Online Auction End Price Prediction Using Machine Learning

A.Koushik[1], A.Harshitha, A.Avani, B.Pavan[4], Ch.Srikanth Varma[5]

[1]Author, student, Computer Science and Engineering, Gayatri vidya parishad college of Engineering(A)
[2]Author, student, Computer Science and Engineering, Gayatri vidya parishad college of Engineering(A)
[3]Author, student, Computer Science and Engineering, Gayatri vidya parishad college of Engineering(A)
[4]Author, student, Computer Science and Engineering, Gayatri vidya parishad college of Engineering(A)
[5]Mentor, Associate Professor, Computer Science and Engineering, Gayatri vidya parishad college of Engineering(A)

Abstract- This study explores the impact of internet auctions using eBay data. It employs a range of machine learning algorithms to predict auction end prices. Trained on 70% of the dataset, the system shows high predictive accuracy and breaks traditional auction constraints. Ensemble methods, such as Voting Classifier and Voting Regressor, notably improve performance, achieving 100% accuracy and an 80% R2 score, respectively. This underscores the effectiveness of ensemble methods in online auction analysis.

Keywords – Online Auction, Machine learning, end price, voting classifier and voting regressor

INTRODUCTION

The widespread adoption of machine learning across various fields underscores its feasibility and cost-effectiveness in performing essential tasks by learning from examples. As internet usage becomes ubiquitous in today's society, online platforms have become a preferred medium for various activities, including commerce. Online auctions, epitomized by platforms like eBay, have witnessed significant growth, offering convenience and efficiency to buyers and sellers alike. With millions of items listed daily, online auctions generate vast amounts of data, which can be leveraged for market research, product development, and predictive analytics. This project aims to utilize machine learning algorithms to predict the end prices of auction items, providing valuable insights to enhance profit maximization for individuals involved.

In this project, a diverse ensemble of machine learning algorithms, including Range Index, SVM, Naive Bayes, and others, is employed to predict auction end prices. Trained on a substantial portion of eBay's dataset, these algorithms transcend traditional auction limitations, aiming for enhanced predictive accuracy. The focus is on employing innovative ensemble techniques to achieve superior performance in predicting auction outcomes.

The technology stack utilized in this project is anchored by Anaconda, a comprehensive software distribution facilitating Python-based development for data science and machine learning tasks. Python serves as the primary language, offering simplicity, readability, and a rich ecosystem of libraries for implementing sophisticated machine learning algorithms and data processing tasks. Flask, a lightweight web application framework, is utilized for the backend, while frontend technologies such as HTML, CSS, JavaScript, and Bootstrap4 are employed to create an intuitive user interface.

The purpose of this project is to provide actionable insights to buyers and sellers participating in online auctions, enabling informed decision-making to maximize profits on individual transactions. Additionally, the project seeks to enhance the overall efficiency and effectiveness of the online auction marketplace, contributing to a streamlined and profitable experience for users.

The scope of the project encompasses data collection and preparation, model training and evaluation, integration into auction platforms, and ongoing monitoring and maintenance. Potential extensions include real-time data integration and prediction of additional auction-related metrics, ultimately aiming to enhance understanding and prediction of online auction outcomes, thus contributing to the efficiency and profitability of eBay's marketplace.

PROPOSED SYSTEM

The proposed system addresses the evolving landscape of online auctions, utilizing eBay data to predict end prices of auction items. Overcoming traditional constraints, such as geographical and temporal limitations, the system employs a diverse array of machine learning algorithms, including Range Index, SVM, Naive Bayes, and others. For closing price prediction [12], the system integrates SVR, Bayesian Regression, KNN, Decision Tree Regressor, Random Forest Regressor, and Voting Regressor. The training process involves 70% of the dataset, fostering adaptability to the dynamic nature of online commerce. By leveraging ensemble methods, the system aims to refine predictive accuracy and create a versatile tool capable of navigating the intricacies of the online auction environment, contributing to the advancement of predictive analytics in e-commerce transactions.

In the realm of classification, various machine learning algorithms are employed. SVM classifies data points by finding the hyperplane that best separates them into different classes, making it suitable for range index classification tasks. Naive Bayes and Uniform Prior Naive Bayes offer quick and effective predictions by assuming independence among features, while KNN[6] captures local patterns for accurate categorization. Decision Tree and Random Forest provide interpretability and robust predictions by recursively splitting data and combining multiple decision trees, respectively. The Voting Classifier aggregates predictions from multiple models to determine the final classification, resulting in more reliable predictions.

For closing price prediction, regression techniques are utilized. SVR handles non-linear relationships and high-dimensional data effectively, while Bayesian Regression incorporates Bayesian principles to estimate model parameters, providing probabilistic predictions. KNN and Decision Tree Regressor[13] capture local patterns and non-linear relationships, while Random Forest Regressor mitigates overfitting and improves prediction accuracy. The Voting Regressor combines predictions from multiple regression models, offering a robust approach to closing price prediction.

The proposed system offers several advantages. It harnesses a diverse ensemble of machine learning algorithms, providing versatility in predicting end prices and adapting to the dynamic nature of online auctions. By eliminating traditional constraints like geography and time, it opens up new possibilities for online commerce, expanding the scope of transactions. Incorporating advanced ensemble methods enhances predictive accuracy, fostering more reliable and robust predictions. Trained on 70% of eBay auction data, the system exhibits adaptability to evolving market trends, ensuring it stays relevant and effective in predicting auction outcomes. Overall, the inclusion of both range index classification and various regression models for closing price prediction provides a holistic and comprehensive solution for online auction analysis and prediction.

During the analysis phase, the feasibility of the project is thoroughly examined, and a business proposal is presented, outlining a general plan for the project along with cost estimates. The feasibility study focuses on three key considerations: economical, technical, and social feasibility.

Economical Feasibility: This assessment evaluates the economic impact of the proposed system on the organization. It examines whether the funds allocated for research and development are justified and if the system can be developed within budget constraints. Since most of the technologies used are freely available, the project remains economically feasible. Only customized products had to be purchased, keeping expenditures within reasonable limits.

Technical Feasibility: This analysis assesses the technical requirements of the system to ensure that it does not excessively strain available technical resources. A system that demands significant technical resources could burden the client. Therefore, the developed system must have modest technical requirements, requiring minimal or no changes for implementation. By keeping technical demands manageable, the system remains technically feasible and ensures smoother implementation.

Social Feasibility: This aspect evaluates the level of acceptance of the system by users and their willingness to adopt it. It includes training users to efficiently use the system and ensuring they perceive it as a necessity rather than a threat. User acceptance depends on effective education and familiarization with the system. Users should feel confident in using it and be encouraged to provide constructive feedback as they are the ultimate users of the system.

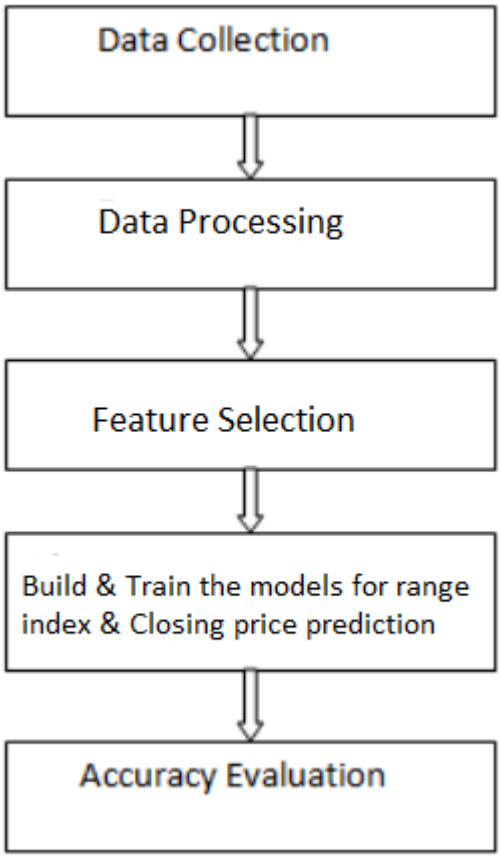


FIG.1: SYSTEM ARCHITECTURE

IMPLEMENTATION

In this project, various modules are employed to streamline the prediction process in online auctions. These modules encompass data exploration, processing, splitting data into training and testing sets, model generation, user signup and login, user input, and final prediction display. By orchestrating these modules, the system efficiently handles data ingestion, preparation, model building, and user interaction, ensuring a seamless prediction experience.

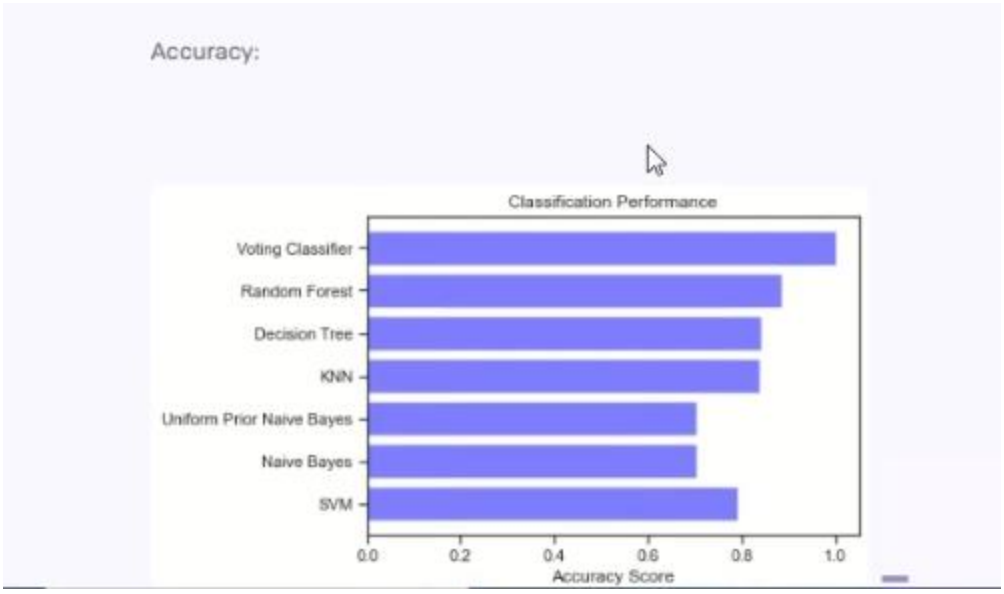
An extension to the base paper introduces advanced ensemble techniques, enhancing prediction accuracy[9] significantly. These techniques, such as the Voting Classifier and Voting Regressor, combine the predictions of multiple models to produce more robust and accurate outcomes. By leveraging ensemble methods, the project achieves remarkable predictive prowess, marking a significant advancement in online auction analysis.

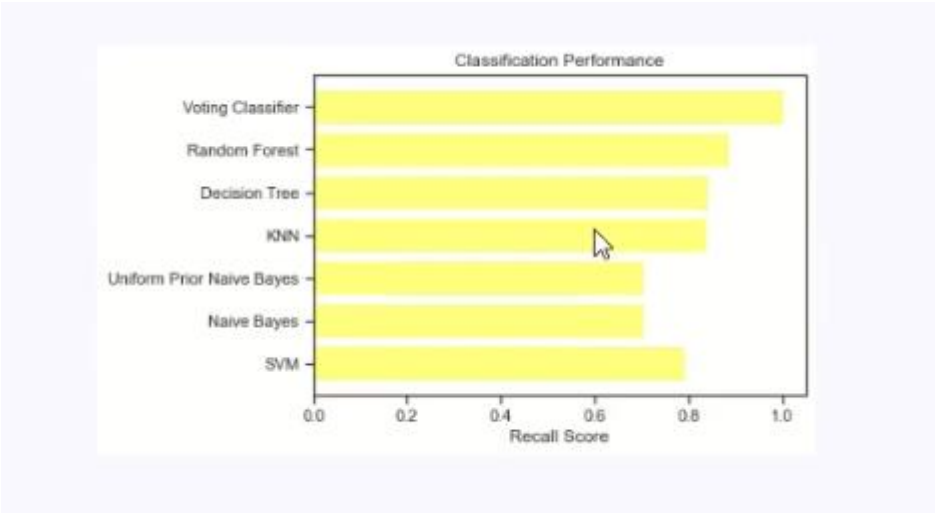
The project employs a selection of key libraries to support its functionalities. NumPy and Pandas facilitate efficient data manipulation and analysis, while Pickle enables the serialization of Python objects for model persistence. Flask provides a lightweight framework for web application development, enabling user registration, input submission, and result display. Seaborn enriches the project's data visualization capabilities, offering insightful graphical representations of auction data.

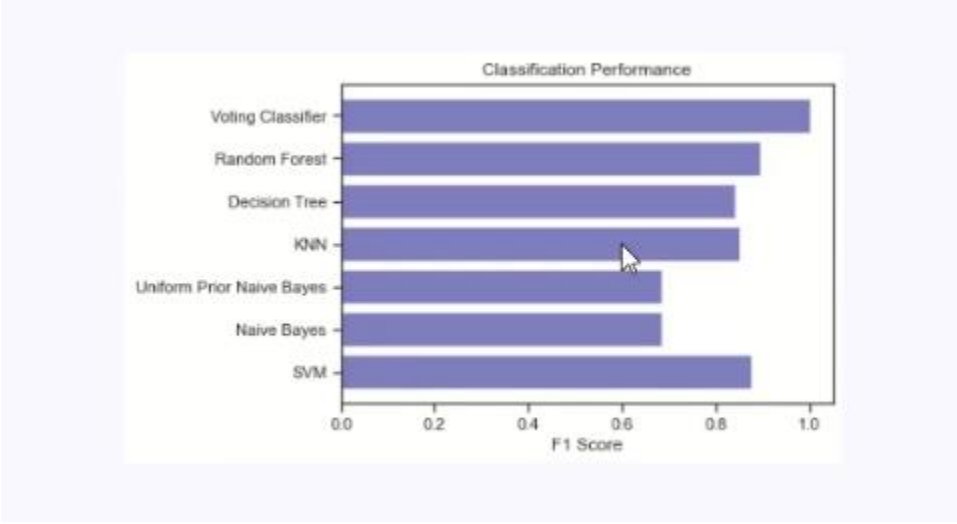
Feasibility analysis ensures that the project aligns with economic, technical, and social considerations. Economically, the project remains feasible by utilizing freely available technologies and minimizing custom product purchases. Technically, it imposes modest demands on resources, ensuring smooth implementation. Socially, the system prioritizes user acceptance through user-friendly interfaces and effective training methods, fostering confidence and constructive feedback among users. Overall, the project demonstrates a harmonious balance between feasibility and innovation in the domain of online auction prediction.

RESULTS

MODEL PERFORMANCE METRICS:







From visualizations to metrics, our dashboard provides a comprehensive overview of our project's performance and impact. One can log on to the website using the sign up button on the top right corner.After entering your details like name email id ,you can sign in into the website ,then give the details of the item of auction like bid id , open bid ,etc. then clicking on the predict , which gives the result predicting the closing price and says if its low or high.

CONCLUSION

In conclusion, this project successfully navigated the dynamic landscape of online auctions, presenting a comprehensive system for predicting end prices and range indices of auction items using eBay data. Leveraging a diverse ensemble of machine learning algorithms, the system transcended traditional constraints, offering versatility and adaptability to the evolving online commerce environment. The range index classification, facilitated by SVM, Naive Bayes, Uniform Prior Naive Bayes, KNN, Decision Tree, Random Forest, and Voting Classifier, showcased robust accuracy, ensuring precise categorization of auction items within specified ranges. For closing price prediction, the ensemble of SVR, Bayesian Regression, KNN, Decision Tree Regressor, Random Forest Regressor, and Voting Regressor demonstrated a high level of accuracy, providing reliable forecasts for auction outcomes. The incorporation of innovative ensemble methods such as Voting Classifier and Voting Regressor further elevated predictive performance. This project contributes to the field by addressing the challenges posed by the intricate dynamics of online auctions, offering a sophisticated toolset for both range index classification and closing price prediction. The successful application of diverse algorithms and ensemble techniques underscores the potential for advanced machine learning methodologies to enhance the efficiency and accuracy of predictive analytics in the context of online commerce.

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