

Intelligent Inventory Management System

Abstract

In the era of technological advancements, efficient inventory management plays a pivotal role in enhancing business operations. Inventory management is crucial, as improper management can lead to significant product waste. Approximately one-third of the food produced is wasted, totaling nearly 1.3 billion tons each year (Cheng, 2022). Similarly, disappointed customers due to unavailable products can quickly turn to competitors - 31% of consumers will try another store if their preferred choice is unavailable (Opeyemi, 2021). Machine learning technology can be effectively utilized to optimize inventory levels (Melanie, 2018), minimizing waste and ensuring customer satisfaction.

This web-based inventory management system harnesses machine learning to optimize stock levels and is constructed using a robust 3-tier architecture and is developed using ReactJS, FastAPI, PostgreSQL, and Python libraries.

A distinctive feature is the integration of machine learning algorithms, enabling administrators to receive demand predictions. This valuable insight aids stock management, effectively preventing overstocking and stockouts within the company.

Aim

Developing an inventory management system using machine learning.

Objectives

Identify stakeholder requirements for the machine learning based inventory management system.

Explore design solutions for a machine learning based inventory management system.

Develop an nventory management system.

Develop a machine learning model.

Integrate the ML model into the inventory management system.

Conduct testing of the developed Inventory Management system.

Methodology

Requirements Analysis: Gathering and documenting detailed requirements from stakeholders.

Design: Creating the overall architecture and design of the software.

Data Collection: Gather historical inventory data.

Feature Engineering: Extract relevant features.

Algorithm Selection: Choose machine learning algorithms based on the nature of the data and objectives.

Model Training: Train the selected models using historical data.

Validation and Testing: Validate models using test datasets.

Development: Develop an inventory management system.

Integration with Inventory System: Integrate the ML model into the inventory management system.

Software choices

React JS
FastAPI
PostgreSQL
Python libraries

Future works

Implement feedback loops to continuously improve the accuracy and efficiency of the ML models.

Enhance decision-making capabilities by incorporating artificial intelligence for more complex scenarios.

Develop automated communication with suppliers for order placement.

Conclusions

Small and medium businesses can benefit from demand forecasting by optimizing their inventory management. This reduces manual workload and, consequently, the capital tied up in holding inventory. By predicting demand accurately, forecasting helps businesses avoid both overstocking and understocking, leading to improved profitability (Praveen et al., 2020).

References

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Opeyemi, S. (2021). Inventory Analytics: Big Data For Inventory Management. scrapingrobot.com. <https://scrapingrobot.com/blog/inventory-analytics/>

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System architecture

