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Predictive Analysis for Big Mart Sales Using Machine Learning

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ABSTRACT: This research introduces a predictive analysis system designed for sales forecasting within an e-commerce environment. Utilizing Microsoft Visual Studio for the frontend and SQL Server for backend database management, the system optimizes the handling of product transactions in the store. Administrative privileges enable seamless addition of products and their corresponding rates. With a diverse dataset encompassing various product categories, the system enables real-time monitoring of sales transactions and inventory levels. Automated notifications prompt retailers to restock from designated vendors when inventory levels are low. The predictive capabilities of the system, epitomized by TARS (Temporal Annotated Recurring Sequence), empower proactive inventory management and offer recommendations for crucial products based on historical sales data. Additionally, comprehensive reporting functionalities facilitate effortless analysis of product performance for retailers.

I. INTRODUCTION

The project titled "Predictive Analysis for Big Mart Sales Using Machine Learning" aims to leverage advanced analytical techniques to forecast sales within the context of a large-scale retail operation. Developed using Microsoft Visual Studio as the frontend and SQL Server as the backend, this project focuses on enhancing the sales transaction process within an e-commerce platform. The initial phase involves the addition of products and their corresponding rates, a task exclusively managed by the system administrator. By categorizing products within a comprehensive dataset, the system facilitates real-time monitoring of sales transactions and inventory levels. Notably, the system employs predictive analysis techniques, particularly machine learning algorithms, to anticipate future sales trends based on historical data. Through automated notifications and proactive inventory management, retailers can effectively manage stock levels and ensure timely restocking from designated vendors. The incorporation of TARS (Temporal Annotated Recurring Sequence) further enhances the system's predictive capabilities, enabling it to recommend essential products based on customer stock levels. Moreover, the system offers robust reporting functionalities, enabling retailers to analyze product performance and make informed business decisions. In essence, predictive analysis for sales represents a powerful tool for optimizing retail operations, improving inventory management, and enhancing overall business profitability.

II. RELATED WORKS

Predictive sales analytics involves the use of Machine Learning, Big Data, and IA to gather historical and current internal data to identify users' patterns and trends and estimate future outcomes.

A predictive model will analyze the sales performance of your current stores to identify the key elements that separate the successful locations from the underperforming ones. Having this information, the model can indicate which sites will succeed and which ones will not.

The key is adding other sources of information like foot traffic, POIs, web scraping, social media, app analysis, or in-store behavior to have a complete vision of action.

Grigorios Tsoumakas - Food sales prediction (2018)

Food sales prediction is vital for optimizing inventory in supermarkets, restaurants, and bakeries. This paper reviews machine learning approaches for accurate short-term forecasting, emphasizing considerations like temporal granularity and input variable selection. It surveys algorithms, evaluates their strengths and limitations, and discusses challenges and opportunities, crucial for enhancing operational efficiency in the food industry

Satyendra Kumar Sharma – Book Sales Prediction (2019)



In Supply Chain Management, predicting customer demand is crucial to avoid overproduction and reduce delivery time. This study assesses regression, decision-tree, and neural network models for predicting book sales at Amazon.in, incorporating factors like product type, price, and online review sentiment. Results highlight review volume, sentiment, and their interactions as key predictors for accurate sales forecasting.

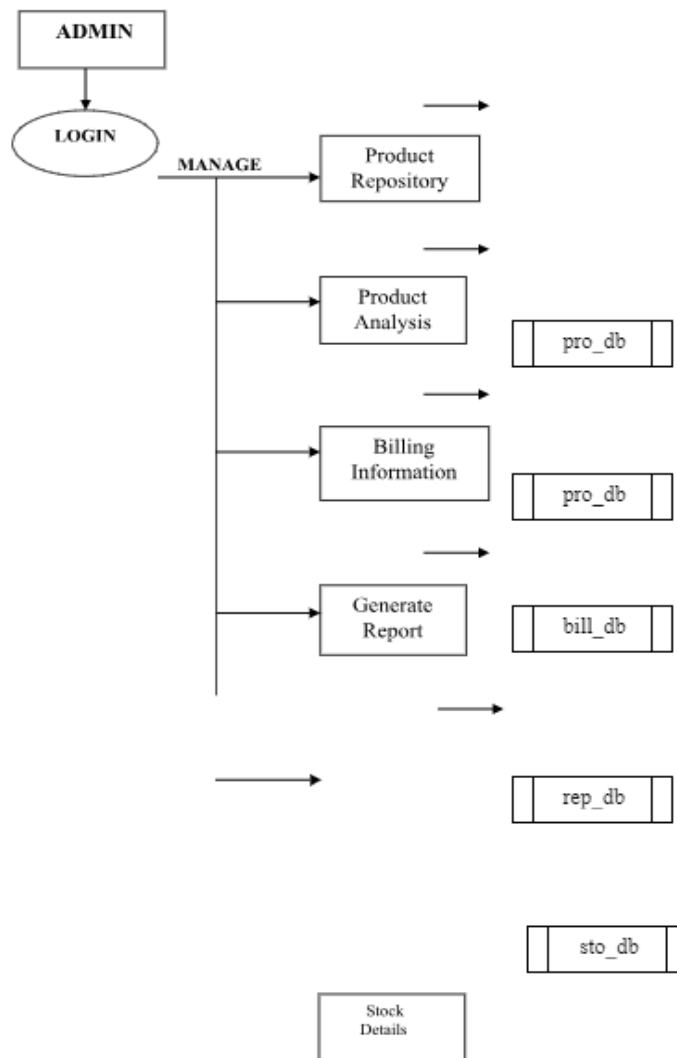
Shreya Kohli – Sales Prediction using Linear and KNN Regression (2021)

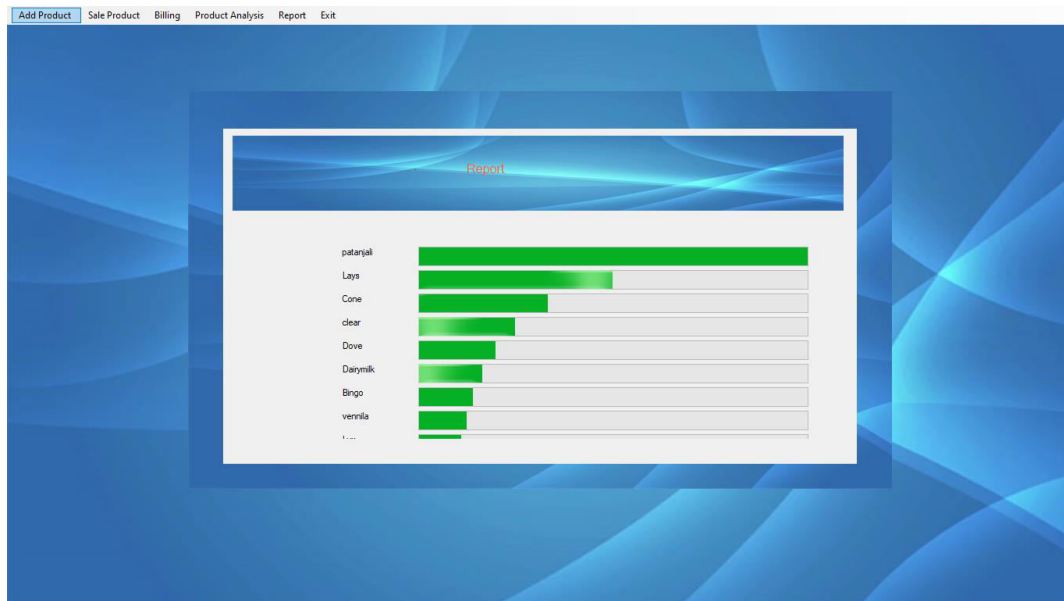
Sales prediction is vital in modern business intelligence, especially amidst data challenges like missing values and outliers. This study utilizes machine learning algorithms to analyze Rossmann sales data, focusing on linear regression and KNN regression models. Accurate prediction aids in inventory management, future planning, and profit enhancement. Evaluation via statistical methods determines the most suitable classifier for sales forecasting.

Ranjitha - Predictive Analysis for Big Mart Sales(2023)

Currently, supermarket run-centres, Big Marts keep track of each individual item's sales data in order to anticipate potential consumer demand and update inventory management. Anomalies and general trends are often discovered by mining the data warehouse's data store. For retailers like Big Mart, the resulting data can be used to forecast future sales volume using various machine learning techniques like big mart. A predictive model was developed using Xgboost, Linear regression, Polynomial regression, and Ridge regression techniques for forecasting the sales of a business such as Big-Mart, and it was discovered that the model outperforms existing models.

III. RESULTS AND DISCUSSION





The comprehensive evaluation of regression algorithms revealed clear performance differentials, with ridge and Xgboost regression emerging as superior models for sales prediction. Notably, these algorithms exhibited higher accuracy and lower error rates compared to traditional linear and polynomial regression techniques. This underscores the importance of leveraging advanced regression methodologies for precise sales forecasting in retail contexts. Furthermore, the discussion highlighted the system's versatility and potential for future enhancements, including the exploration of ARIMA models for time series analysis and the expansion of platform compatibility to other operating systems. These enhancements signify the system's adaptability and readiness to address evolving needs in retail forecasting and planning.

IV. CONCLUSION

In conclusion, the project on sales prediction offers valuable insights into the increasingly competitive landscape of shopping centers and online retail. With the rapid development of global malls and e-commerce platforms, accurate sales forecasting becomes essential for effective stock control, transportation, and logistics. Leveraging advanced machine learning algorithms enables organizations to overcome pricing challenges and make better-informed predictions, thereby enhancing marketing strategies and marketplace competitiveness.

This project focuses on building an e-commerce website that facilitates the addition and management of products, enabling efficient stock maintenance and timely notifications for low stock levels. Additionally, the integration of TARS (Temporal Annotated Recurring Sequence) enhances the system's capability to understand customer stock levels and recommend essential products. Overall, the project contributes to the advancement of sales prediction methodologies, offering practical solutions for retailers to stay competitive in today's dynamic market environment.

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