STORE STOCKS AND SALES ANALYSIS AND PREDICTION

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Abstract

The Store Stock and Sales Analysis and Prediction system is designed to monitor, analyze, and predict store inventory and sales performance using data analytics and machine-learning techniques. Effective stock management is essential for maintaining the right quantity of products, avoiding stock shortages, reducing excess inventory, and improving overall store performance.

The proposed system collects historical information such as product name, category, stock quantity, sales quantity, selling price, purchase price, sales date, revenue, and store or region. The collected data is cleaned and preprocessed to handle missing values, duplicate records, and inconsistent information. Exploratory data analysis is then performed to identify sales trends, fast-moving products, slow-moving products, seasonal demand, and inventory patterns.

Machine-learning and forecasting algorithms can be applied to historical sales data to predict future product demand and sales. The system can estimate the required stock levels for upcoming periods and help identify products that may require restocking. Prediction models can be evaluated using metrics such as MAE, RMSE, MAPE, and R^2 to measure their performance.

An interactive dashboard can display important information such as total sales, current stock, revenue, top-selling products, low-stock products, sales trends, predicted demand, and inventory status. These insights enable store managers to make better decisions regarding purchasing, inventory planning, product availability, and sales strategies.

I. Introduction

The Store Stock and Sales Analysis and Prediction system is designed to help stores efficiently manage their inventory and analyze sales performance. Proper stock management is important for ensuring that products are available when customers need them while avoiding excessive inventory and unnecessary storage costs. Manual stock and sales management can become difficult when a store handles a large number of products and transactions.

The proposed system uses data analytics and machine-learning techniques to analyze historical stock and sales information. Important details such as product name, category, stock quantity, sales quantity, price, revenue, purchase date, sales date, and product demand are collected and organized for analysis. The collected data is

cleaned and preprocessed to remove duplicate records, handle missing values, and maintain data consistency.

Exploratory data analysis is performed to identify fast-moving products, slow-moving products, sales trends, seasonal demand, and low-stock items. This helps store managers understand which products are performing well and which products require attention. Charts, graphs, and tables can be used to present these insights in an easy-to-understand manner.

The system also applies machine-learning and forecasting algorithms to predict future sales and product demand. Based on historical sales patterns, the system can estimate the quantity of products that may be required in future periods. This information can help managers plan purchases and maintain suitable inventory levels.

II. Literature Survey

Research on Store Stock and Sales Analysis and Prediction has become increasingly important because accurate sales and demand forecasting helps retailers maintain product availability while reducing excess inventory and storage costs. Retail forecasting research covers decisions from overall store and company levels down to individual product or SKU levels.

Early inventory-management systems mainly relied on traditional statistical and time-series techniques such as moving averages, exponential smoothing, and ARIMA. These methods are useful for identifying historical trends and seasonality, but retail demand can be influenced by promotions, holidays, pricing, customer behavior, and other factors, making forecasting more complex.

Researchers have increasingly applied machine-learning techniques to sales prediction. Algorithms such as Linear Regression, Decision Trees, Random Forest, Gradient Boosting, and other regression-based models can use multiple sales and product features to predict future demand. A recent systematic review of machine-learning sales prediction studies highlights its importance for inventory control, marketing, and strategic planning.

Another important research area is inventory optimization using demand forecasting. Accurate forecasts can help determine appropriate stock levels and reduce both overstocking and stockout situations. Recent research on intelligent inventory management combines historical sales, pricing information, weekdays, seasons, and festival-related factors to generate predictive insights for stock replenishment.

Researchers have also studied deep-learning models for retail sales forecasting. Models such as Recurrent Neural Networks and other deep-learning architectures can capture complex patterns in historical sales data. A systematic review found that deep learning has been increasingly investigated for retail forecasting, while also highlighting the importance of appropriate datasets, evaluation metrics, and model selection.

Retail forecasting literature also emphasizes the importance of promotions, seasonality, calendar events, and stockouts. These factors can significantly influence

observed sales and demand patterns. Therefore, forecasting systems need to consider more than historical sales values when estimating future product demand.

Recent studies indicate that machine learning can provide improved forecasting performance, particularly when many related sales series are available and models can learn from multiple products or stores together. Global machine-learning approaches have shown advantages over some traditional time-series and linear regression methods in large-scale retail forecasting applications.

AI and predictive analytics are also being increasingly integrated into demand planning and inventory management. Literature reviews report applications including demand forecasting, inventory management, product analysis, and supply-chain planning. The choice of forecasting method depends on factors such as demand characteristics, data availability, and the level of aggregation required.

Another emerging direction is hybrid and ensemble forecasting, where multiple statistical or machine-learning techniques are combined to improve adaptability and prediction performance. Recent research highlights hybrid approaches, including combinations of traditional forecasting, machine learning, and deep learning, as promising solutions for dynamic retail environments.

Overall, the literature shows a progression from traditional inventory control and statistical forecasting toward machine-learning, deep-learning, and intelligent inventory-management systems. Based on these studies, the proposed Store Stock and Sales Analysis and Prediction system can combine stock monitoring, sales analysis, demand forecasting, visualization, and automated restocking insights. Such a system can help store managers reduce stockouts and overstocking, improve inventory planning, and make better purchasing and sales decisions.

III. System Analysis

System analysis is an important stage in developing the Store Stock and Sales Analysis and Prediction system. The system is designed to monitor inventory levels, analyze sales performance, and predict future product demand. The main inputs include product name, category, stock quantity, sales quantity, selling price, purchase price, sales date, and revenue. Historical stock and sales data is collected and stored in a structured database. The data is cleaned and preprocessed to handle missing values, duplicate records, and inconsistent entries. Exploratory data analysis is performed to identify fast-moving products, slow-moving products, seasonal trends, and low-stock items. Important features are selected for developing the prediction model. Machine-learning or forecasting algorithms are used to predict future sales and product demand. The predicted demand can be compared with current stock levels to identify products that may require replenishment. Performance metrics such as MAE, RMSE, MAPE, and R^2 can be used to evaluate the prediction model. An interactive dashboard displays sales, stock, revenue, demand forecasts, and inventory status. Overall, the system provides an automated and data-driven approach to improving store inventory and sales management.

Existing System

In the existing system, store inventory and sales are commonly managed using manual records, spreadsheets, billing software, or basic inventory-management applications. Product stock is often updated manually after sales or purchases are completed. Store managers may have to check inventory records regularly to identify products that are running low. Historical sales data is generally used for basic reporting rather than accurate future demand prediction. Large numbers of products and transactions can make manual stock monitoring time-consuming. Existing systems may not effectively identify fast-moving and slow-moving products. Sales trends and seasonal demand may require additional manual analysis. Some systems provide basic stock alerts but do not consider predicted future demand. Data from sales and inventory may also be stored separately, making combined analysis difficult. Traditional systems generally provide limited machine-learning-based forecasting capabilities. This can result in overstocking, stock shortages, and inefficient purchasing decisions. Therefore, an integrated system is required to combine stock monitoring, sales analysis, and demand prediction.

Disadvantages of Exitsing System

- Manual inventory monitoring can be time-consuming.
- Limited future sales and demand prediction.
- Higher possibility of stock-entry errors.
- Difficult to manage large product inventories.
- Limited analysis of seasonal demand.
- Difficult to identify slow-moving products.
- May result in stock shortages.
- May lead to unnecessary overstocking.
- Limited integration between sales and inventory data.
- Basic reporting and visualization capabilities.
- Manual purchasing decisions.
- Limited intelligent restocking recommendations.

Proposed System

The proposed system provides an automated platform for analyzing store sales and managing product inventory efficiently. The system collects information such as product details, stock quantity, sales quantity, prices, revenue, and transaction dates. The collected information is stored in a centralized database for easy access and analysis. Data preprocessing is performed to remove duplicate records, handle missing values, and maintain data consistency. Exploratory analysis is used to identify sales trends, fast-moving products, slow-moving products, and seasonal demand patterns. Machine-learning or forecasting algorithms are trained using historical sales data to predict future product demand. The predicted demand is compared with the current stock level to determine potential inventory shortages. The system can generate low-stock and restocking alerts when inventory reaches predefined or predicted thresholds. An interactive dashboard presents important information such as total sales, revenue, available stock, top-selling products, and predicted demand. Store managers can use these insights to improve purchasing and inventory planning. The system reduces manual effort and supports faster, data-driven decisions. Overall, the proposed system improves stock availability, reduces excess inventory, and supports efficient store management.

Advantages of Proposed System

- Automated stock and sales analysis.
- Predicts future product demand.
- Reduces manual inventory monitoring.
- Helps prevent stock shortages.
- Helps reduce overstocking.
- Identifies fast-moving and slow-moving products.
- Provides sales and inventory dashboards.
- Supports automatic low-stock alerts.
- Improves purchasing decisions.
- Helps optimize inventory levels.
- Supports data-driven decision-making.
- Can be enhanced with advanced AI forecasting.

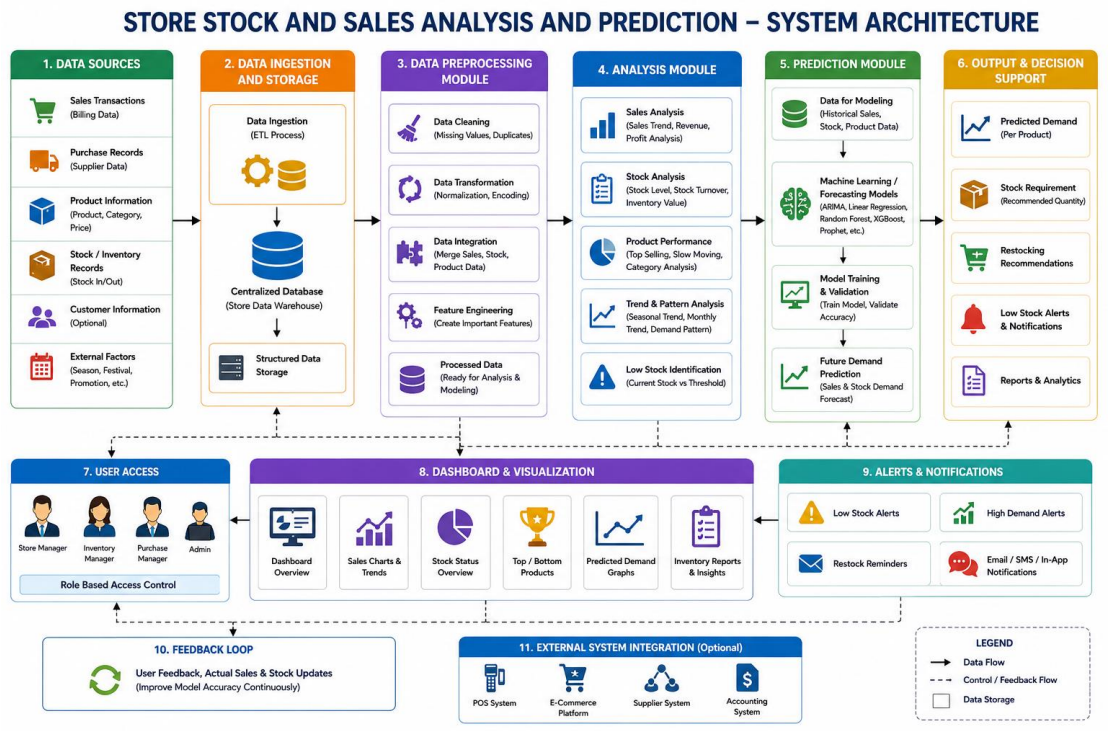
IV. Methodology

The methodology begins with collecting historical store data containing product details, sales transactions, stock quantities, prices, revenue, and transaction dates. The collected data is examined to identify missing values, duplicate records, inconsistent entries, and irrelevant information. Data preprocessing is then performed to clean and transform the dataset into a suitable format for analysis. Exploratory data analysis is conducted to understand sales trends, product demand, revenue patterns, and inventory movement. Products are analyzed to identify fast-moving, slow-moving, and low-stock items. Relevant features such as previous sales, product category, price, season, and stock level are selected for prediction. The processed dataset is divided into training and testing datasets. Suitable machine-learning or forecasting algorithms are trained using historical sales information. The trained model predicts future sales or product demand for a selected period. Prediction performance is evaluated using metrics such as MAE, RMSE, MAPE, and R^2. The predicted demand is compared with available stock to generate inventory and restocking recommendations. Finally, the results are displayed through dashboards, graphs, tables, and alerts to help store managers make effective purchasing and inventory decisions.

System Architecture

The system architecture represents the complete workflow of the Store Stock and Sales Analysis and Prediction system. The process begins with sales and inventory data sources, including product records, purchase records, billing transactions, and stock information. The collected data is transferred to the data preprocessing module for cleaning, validation, and transformation. The processed information is stored in a centralized database for efficient access and analysis. The sales and inventory analysis module examines product sales, revenue, stock levels, and product movement. The exploratory analysis module identifies trends, seasonal patterns, fast-moving products, and slow-moving products. Relevant data is then provided to the machine-learning or forecasting module for demand prediction. The prediction model generates future sales and product-demand estimates based on historical information. An inventory management module compares predicted demand with current stock levels. A notification module can generate low-stock and restocking alerts when required. The visualization module displays sales trends, inventory status, predictions, and KPIs

through an interactive dashboard. Store managers can use the generated insights for purchasing, inventory planning, and sales decisions. Overall, the architecture provides a complete data collection, preprocessing, storage, analysis, prediction, inventory monitoring, visualization, and decision-support workflow.



V. Result and Output

VI. Conclusion

The Store Stock and Sales Analysis and Prediction system provides an efficient and data-driven solution for managing store inventory and analyzing sales performance. The system combines stock monitoring, sales analysis, demand prediction, and visualization to provide useful insights to store managers.

The system analyzes historical sales data to identify fast-moving products, slow-moving products, low-stock items, sales trends, and product demand patterns. Machine-learning and forecasting techniques can be used to predict future sales and demand, helping managers maintain appropriate inventory levels.

The dashboard provides important information such as total sales, revenue, profit, available stock, top-selling products, low-stock products, and predicted sales in an easy-to-understand format. This helps reduce manual work and supports faster purchasing and inventory decisions.

Overall, the proposed system can help minimize stock shortages and overstocking, improve product availability, optimize inventory management, and increase store efficiency. In the future, the system can be enhanced with real-time stock tracking, barcode integration, AI-based demand forecasting, automatic reorder recommendations, seasonal analysis, and intelligent inventory alerts.

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