

The Role of Predictive Modeling and Optimization in Enhancing Smart Factory Efficiency

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Abstract : This research examines the application of predictive modelling and optimization algorithms to improve production efficiency in smart factories. Utilizing gradient boosting and neural networks, the study builds robust KPI estimators to predict production outcomes based on real-time data. Optimization methods, including Bayesian optimization and gradient-based algorithms, identify optimal process configurations that maximize availability, efficiency, and quality KPIs. The paper highlights the modular architecture of a recommender system that integrates predictive models, data visualization, and adaptive automation. Comparative analysis across multiple production processes reveals significant improvements in operational performance, laying the foundation for scalable, self-regulating manufacturing systems.

Keywords : predictive modeling, optimization, smart factory, efficiency

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