and ideas generated by the ECSEL JU AI4DI, ANDANTE and TEMPO projects.

The authors describe industrial AI's challenges, the approaches adopted, and the main industrial systems and applications to give the reader a good insight into the technical essence of the field. The articles provide insightful material on industrial AI technologies and applications.

The book is a valuable resource for researchers, post-graduate students, practitioners, and technology developers interested in gaining insight into the industrial edge AI, IIoT, embedded machine and deep learning, new technologies, and solutions to advance the intelligent processing at the edge.

Keywords: Industrial artificial intelligence, intelligent embedded technologies, edge industrial computing, neuromorphic computing, neuromorphic architecture, neural networks, benchmarking, deep learning, machine learning, industrial internet of things, image processing, semiconductor manufacturing.