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[Summary 1/4]

The first set of summaries offers an overview of the role of AI in business process transformation and business monitoring.

Introduction

AI *refers to the "application of technology used to perform tasks that duplicate human cognitive functions*"[1]. This definition suggests that AI should be able to handle situations that are currently handled by humans. That's what makes AI different from traditional software.

AI and Business

In the business realm, AI can enhance business performance, mainly through cost-effective automation solutions. It can also assess decisions, supporting organizations in their decision-making process. By automating tasks and processes, organizations aim to give employees more time and focus, to optimize other critical business aspects. Although the advantages are highly valuable, integrating AI solutions comes with some challenges. First, in some cases, AI can only act as an intermediary to complete activities. Hence, human collaboration is highly recommended to get better results. However, some automated systems continuously improve based on their experience and don't have to be reprogrammed frequently. And second, as AI can complete multiple tasks, jobs' spectrums have to be redefined.

AI and the monitoring process

AI encompasses a broad spectrum of models and techniques, including machine learning, natural language processing, and robotics. Combined with the increasing flow of data, and advanced software equipment, these AI algorithms strengthen the monitoring process. Moreover, they allow for better prediction as organizations can leverage AI-generated hypotheses to find and test new ideas. In terms of prediction and decision, the summary mentions Machine Learning (ML) and more specifically the Neural Network Model (NNM). Inspired by human capabilities, NNM is an ML model that is used to process big data, identify patterns, and perform tasks. Overall, all of these AI-powered functions and software applications contribute to supporting the monitoring business process, mainly through data analysis, prediction, and decision-making insights.

The role of data in Business Process Monitoring

Data is highly valuable for organizations[2]. Real-time data is crucial to monitor and optimize processes, as well as to make informed decisions. It is particularly useful for predictive monitoring.

The article explores how Machine Learning (ML) and Deep Learning (DL) contribute to enhancing predictive monitoring. The first step is defining logs to apply DL techniques. A log is a record of activities in a computer system. The goal here is to collect as much information as possible for the DL model to make predictions. Performance is assessed using metrics such as accuracy and precision of the predictions. Based on these two metrics, DL

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[1] Summary of "Artificial intelligence as a driver of business process transformation."
[2] Summary of "Machine Learning in Business Process Monitoring: A Comparison of Deep Learning and Classical Approaches Used for Outcome Prediction."

outperforms ML when it comes to outcome-oriented predictive monitoring. Although ML has been used in business processes for a longer time, DL seems promising. Comprehensive research could contribute to unleashing its full potential. However, ML and DL's ability to make predictions and detect issues early on enhances the monitoring process. Additionally, it allows organizations to save time, money, and resources.

The role of Machine Learning in Business Process Monitoring

Machine learning can be combined with other innovative technologies for real-time monitoring[3]. The article uses the example of automotive manufacturing, where the monitoring process is managed by advanced systems processing a large flow of data. In this case, real-time monitoring is enabled by **IoT-based sensors**, **big data processing,** and **hybrid prediction models**. IoT-based sensors are physical devices able to collect and share data over the internet or networks to software applications that process, analyze, and monitor it.

In a process like manufacturing, faults and errors are frequent. However, such technology combinations allow for the prevention and early detection of anomalies. As mentioned above, this combination includes **hybrid prediction models**. These are the **DBSCAN** (Density-Based Spatial Clustering of Applications with Noise) and the **RF** (Random Forest). They contribute to assessing, controlling, and monitoring data. Their accuracy allows for a more efficient monitoring process. However, the efficiency of such a combination is limited by the security issues related to the IoT sensors.

Overall, beyond the security issues encountered, this combination is more accurate and effective for monitoring activities.

Leveraging AI-powered sensors for sustainability

AI-powered sensors are said to be particularly helpful in the realm of sustainable development[4]. The article addresses the advantages and limits of soft sensors, a technique to estimate “hard-to-measure” quality parameters in industrial processes. In this case, soft sensors are compared to traditional hardware sensors. Hardware sensors' main problem is their inability to assess some quality parameters that are crucial for end-desired product quality. Using soft sensors instead would fix that issue by providing **real-time data** and **predictions**. Although they outperform hardware sensors, soft sensors encounter some limitations when used with traditional modeling techniques. Advanced AI-based algorithms would be more suitable as they could provide more accurate real-time assessment of the quality parameters, be implemented on existing hardware at no cost, and ease maintenance. Developing soft sensors also comes with some challenges such as missing data, varying sampling rates, small datasets, and model interpretability. To overcome these challenges, soft sensor applications integrate AI models such as **Deep Neural Networks (DNN)**, fuzzy logic, evolutionary algorithms, and unsupervised & semi-supervised learning techniques. As a result, optimized soft sensors enable organizations to assess and monitor material efficiency, resource efficiency, eco-efficiency, and control waste, supporting their sustainable strategy. Research shows that there’s more to accomplish to enhance the prediction

[3] Summary of “Performance Analysis of IoT-Based Sensor, Big Data Processing, and Machine Learning Model for Real-Time Monitoring System in Automotive Manufacturing.”

[4] Summary of: “The role of artificial intelligence-driven soft sensors in advanced sustainable process industries: A critical review.”

accuracy and efficiency of soft sensors, leaning toward a continuous monitoring process in industries.