RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

25 years OF ACADEMIC EXCELLENCE

Department of Computer Science and Engineering

DYNAMIC SALES COMMISSION PREDICTION USING MACHINE LEARNING

Mr Karthick V
Associate professor

Yaashish G(210701317)
Shiyaam Prasad V (210701321)

ABSTRACT

In today's highly competitive market, the efficient distribution of sales incentives is crucial for driving revenue growth, maintaining a motivated sales force, and optimizing overall business performance. However, traditional commission structures often fall short in addressing the dynamic nature of product demand, leading to inefficiencies, missed opportunities, and potential disparities in rewards among sales teams.To overcome these challenges, the proposed system harnesses the power of cutting-edge artificial intelligence and machine learning technologies. By leveraging historical sales data, real-time market insights, and sophisticated algorithms, the system dynamically adjusts commission rates based on fluctuating product demand levels. This approach ensures that salespersons are incentivized to prioritize products with slower sales velocity, thereby optimizing stock clearance, reducing inventory holding costs, and maximizing revenue potential.

INTRODUCTION

In the dynamic and competitive landscape of retail sales, optimizing sales commissions stands as a crucial factor in driving revenue growth, motivating sales teams, and ensuring business success. Traditional commission structures often struggle to keep pace with the rapid fluctuations in product demand, market trends, and customer preferences, leading to inefficiencies and missed opportunities for revenue maximization. The proposed system addresses these challenges and usher in a new era of strategic sales performance management. The Dynamic Sales Commission Generator is a sophisticated system designed to optimize sales commission management in retail organizations. Leveraging advanced technologies such as machine learning, web development frameworks like Flask and JavaScript libraries like Chart.js, The system automates commission calculations, predicts sales commissions, and provides actionable insights for strategic decision-making.

LITERATURE SURVEY

SNO	TITLE	AUTHOR	YEAR PUBLISHED	CONTRIBUTION
1	Effective Implementation of Predictive Sales Analytics,	Johannes Habel, Sascha Alavi and Nicholas Heinitz	December 30, 2022	Th explores the effectiveness of predictive analytics in sales, and offering practical insights for optimizing analytics investments.
2	Dynamic Incentives in Sales Force Compensation	Olivier Rubel, Ashutosh Prasad	July 10,2022	suggests tailored compensation strategies to motivate salespeople enhancing performance and fairness.

LITERATURE SURVEY

SNO	TITLE	AUTHOR	YEAR PUBLISHED	CONTRIBUTION
3	On Setting Optimal Sales Commissions	Paul Berger	December 30, 2022	explores optimal commission rates for salespeople, accounting for both predictable and unpredictable sales patterns.
4	The Cost Impact of Sales Prediction Accuracy	Kira Hoffmann, Matthias D. Mahlendorf, Kim Pettersson	01 June 2020	Provides unexpected sales changes significantly impact costs and highlights the benefits of using xgboost for sales predictions in medium-sized firms.

LITERATURE SURVEY

SNO	TITLE	AUTHOR	YEAR PUBLISHED	CONTRIBUTION
5	Optimal Sales Force Diversification and Group Incentive Payments	Fabio Caldieraro, Anne T. Coughlan	19 june, 2019.	examines optimal sales team compensation, finding fixed salaries and low sales revenues offering practical insights for various scenarios.
6	Does Your Sales Incentive Plan Pay for Performance	Songjun Luo, Ph.D	January 2021	This study identifies the best sales team compensation strategies, recommending fixed salaries for low sales revenues and commissions for high revenues.

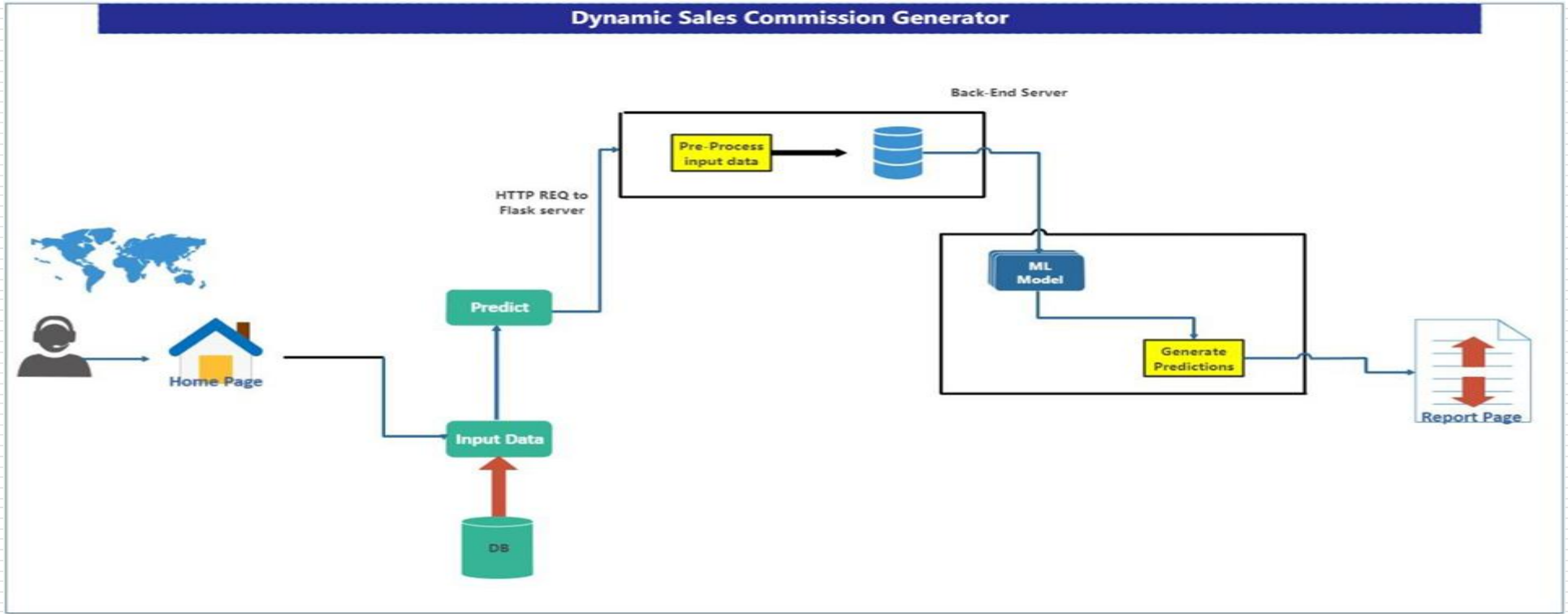
LITERATURE SURVEY

SNO	TITLE	AUTHOR	YEAR PUBLISHED	CONTRIBUTION
7	Understanding Machine Learning: From Theory To Algorithms	Johannes Habel, Sascha Alavi and Nicholas Heinitz	December 30, 2022	finds that the Gradient Boost Algorithm is highly accurate and reliable for improving sales forecasting using intelligent decision systems.
8	Sales-forecasting of Retail Stores using Machine Learning Techniques	Akshay Krishna; Akhilesh V; Animikh Aich	December 22,2018.	Uses a simplified-approach with random projections to efficiently predict product sales, outperforming other models on Amazon.com sales data for tablets.

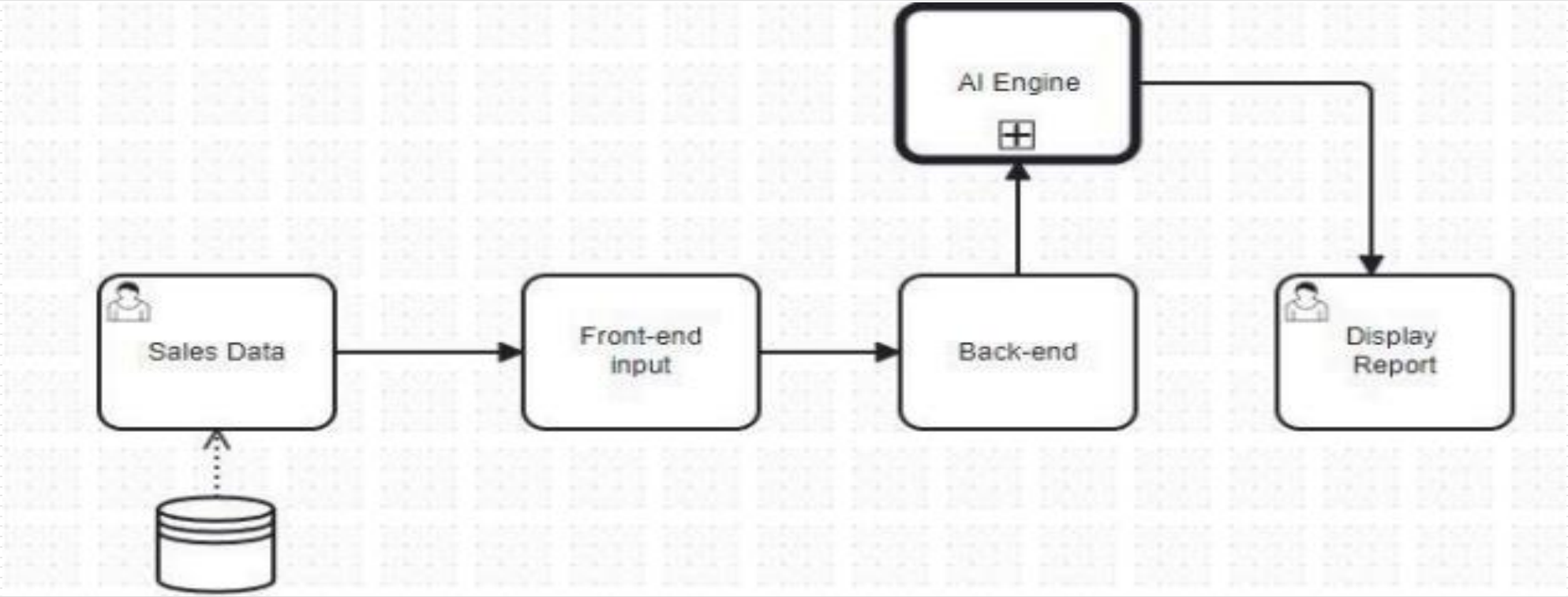
OBJECTIVES

The main objective of this project is to design and implement a dynamic sales commission generator that can adapt to real-time market trends and sales performance metrics within the retail sector.This enables the salesperson to understand the changing customer preferences and market demands, optimizing their sales approach and maximizing sales opportunities.The system's ability to optimize sales strategies and maximize revenue potential means that salespersons have the opportunity to earn higher commissions based on their contributions to sales objectives and achievements.

ARCHITECTURE DIAGRAM



SYSTEM FLOW DIAGRAM



PROPOSED WORK

The proposed system calculates commission rates dynamically based on real-time sales data, market demand, and predictive analytics. This ensures that commission rates adjust automatically to optimize sales performance and maximize revenue : Using machine learning algorithms, the system automates commission calculations, reducing manual efforts and errors associated with traditional methods. The system features a user-friendly web interface for uploading sales data, visualizing sales performance metrics through interactive charts, and obtaining accurate predictions for sales commissions. Leveraging technologies such as Flask, HTML, CSS, Bootstrap, and JavaScript libraries like Chart.js, the system offers a seamless and interactive user experience.

RESEARCH GAPS

Adaptability of Commission Structures: Existing sales commission systems lack flexibility in adjusting commission rates based on dynamic market conditions and real-time data, leading to inefficiencies.

Real-time Data Utilization: There's a need for incorporating real-time market insights and sales data to dynamically adjust commission rates effectively

Automation of Commission Calculation: Manual processes for calculating commissions are error-prone and time-consuming, highlighting the need for automated, reliable systems.

Comprehensive Insights: Existing systems fail to provide comprehensive insights into sales performance, customer behavior, and market trends, which are crucial for informed decision-making.

MODULE DESCRIPTION

1. **Data Preparation**: The sales data CSV file uploaded by the user contains columns for sales amount and product demand level, among other potentially relevant features. The data is preprocessed using Pandas to handle missing values, scale numeric features if necessary, and extract the required input features for the prediction task.

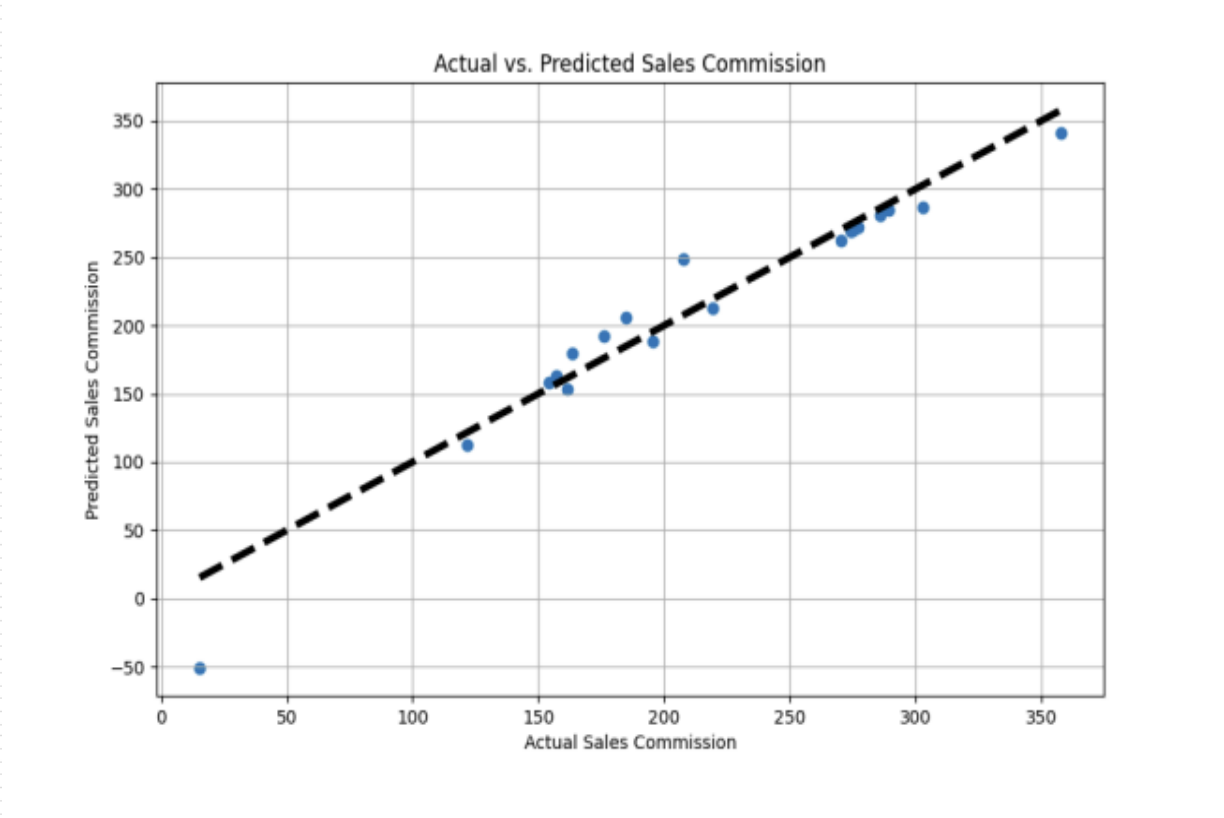
2. **Model Training:** The preprocessed data is used to train a Linear Regression model using the Scikit-learn library. The model learns the relationship between the input features and the target variable (sales commission) from the training data

MODULE DESCRIPTION

3. Model Prediction: When a user uploads a CSV file with sales data, the uploaded data is processed and fed into the trained Linear Regression model. The model then predicts the sales commissions for the given sales amount and product demand level in the uploaded data. The predicted commission values are returned to the frontend as JSON responses and displayed to the user.

4. Evaluation and Validation: The accuracy and performance of the Linear Regression model are evaluated using cross-validation techniques during the model training phase . The model's predictions are validated against actual sales commission data to assess its effectiveness in predicting commissions based on sales and demand leve

RESULT AND DISCUSSION



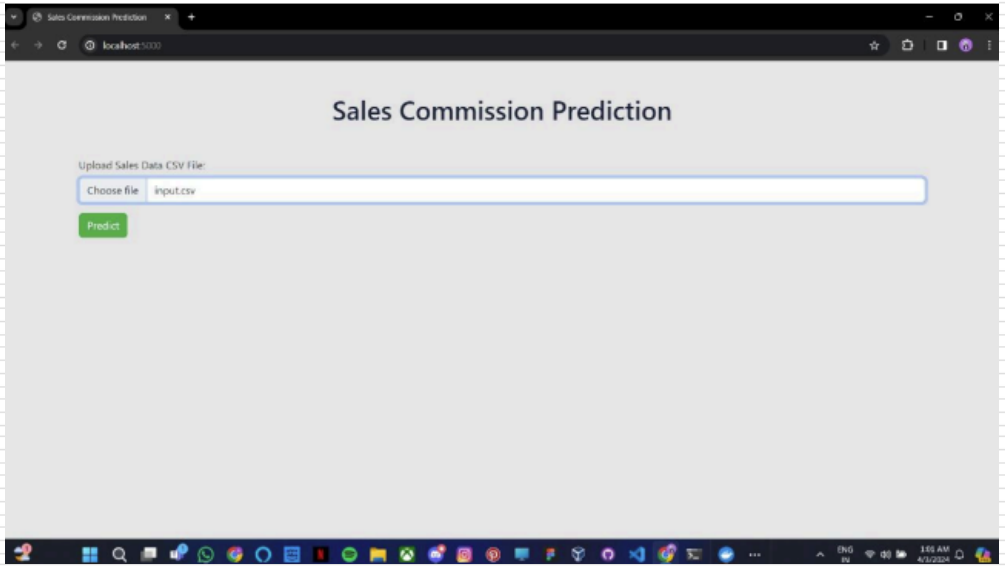
RESULT AND DISCUSSION

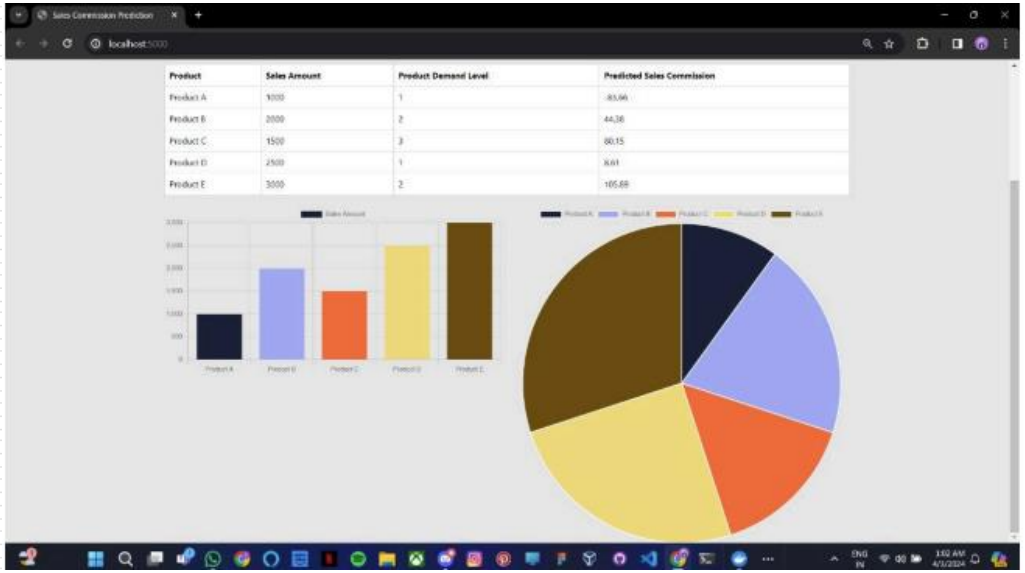
- Cross-validation scores: [0.82382581 0.94602497 0.93988099 0.84281289 0.73894661]
- Average cross-validation score: 0.8582982538540552
- Mean Squared Error: 424.2733983042342
- R-squared Score: 0.9309936207832515

RESULT AND DISCUSSION

The cross-validation scores you provided range from approximately 0.739 to 0.946, with an average cross-validation score of approximately 0.858. Generally, higher cross-validation scores indicate better performance, so these scores suggest that your model performs relatively well across different subsets of the training data. Regarding the evaluation metrics on the test set: - The mean squared error (MSE) of approximately 424.27 indicates the average squared difference between the predicted and actual sales commissions. Lower values of MSE indicate better model performance. - The R-squared score of approximately 0.931 represents the proportion of variance in the target variable (sales commissions) that is explained by the independent variables (sales amount and product demand level). Higher R-squared values closer to 1 indicate a better fit of the model to the data. In summary, the cross-validation scores and evaluation metrics (MSE and R-squared) suggest that your model performs quite well in predicting sales commissions based on the given features. However, it's essential to consider the specific context and requirements of your application to determine if these performance metrics meet your

EXECUTION OUTPUT





CONCLUSION

By harnessing the power of machine learning algorithms, specifically Linear Regression, and integrating them into a user-friendly web application using Flask and JavaScript technologies, a robust and efficient solution has been created for predicting sales commissions based on sales amount and product demand level.The project's success lies in its ability to streamline the traditionally complex and time-consuming process of commission calculation, offering users an intuitive platform to upload sales data, receive accurate predictions, and visualize insights through interactive charts.In conclusion, the Dynamic Sales Commission Generator project represents a significant step forward in sales commission management, offering businesses a practical and efficient tool to optimize their sales strategies, incentivize salespersons effectively, and maximize profitability. With further enhancements and refinements, this system has the potential to revolutionize commission calculation processes across various industries, driving growth and success in the competitive market landscape.

FUTURE ENHANCEMENTS

This project has a wide range of scope, Dynamic Sales Commission Prediction system could involve incorporating more advanced machine learning algorithms to further improve prediction accuracy and efficiency. Additionally, integrating real-time market data feeds and social media sentiment analysis could provide more comprehensive insights into customer behavior and market trends, allowing for more dynamic adjustment of commission rates. Furthermore, enhancing the user interface and adding features such as personalized dashboards for sales representatives and managers could improve usability and decision-making capabilities. Finally, exploring the possibility of leveraging blockchain technology for transparent and secure commission tracking and payment processing could enhance trust and efficiency in the commission management process

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Thank You