

AI-Driven production optimization: enhancing industrial efficiency, sustainability, and recycling through automated decision systems

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This paper presents a system designed to optimize industrial efficiency and enhance sustainability by addressing two critical dimensions of the production process. First, it focuses on the early detection and removal of defective or problematic products at the earliest possible stage, thereby avoiding unnecessary consumption of energy and raw materials. Second, the system supports intelligent decision-making regarding rejected materials at various points along the production chain — determining whether these materials can be reintegrated into earlier stages of production or should be directed to external recycling and waste management facilities. This approach not only minimizes waste but also promotes circular economy practices within the industrial environment, in line with the European Union's strategic framework for recycling and resource efficiency [1], which emphasizes waste reduction, material recovery, and the responsible management of industrial by-products.

The proposed system leverages advanced factory automation, combining improved vision recognition systems with AI-powered decision-making algorithms to optimize both product quality control and material recovery workflows, thus contributing to more sustainable and environmentally compliant manufacturing processes.

References

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