UNCOVERING THE INTERNET-BASED MERCHANDISE USING SENTIMENT EVALUATION AND MACHINE LEARNING ALGORITHMS

Project Reference No.: *47S_BE_3585*

College ***:*** *S.E.A. College of Engineering And Technology, Bengaluru*
Branch ***:*** *Department of Information and Science Engineering*
Guide(s) ***:*** *Dr. Nijaguna G. S*
Student(S) ***:*** *Mr. Mohammed Azmathulla*
Mr. Shabaz Pasha
Mr. Brij Bhushan Kumar
Mr. Basavaraj Rajur.

Keywords:

Sentiment analysis (SA), Online retail, computational linguistics, automated learning, advanced learning, sentiment mining, textblob and opinion mining.

Introduction

E-commerce has been created by the rapid development of the Internet and the transformation of people's shopping modes, which has contributed to the emergence of Amazon, eBay and other numerous e-commerce platforms. In the meantime, a growing number product or service on the platform through online comments. The reviews not merely reflect the performance as well as the quality of online goods or services, but also display consumers' shopping experiences in an authentic and comprehensive manner. It turns out, online reviews have been regarded as a valid information source for both consumers and merchants. Especially for certain new and untried products, the reviews offer consumers valuable references for product selection, which is of great significance to reduce purchasing risks. Besides, the reviews help merchants have an appreciation of consumer attitudes, such as motivations, satisfaction, etc., thus developing products that can meet the expectations of consumers. Admittedly, it is crucial for business success to gain insights into product experience and timely grasp consumers' practical demands from the reviews.

Figure 1.1: Product Review Scenarios

Objectives

Based on the aim of the project, we have designed the objectives as:

- Initially reviews data will be collected from the online E-Commerce Platform
- Text processing is applied using Natural Language Processing Techniques
- Split the dataset into Train and test.
- Develop the Machine Learning Models for the classification of the reviews.
- Performance of each model is evaluated separately and comparison study can be given.
- Finally, we have developed a flask web application that provide effective way to online product experience and customers' demands, thereby strongly supporting future product improvement and marketing strategy optimization.

Methodology

Step 1: Dataset

- To begin with, a large number of online review texts are collected from Internet platforms such as Amazon, eBay or any other E-Commerce Platform.
- Afterward, the obtained reviews are standardized into sets of word arrays through text preprocessing to simplify the succeeding procedures of text analysis.

Step 2: Data Pre processing

- Review texts, as a type of unstructured information, are not allowed to be directly processed and analyzed. We need to apply Text Processing techniques to balance and structure the data.
- Text Processing methods Feature Selection Feature Extraction, Tokenization and Stemming are applied.

Step 3: Model Training and Development

- Split the dataset into Train and test.
- Develop the NLP & Machine Learning Models for the classification of the reviews.

Step 4: Performance Evaluation

- Performance of each model is evaluated separately and comparison study can be given.

Step 5: Demonstration of Online Product Experience System

- Finally, we provide effective way to online product experience and track customers' demands, thereby strongly supporting future product improvement and marketing strategy optimization.

Proposed System

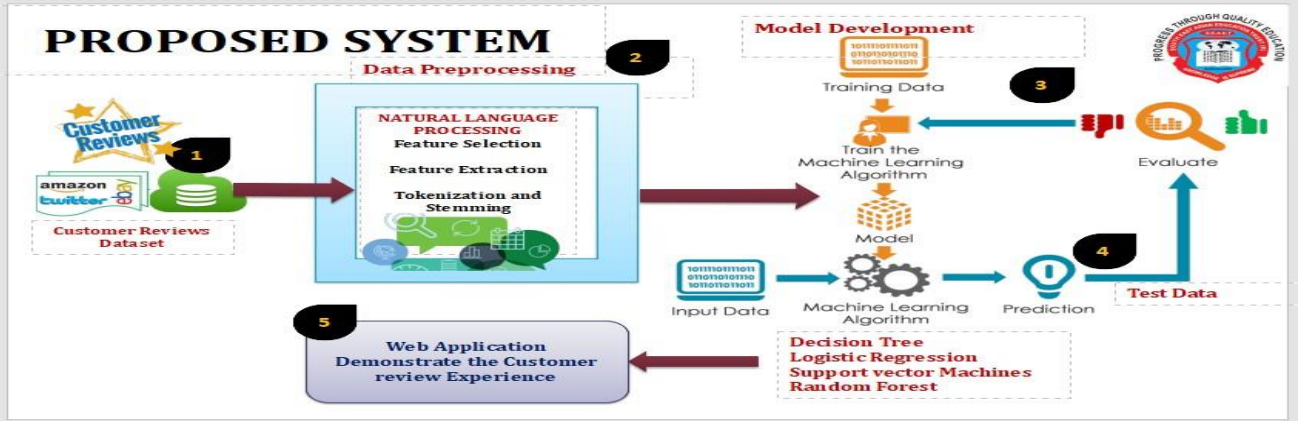


Fig 1.2 : Proposed System

Architecture Diagram

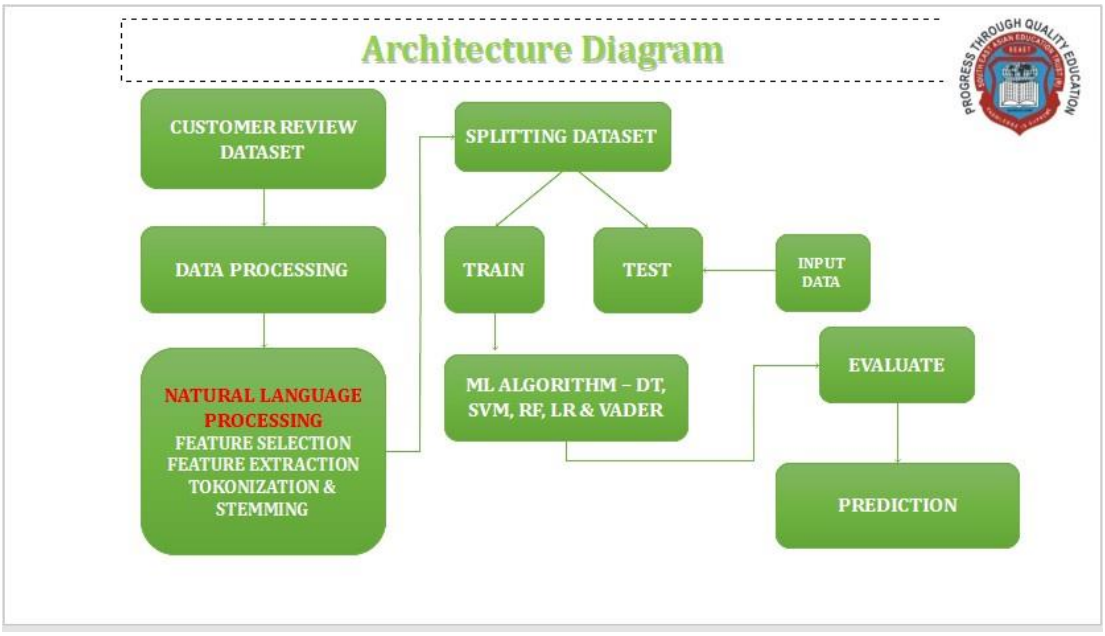


Fig 1.3 : Architecture Diagram

Flow Chart

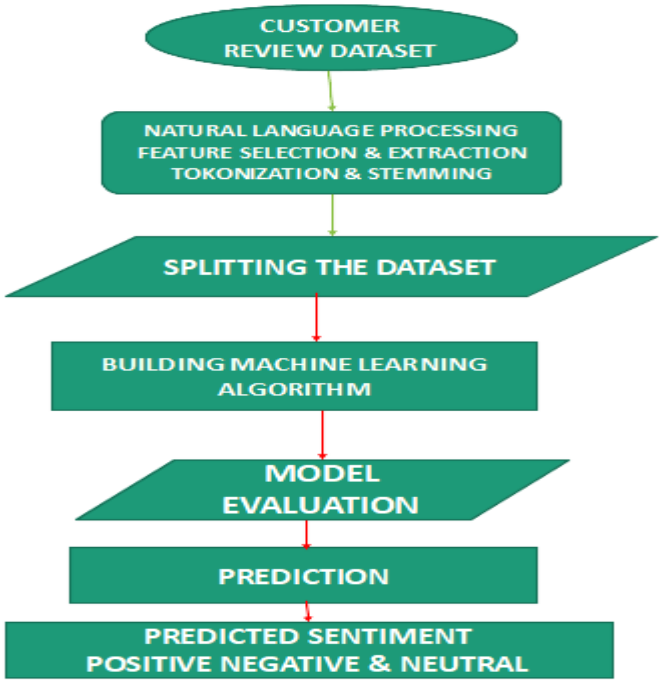


Fig 1.4 : Flow Chart

Sequence Diagram

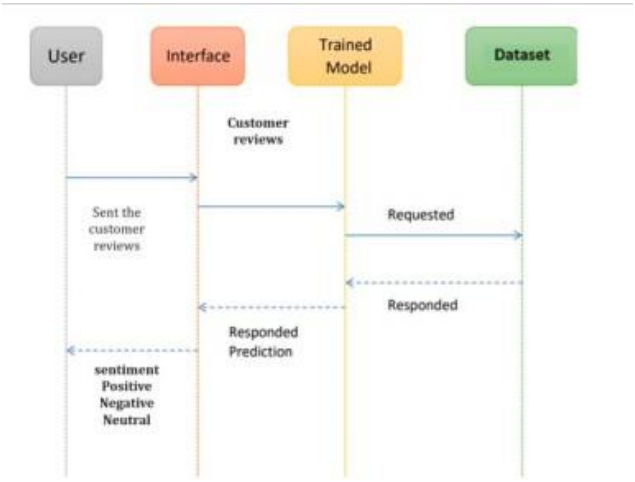


Fig 1.5 : Sequence Diagram

Results

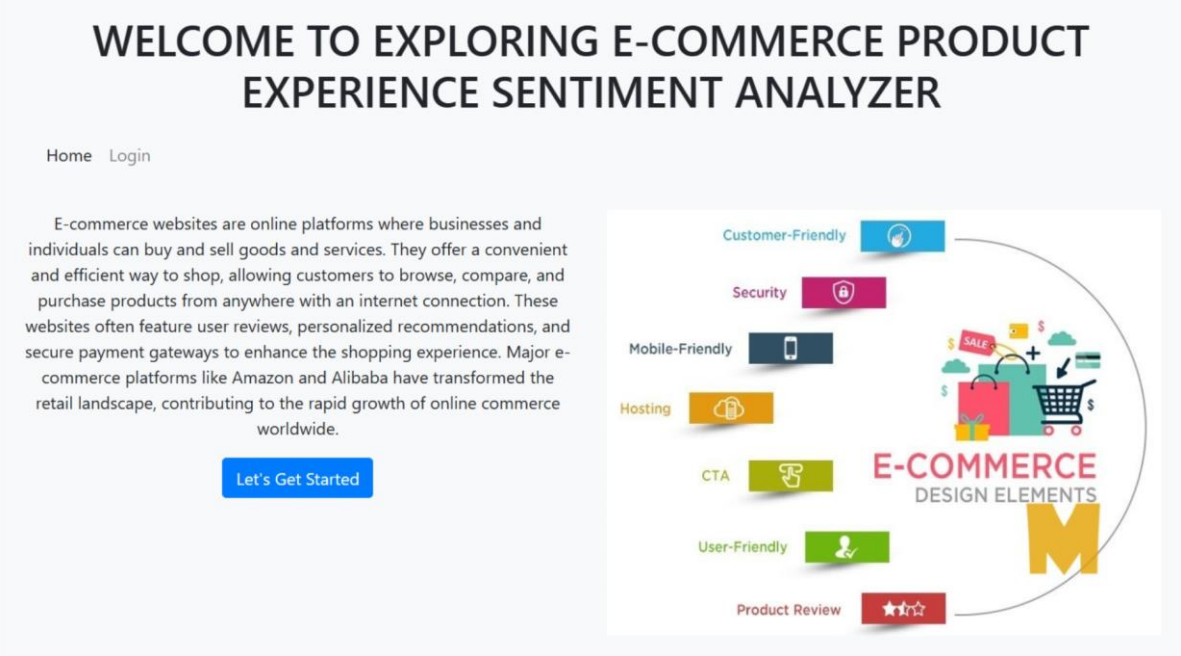


Fig1.6 : Home Page

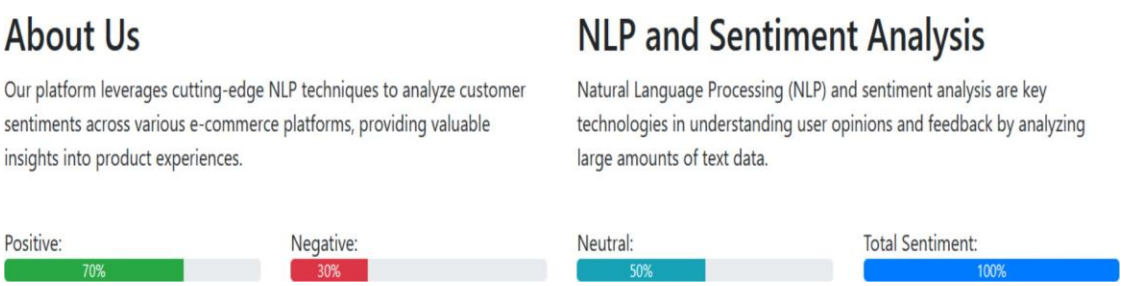


Fig 1.7: About us and NLP and Sentiment Analysis

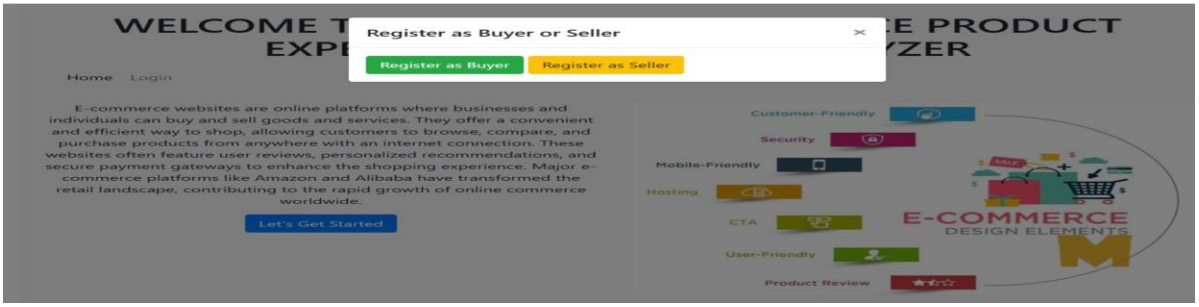


Fig 1.9: Register as Buyer or Seller

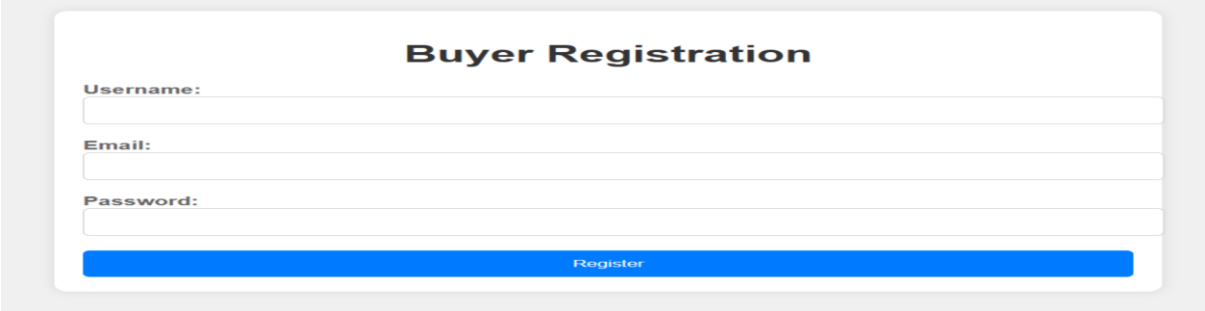


Fig 1.10: Buyer Registration Form

Fig 1.11: Seller Registration Form

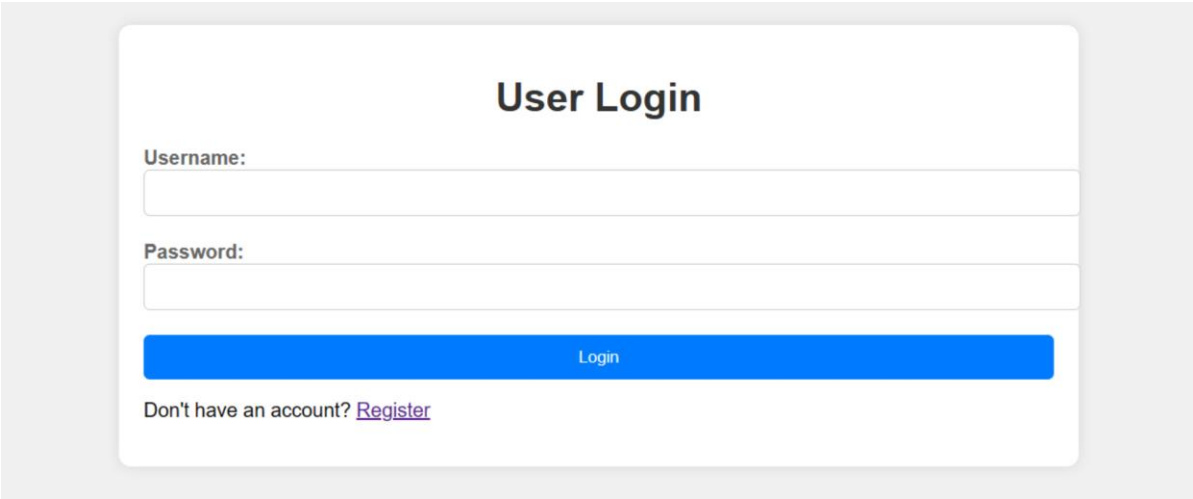


Fig 1.11: Login Page

Product Information

E-commerce products encompass a wide range of items available for purchase online, from physical goods to digital services. They include categories such as electronics, fashion, home appliances, beauty products, and furniture. Consumers can conveniently browse, compare, and purchase these products through e-commerce platforms, often benefiting from user reviews, detailed product information, and competitive pricing. As e-commerce continues to grow, retailers are constantly innovating to offer better customer experiences, personalized recommendations, and efficient delivery options.

Fig 1.12: Product Information

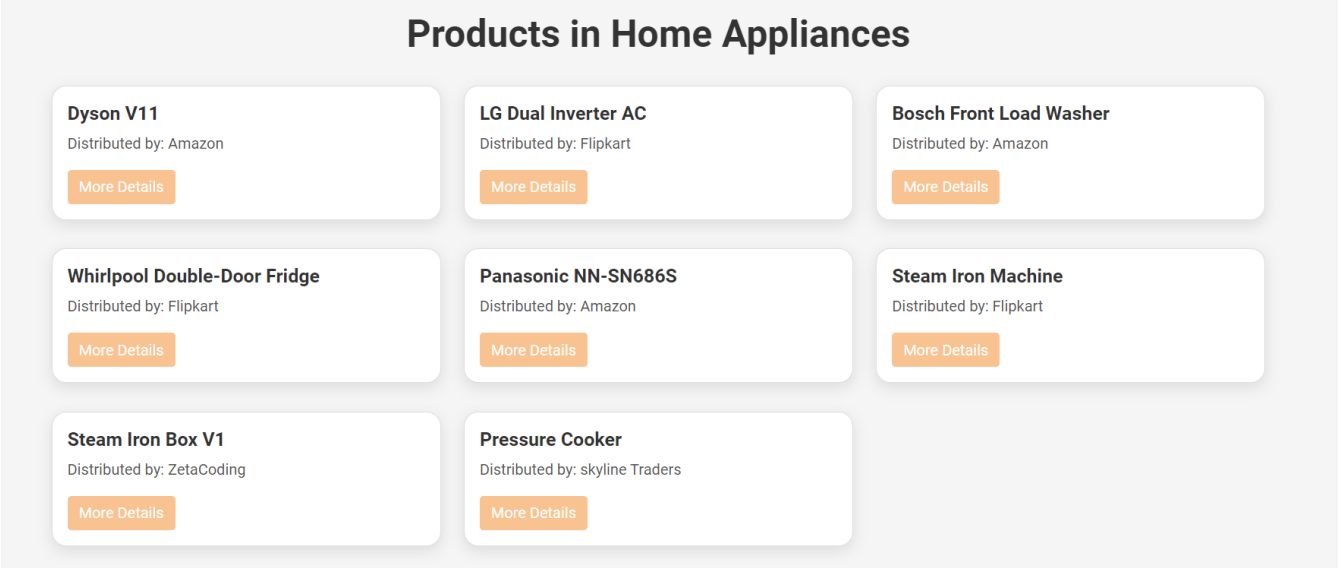
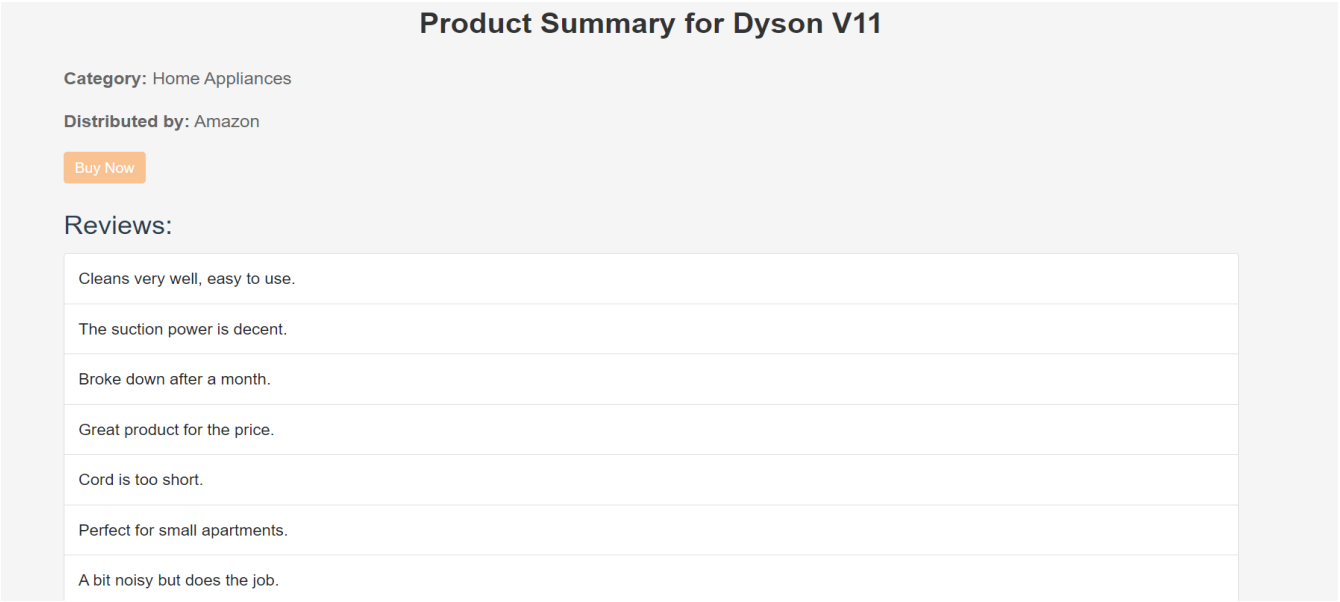


Fig 1.14 : Products in Particular Category (eg: Products in Home Appliances)



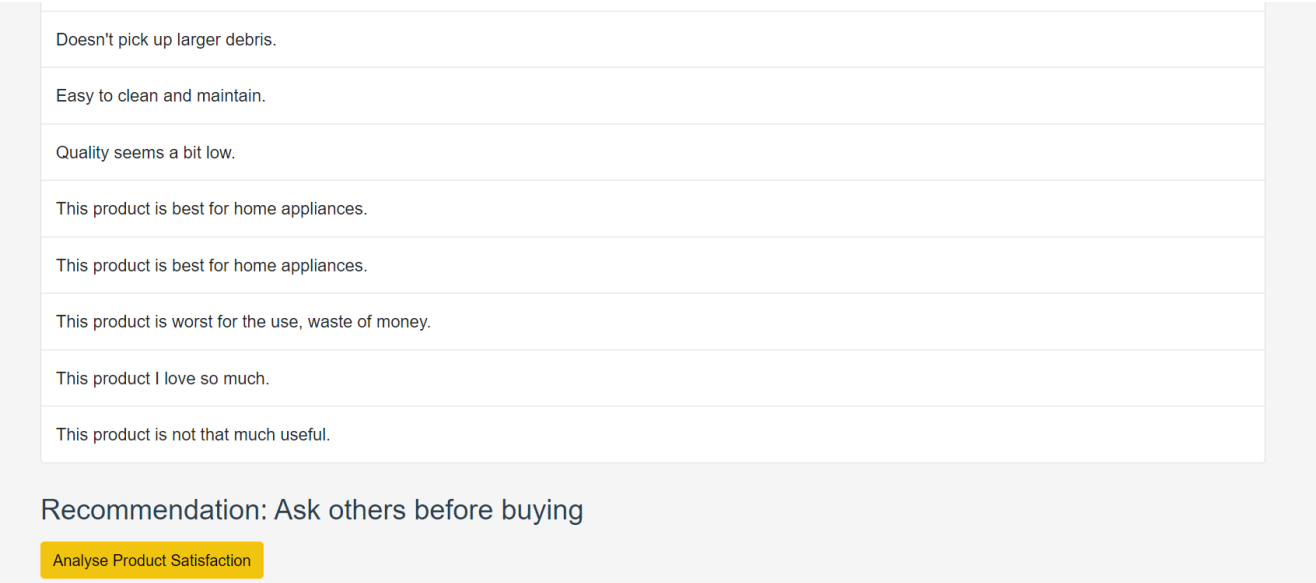


Fig 1.15 : Reviews for Products

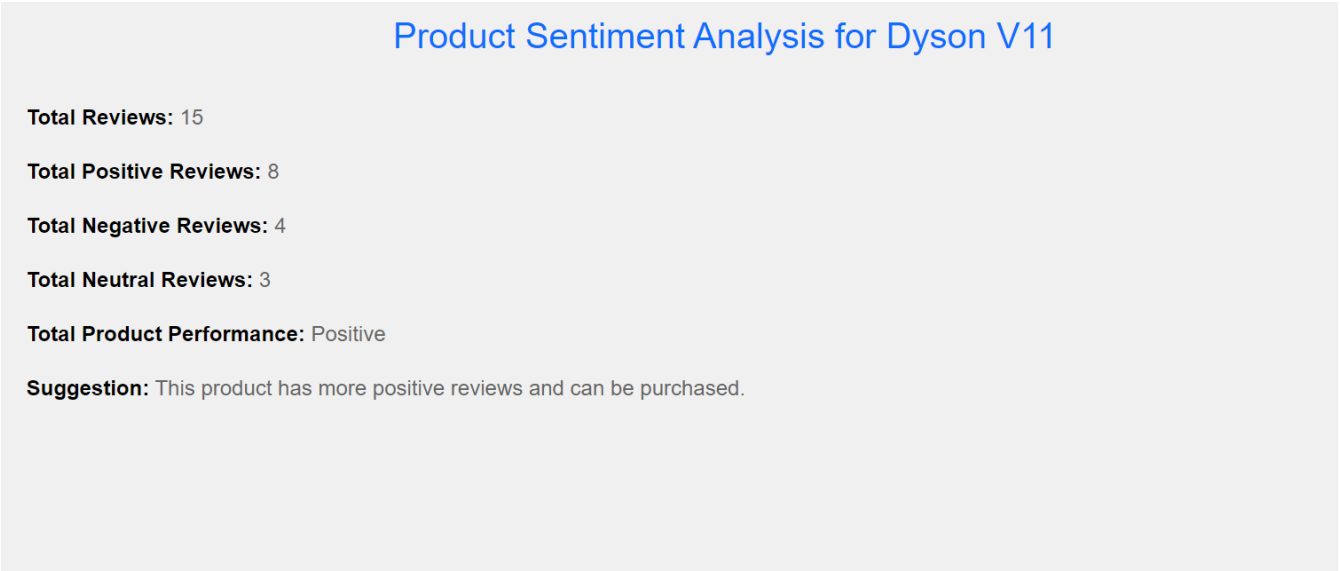


Fig 1.16 : Sentiment Analysis of a Product

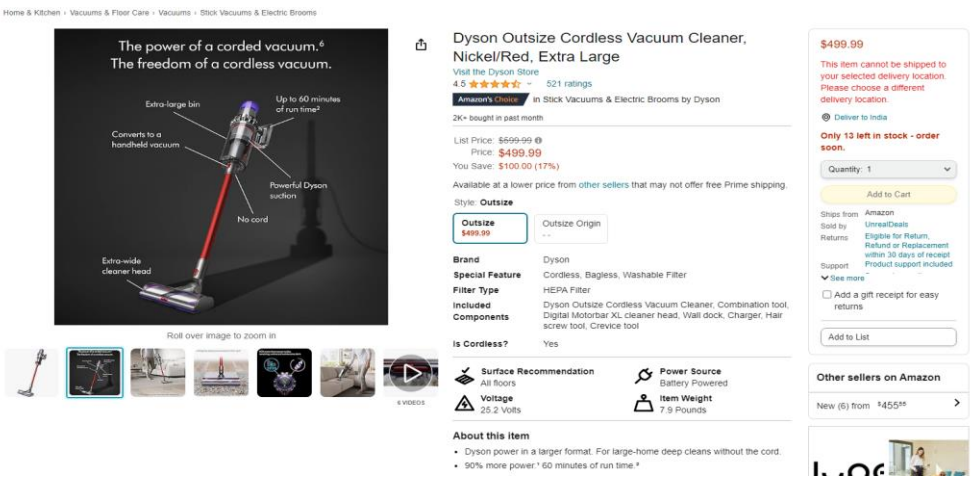


Fig 1.17 : Product link Redirection

CONCLUSION

In your project, a combination of Machine Learning Algorithms including Logistic Regression, Linear Support Vector Classifier, K-Nearest Neighbor, and Random Forest Classifier was employed for sentiment analysis. To enhance the NLP tasks, the TextBlob Python library was utilized, offering advanced functionalities and superior performance compared to NLTK. Specifically, operations like semantic parsing, noun phrase extraction, sentiment analysis, and spell correction demonstrated improved results when implemented with TextBlob. This integration of machine learning algorithms and TextBlob's features has significantly elevated the accuracy and

Innovation In The Project

The project described lies in its integrated approach to sentiment analysis, combining advanced machine learning algorithms with the sophisticated natural language processing capabilities of the TextBlob library, within a practical application framework built using the Flask web framework.

Here are the key innovative aspects:

Enhanced NLP with TextBlob: Unlike simpler applications that might rely on basic NLP tools, this project utilizes TextBlob, which is known for its superior NLP functionalities over other libraries like NLTK. TextBlob enhances the project with capabilities such as semantic parsing, noun phrase extraction, improved sentiment analysis, and spell correction. These features contribute

detection in customer reviews.

to a deeper and more accurate analysis of text data.

suggestions to better fit user sentiment and preferences.

Application of NLP in E-Commerce Recommendations: The project applies NLP not just for analyzing sentiments but also for powering a recommendation system on an e-commerce platform. This dual application is innovative as it uses the sentiments expressed in product manuals and customer reviews to influence and enhance the recommendation algorithm, thereby tailoring of machine learning and NLP are directly applied in a user-accessible way, enhancing both user experience and business value.

Business and Consumer Impact: The innovative integration of these technologies is not just a technical achievement but is directly applied to enhance business strategies and consumer satisfaction. By understanding and analyzing consumer feedback through advanced sentiment analysis, businesses can make informed decisions on product improvements and marketing, ultimately leading to better consumer experiences and business outcomes.

Scope For Future Work

- **Integrating Deep Learning Models** to improve sentiment analysis accuracy, particularly for detecting subtle nuances and complex emotions.
- **Expanding Language Support** to include multiple languages and dialects, making the system useful in a global marketplace.
- **Enhancing Personalization** through machine learning models that adapt based on individual user behaviors and preferences.
- **Real-Time Analysis** capabilities to process sentiments as new reviews are posted, allowing for dynamic updating of sentiment data.
- **Advanced Semantic Analysis** to better understand the context and subtleties like sarcasm or irony in text.
- **Improved User Interaction** with the system through a more intuitive UI/UX, enabling users to provide feedback on sentiment and recommendation accuracy.
- **Ethical AI and Bias Reduction** in sentiment analysis models to ensure fairness and neutrality in automated assessments.
- **Robust Data Privacy** Enhancements to secure sensitive user data, adhering to regulations like GDPR.
- **Cross-platform Integration** with other business systems (CRM, ERP) for a holistic view of trends in product sentiment.

consumer behavior and better inventory management.

- **Scalability Improvements** to handle larger datasets and more users without compromising performance.
- **Predictive Analytics** to forecast future trends based on sentiment and behavioral
- **Visual Analytics Tools** for businesses to easily understand sentiment trends, consumer data.

  demands, and market conditions.
- **Customer Journey Analytics** to map the entire customer journey through sentiment milestones and improve customer engagement strategies.
- **Augmented Reality (AR)** Integration for an innovative shopping experience where customers can see product sentiments and reviews in real-time through AR interfaces.

References

[1]. S. M. Mohammad, ``Sentiment analysis: Detecting valence, emotions, and other affectual states from text,'' in *Emotion Measurement*. Sawston, U.K.: Woodhead, 2016, pp. 201_237.

[2]. M. Taboada, ``Sentiment analysis: An overview from linguistics,'' *Annu. Rev. Linguistics*, vol. 2, no. 1, pp. 325_347, Jan. 2016.

[3]. F. Emmert-Streib, O. Yli-Harja, and M. Dehmer, ``Utilizing social media data for psychoanalysis to study human personality,'' *Frontiers Psychol.*, vol. 10, p. 2596, Nov. 2019.

[4]. L. Sinnenberg, A. M. Buttenheim, K. Padrez, C. Mancheno, L. Ungar, and R. M. Merchant,

``Twitter as a tool for health research: A systematic review,'' *Amer. J. Public Health*, vol. 107, no. 1, pp. e1_e8, Jan. 2017.

[5]. R. E. Wilson, S. D. Gosling, and L. T. Graham, ``A review of Facebook research in the social sciences,'' *Perspect. Psychol. Sci.*, vol. 7, no. 3, pp. 203_220, May 2012.

[6]. M. S. Shaharudin, Y. Fernando, C. J. C. Jabbour, R. Sroufe, and M. F. A. Jasmi, ``Past, present, and future low carbon supply chain management: A content

review using social network analysis," *J. CleanerProd.*, vol. 218, pp. 629_643, May 2019.

[7]. B. Qi and A. M. Costin, ``Investigation of the in_uence of Twitter user habits on sentiment of their opinions towards transportation services," in *Computing in Civil Engineering 2019: Smart Cities, Sustainability, andResilience*. Reston, VA, USA: American Society of Civil Engineers, 2019,pp. 314_321.

[8]. R. P. S. Kaurav, K. G. Suresh, and S. Narula, ``New education policy: Qualitative (contents) analysis and Twitter mining (sentiment analysis)," *J. Content, Community Commun.*, vol. 12, no. 1, pp. 4_13, 2020.

[9]. R. K. Dong, ``Emotion and international business: Theorising fear of failure in the internationalisation," *Frontiers Psychol.*, vol. 13, Mar. 2022, Art. no. 850816, doi: 10.3389/fpsyg.2022.850816.

[10]. Warrier, P. Singh, and C. W. Jien, ``Factors that lead Amazon.com to a successful online shopping platform," *Int. J. Tour. Hosp. Asia Pasific*, vol. 4, no. 1, pp. 7_17, 2021.

[11]. [11] C. A. Haryani, A. N. Hidayanto, N. F. A. Budi, and Herkules, ``Sentiment analysis of online auction service quality on Twitter data: A case of E-bay," in *Proc. 6th Int. Conf. Cyber IT Service Manage. (CITSM)*, Aug. 2018.

[12]. H. Luo, ``A review of research on identi_cation of false reviews in Ecommerce," *J. Manage. Humanity Res.*, vol. 3, pp. 9_15, Jul. 2020.

[13]. K. Thirumaran, H. Jang, Z. Pourabedin, and J. Wood, ``The role of social media in the luxury tourism business: A research review and trajectory assessment," *Sustainability*, vol. 13, no. 3, pp. 12_16, 2021.

[14]. S. Tao and H.-S. Kim, ``Online customer reviews: Insights from the coffee shops industry and the moderating effect of business types," *Tourism Rev.*, vol. 77, no. 5, pp. 1349_1364, Aug. 2022.

[15]. B. von Helversen, K. Abramczuk, W. Kope¢, and R. Nielek, ``Influence of consumer reviews on online purchasing decisions in older and younger adults," *Decis. Support Syst.*, vol. 113, pp. 1_10, Sep. 2018.

[16]. C. Campbell and J. R. Farrell, ``More than meets the eye: The functional components underlying influencer marketing," *Bus. Horizons*, vol. 63, no. 4, pp.

469_479, Jul. 2020.

[17]. J. M. Luo, H. Q. Vu, G. Li, and R. Law, ``Understanding service attributes of robot hotels: A sentiment analysis of customer online reviews,'' *Int. J. Hospitality Manage.*, vol. 98, Sep. 2021, Art. no. 103032.

[18]. J. R. Saura, D. Palacios-Marqués, and D. Ribeiro-Soriano, ``Exploring the boundaries of open innovation: Evidence from social media mining,'' *Technovation*, Jan. 2022, Art. no. 102447.

[19]. P. Dash, J. Mishra, and S. Dara, ``Sentiment analysis on social network data and its marketing strategies: A review,'' *ECS Trans.*, vol. 107, no. 1, pp. 7417_7425, Apr. 2022.

[20]. S. Gupta and R. Sandhane, ``Use of sentiment analysis in social media campaign design and analysis,'' *Cardiometry*, vol. 22, pp. 351_363, May 2022.