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Smart Bot: E-commerce ML with Credit Card Fraud and Chat-bot

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Abstract: Smart Bot is an innovative e-commerce machine learning system that combines powerful credit card fraud detection capabilities and an intelligent chat bot. This advanced platform leverages machine learning algorithms to examine and spot fraudulent activity trends in real-time, providing e-commerce businesses with robust protection against credit card fraud. Through the use of sophisticated data analysis and pattern recognition techniques, Smart Bot is able to accurately detect suspicious transactions, preventing potential financial losses and ensuring a safe and secure online shopping experience for both merchants and customers. Additionally, Smart Bot comes equipped with a conversational chatbot that enhances the customer service experience by providing quick and accurate responses to inquiries and support requests. It utilizes natural language processing algorithms to understand and interpret customer messages, delivering personalized and relevant assistance, product recommendations, and order tracking updates. With Smart Bot, e-commerce businesses can effectively combat credit card fraud while simultaneously improving customer engagement and satisfaction. This innovative solution offers a comprehensive and reliable fraud detection system combined with a user-friendly chat-bot interface, empowering businesses to protect their financial interests and provide an exceptional customer experience. detection of credit card fraud, machine learning, e-commerce, chat bot, pattern recognition, data analysis, customer service, natural language processing, online shopping, fraud prevention.

Keywords: Smart Bot, E-commerce, Machine learning, Credit card fraud detection, Chat bot, Pattern recognition, Data analysis, Customer service, Natural language processing, Online shopping, Fraud prevention Fraud detection, Customer engagement, User-friendly interface, Personalized assistance.

I. INTRODUCTION

Smart Bot is an advanced e-commerce solution powered by machine learning and designed to provide a safe and secure online shopping experience. With its cutting-edge technology, Smart Bot incorporates credit card fraud detection and prevention systems, ensuring that customers can shop with confidence and peace of mind. By analyzing patterns and behaviors, the machine learning algorithms behind Smart Bot are able to identify potentially fraudulent transactions in real-time, effectively mitigating the risk of fraudulent activity. Through a highly sophisticated and adaptive system, Smart Bot continuously learns and improves its fraud detection capabilities, staying one step ahead of evolving fraud techniques.

But Smart Bot doesn't stop at just protecting against fraud. It also serves as an intelligent chat-bot, offering personalized assistance to customers throughout their shopping journey. With a deep understanding of customer preferences and past behaviors, Smart Bot is able to provide tailored product recommendations, answer questions about various products, and assist with resolving any issues or concerns. Whether it's helping customers find the perfect gift for a loved one or guiding them through the checkout process, Smart Bot is there to provide a seamless and satisfying shopping experience.

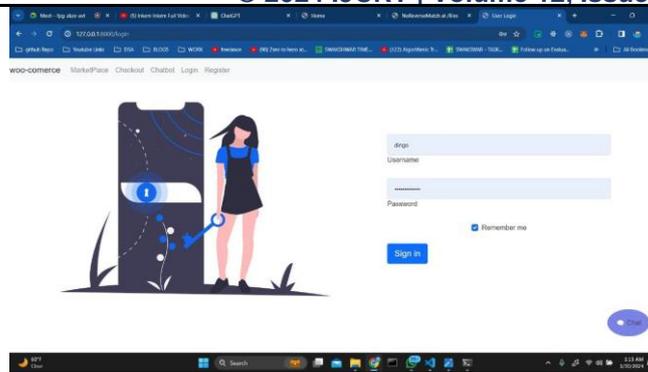


Fig. Interface Chatbots for E- Commerce

One of the key features of Smart Bot is its ability to engage in natural language conversations. By utilizing natural language processing techniques, Smart Bot can comprehend and converse with customers to address their questions, making the feel more personal and interactive. Customers can simply type or speak their questions, and Smart Bot will provide relevant and accurate answers in real-time. Whether it's inquiring about product availability, asking for recommendations, or seeking information about shipping and returns, Smart Bot is always ready to assist and ensure a smooth and efficient shopping experience.

In addition to its fraud detection capabilities and chat-bot functionality, Smart Bot also offers an easy-to-use UI that is simple to browse and intuitive. Clients may easily browse through various product categories, filter search results, and access detailed product information, all within an attractive and visually appealing interface. With its sleek and modern design, Smart In addition to improving the customer experience in general, bots also fosters trust and confidence in the reliability and professionalism of the e-commerce platform.

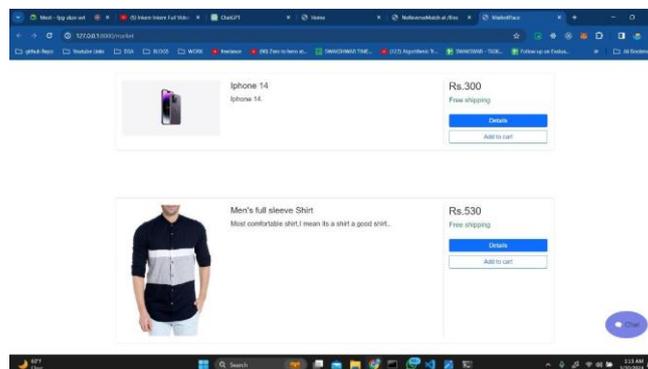


Fig. Interface of add to card

In conclusion, Smart Bot is a comprehensive e-commerce solution that combines advanced machine learning algorithms, credit card fraud detection, and chat-bot functionality to deliver a secure and personalized shopping experience. By safeguarding against fraud and providing intelligent assistance, Smart Bot ensures that customers can shop with peace of mind and efficiency. With its natural language processing capabilities and user-friendly interface, Smart Bot transforms the way customers interact with online stores, making the entire process more engaging, convenient, and enjoyable.

II. LITERATURE SERVEY

1. Artifact-Based Rendering: Harnessing Natural and Traditional Visual Media for More Expressive and Engaging 3D Visualizations

(Johnson S., Samsel F., Abram G., et al. Artifact-based rendering:

Harnessing natural and traditional visual media for more expressive and engaging 3D visualizations. *IEEE Transactions on Visualization and Computer Graphics* . 2019;26(1):p. 1. doi: 10.1109/tvcg.2019.2934260. [PubMed] [CrossRef] [Google Scholar]: Seth Johnson et al defines in this research the preliminary internal design study and two applications represent an initial exploration rather than a definitive evaluation. However, they illustrate a significant breakthrough: the ability to generate comprehensive and scientifically valuable multivariate virtual reality (VR) data visualizations using techniques inspired by traditional physical media. The resulting visual aesthetic has been described by domain scientists as resembling something "produced by nature," suggesting its potential to enhance the comprehensibility and engagement of scientific information. Moreover, by leveraging the existing skills of artists familiar with physical media, we anticipate that this approach, known as Aesthetic-Based Rendering (ABR), could significantly diversify and democratize the creation of 3D scientific visualizations within the visualization community.

2. Tran V. D. The relationship among product risk, perceived satisfaction and purchase intentions for online shopping. *The Journal of Asian Finance, Economics, and Business* . 2020;7(6):221–231. doi: 10.13106/jafeb.2020.vol7.no6.221. [CrossRef] [Google Scholar]

The Relationship among Product Risk, Perceived Satisfaction and Purchase Intentions for Online Shopping:

In Van Dat TRAN's study findings revealed that consumers' perception of product risk has a detrimental impact on their satisfaction with online purchases, particularly affecting the adoption of online shopping in Vietnam. It underscores the importance of understanding and addressing perceived risks, emphasizing the need to differentiate between various types of risks to effectively manage them. Security risk emerges as a significant concern, encompassing both financial and information security aspects. Literature supports the notion that heightened perceived risks, especially related to security, diminish consumer satisfaction and

impede purchase intentions. Conversely, efforts to mitigate perceived risks can enhance consumer satisfaction and foster purchase intentions. In the competitive landscape of online shopping, maintaining long-term customer satisfaction is paramount for success, with security and privacy emerging as critical factors shaping consumers' perceptions of risk.

3. Suresh A., Rani N. J. Consumer perception towards artificial intelligence in E-commerce with reference to Chennai city, India. *Journal of Information Technology and Economic Development*. 2020;11(1):1–14. [Google Scholar]

Consumer Perception towards Artificial Intelligence in E-Commerce With Reference to Chennai City, India

In this study Suresh A, et al showcase India's burgeoning e-commerce sector is witnessing rapid growth driven by a plethora of innovative technologies and advancements. Artificial Intelligence (AI) holds immense potential across diverse domains, garnering increasing attention and adoption among users. The study sheds light on the myriad applications of AI within the realm of e-commerce, revealing its expansive scope for proliferation across different sectors. The research findings underscore the transformative impact of AI, paving the way for groundbreaking innovations and advancements. With AI's trajectory trending upwards, it heralds a new era of possibilities, fuelling the emergence of novel data sciences and machine learning paradigms, poised to revolutionize various industries.

III. RELATED WORKS

1. Due to an increase in fraudulent transactions, credit card fraud detection has grown significantly in importance in recent years [A. Jessica, F. V. Raj, and J. Sankaran, 2023]. In order to identify and stop credit card fraud, machine learning approaches have become more useful [A. Aditi, A. Dubey, A. Mathur, and P. Garg, 2022].

2. Using cutting-edge machine learning approaches to enhance credit card fraud detection has been the subject of many research [A. Maurya and A. Kumar, 2022]. Decision trees, support vector machines, and artificial neural networks are some of these methods [S. V. J. B. Gracia, J. G. Ponsam, S. Preetha, and J. Subhiksha, 2021].

3. A machine learning model for credit card fraud detection was suggested by S. K. S, K. K. Shah, K. Kumar, K. K. Patel, and A. R. Sah (2022) in their study. The model achieved high accuracy in detecting fraudulent transactions [S. K. S, et al., 2022].

4. N. Boutaher, A. Elomri, N. Abghour, K. Moussaid, A survey of the literature on machine learning approaches for credit card fraud detection was carried out by M. Rida (2020). They identified various approaches and algorithms used in the detection process [N. Boutaher, et al., 2020].

5. A machine learning-based fraud detection system for credit card transactions was suggested by I. SADGALI, N. SAEL, and F. BENABBOU in 2019. The framework combined various features and classifiers to detect fraudulent transactions [I. SADGALI, et al., 2019].

6. Using machine learning approaches, C. H. Sumanth, P. P. Kalyan, B. Ravi, and S. Balasubramani (2022) examined credit card fraud detection. They compared the performance of different algorithms and found that ensemble methods achieved higher accuracy Sumanth, C. H., et al. (2022).

7. Y. V. Lakshmi, Y. S. Priyanka, A. Harika, N. Rajitha, and D. Bhargavi (2023) proposed An automated learning system for detecting credit card fraud system. Their approach involved feature selection, clustering, and classification algorithms to identify fraudulent transactions [Y. V. Lakshmi, et al., 2023].

8. O. Adepoju, J. Wosowei, S. Lawte, and H. Jaiman (2019) conducted a comparative evaluation of credit card fraud detection with the use of machine learning methods. After comparing the effectiveness of many algorithms, they discovered that random forest produced the greatest outcomes. [O. Adepoju, et al., 2019].

9. The use of machine learning methods for identifying credit card fraud has shown promising results in terms of accuracy and efficiency. These techniques can aid credit card firms and banking organizations in identifying fraudulent transactions and minimizing financial loss [A. Jessica, et al., 2023].

10. Further research in this field should focus on improving the detection accuracy and reducing false positives in order to provide more effective fraud prevention solutions for credit card transactions [F. V. Raj, et al., 2023].

IV. EXISTING SYSTEM

The existing system for Smart Bot, which combines e-commerce machine learning (ML) for detecting credit card fraud and a chatbot, comes with several disadvantages that hinder its effectiveness. Firstly, the integration of multiple components into a single system result in increased complexity and potential points of failure. Any issues with one component can have a cascading effect on others, leading to system-wide failures or malfunctions. This complexity also makes it challenging to troubleshoot and maintain the system, requiring specialized expertise and time-consuming efforts.

Secondly, the ML algorithms used for credit card fraud detection may not be fully reliable or adaptable. ML models require large amounts of data to be trained, and their accuracy depends on the quality and representativeness of the training data. However, credit card fraud is an evolving phenomenon, and criminals constantly adapt their techniques. This dynamic nature makes it challenging for machine learning algorithms to adapt and reliably identify new patterns or emerging fraud types.

Moreover, the chat-bot component of the system may encounter limitations in its conversational abilities. While advancements in natural language processing (NLP) have improved chat-bot performance, there are still challenges in understanding human language nuances, context, and intent. This can lead to incorrect or inadequate responses, frustrating users and potentially impacting customer satisfaction.

Another disadvantage is the potential for false positives in credit card fraud detection. ML algorithms aim to strike a balance between false positives (flagging a transaction as fraudulent when it is not) and false negatives (failing to identify actual fraud). However, an excessive number of false positives can inconvenience legitimate customers, leading to declined transactions or financial blocks, negatively impacting their experience and trust in the system.

Additionally, the system's reliance on real-time data can pose challenges. Processing, analyzing, and detecting fraudulent transactions in real-time require significant computational power and efficiency. Any delays or bottlenecks in data processing or system response time can result in missed detection opportunities or delayed fraud alerts, potentially causing financial losses for both businesses and customers.

Lastly, user privacy and data security are critical concerns. The integration of e-commerce, credit card information, and chat-bot functionalities requires handling sensitive customer data. Ensuring robust data encryption, storage, and protection measures becomes crucial to prevent unauthorized access or data breaches that could lead to identity theft or financial fraud.

In conclusion, while the existing system for Smart Bot offers potential benefits, it also faces several disadvantages. These include complexity, potential inaccuracies in fraud detection, limitations in the chat-bot's conversational abilities, false positives in fraud detection, challenges in real-time data processing, and the need for stringent privacy and security measures. Addressing these issues would enhance the system's effectiveness and user satisfaction.

V. PROPOSED SYSTEM

The proposed work for Smart Bot includes the development of an intelligent e-commerce system integrated with machine learning techniques to identify and stop credit card theft. The primary aim of this system is to provide a secure and trustworthy platform for online transactions. The machine learning aspect will enable the system to continuously learn and adapt to new fraud patterns, enhancing its ability to identify fraudulent activities accurately. The system will utilize sophisticated data analysis techniques, including anomaly detection and pattern recognition, to flag suspicious transactions in real-time, minimizing the risk of fraudulent activities going unnoticed. Additionally, the system will also incorporate a chat-bot feature to enhance user experience and provide immediate assistance to customers. The chat-bot will be designed to handle frequently asked questions, provide product recommendations, process orders, and resolve customer issues efficiently. Natural language processing and sentiment analysis techniques will be employed to enable the chat-bot to understand and respond appropriately to user queries. The proposed work aims to create a seamless online shopping experience while ensuring the highest level of

Unnamed: 0	customerEmail	customerPhone	customerDevice	customerIPAddress
0	josephhoward@yahoo.com	400-108-5415	yyeiaxpltt82440jnb3v	8.129.104.40
1	evansjeffery@yahoo.com	1-788-091-7546	rdjpm7xaeqqa3kr6mzum	219.173.211.202
2	andersomwilliam@yahoo.com	024.420.0375	4m7h5ip1shyav6vv2r	67b7.3db8.67e0.3beab9d0.90c1.2b60.b9f0
3	rubenjuarez@yahoo.com	670.664.8168x94985	slvov60t0i558may4ks0	95de.8555.5a66.792c.26e0.6ctb.7d87.11af
4	uchen@malone.com	1-981-877-0870	j0pd24k5h8d2fqu0cz4	196.89.235.192

Fig. Dataset Image

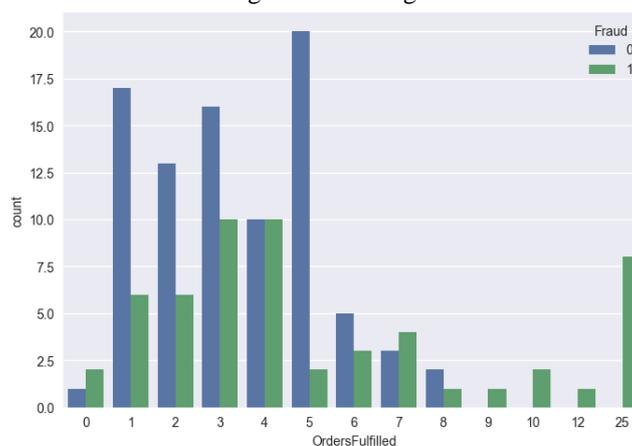


Fig. Orders Fulfilled

protection against fraudulent credit card transactions. Utilizing machine learning techniques and integrating a chat-bot, the Smart Bot has the potential to revolutionize e-commerce and significantly reduce the financial losses associated with credit card fraud for both businesses and consumers.

Table : Difference between existing system and proposed system

Feature/Aspect	Existing System	Proposed System
Credit Card Fraud Detection		
Techniques Used	Primarily rule-based systems, some use basic machine learning models.	More sophisticated machine learning methods, like deep learning, can identify fraud more accurately and effectively.
Real-time Processing	Limited real-time processing capabilities. Delays in identifying and reacting to fraudulent activities.	Enhanced real-time processing and immediate response to fraudulent activities, reducing the window of exploitation.
Data Handling	Uses structured data; may not efficiently process unstructured data.	Utilizes both structured and unstructured data, improving the accuracy of fraud detection through comprehensive data analysis.
Chat-bot		
Conversational Intelligence	Basic, pre-defined rules for handling queries. Limited context understanding.	Advanced natural language processing (NLP) for a more human-like, contextual, and intuitive interaction.
Personalization	Generic responses. Limited personalization based on user data.	Highly personalized interactions based on user behavior, preferences, and past interactions.
Integration with Services	Basic integration with e-commerce services.	Seamless integration with a broader range of e-commerce services, providing a more holistic user experience.
System Scalability		
Scalability	Moderate scalability. May require significant manual intervention for upgrades and scalability.	High scalability with minimal manual intervention. Automated scaling based on system load and transaction volume.
User Experience (UX)		
Ease of Use	User-friendly but with limited features and functionalities.	Enhanced user experience with intuitive design, more features, and functionalities, ensuring a smoother user journey.
Feedback Mechanism	Basic feedback mechanisms for reporting issues.	Advanced, interactive feedback mechanisms allowing real-time improvements and user engagement.

V. SYSTEM ARCHITECTURE

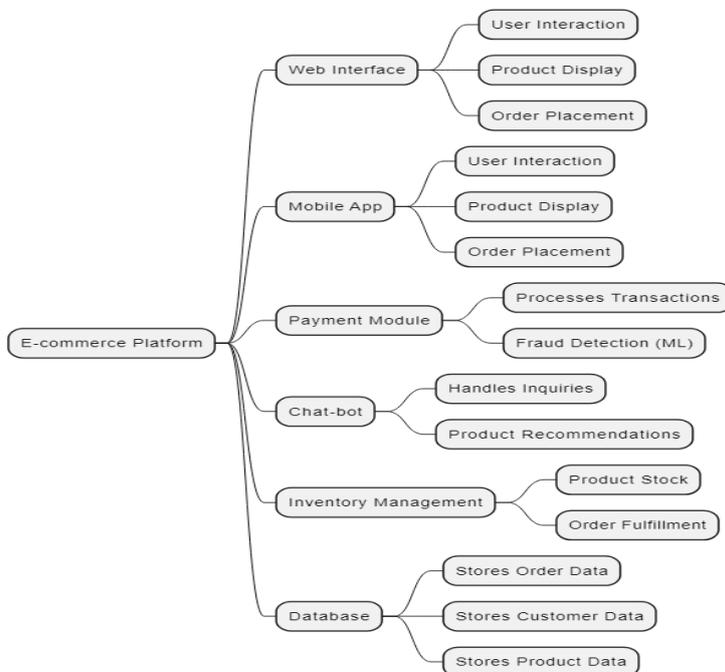


Fig. 1. System Architecture

VI. METHODOLOGY

1. E-commerce Module:

The e-commerce module of the Smart Bot incorporates the necessary functionalities to facilitate seamless online transactions. It includes features such as product catalog management, shopping cart system, order and inventory management, and secure payment processing. The module utilizes machine learning algorithms to provide individualized product recommendations and suggestions, examine customer preferences, past purchases, and browsing activity. Additionally, the e-commerce module can track and monitor key performance indicators, such as conversion rates and customer satisfaction, to enable informed decision-making and optimization of the online store.

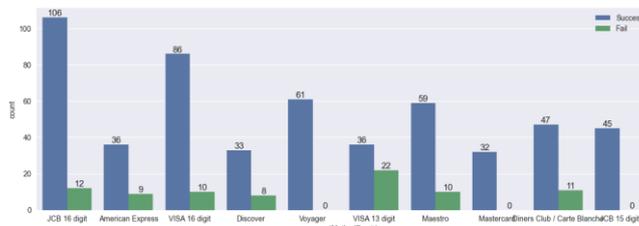


Fig. Comparison between payment Method Registration Failure and payment Method Provider



Fig. Representation in graph for K Value

2. The module for detecting credit card fraud:

The Smart Bot's credit card fraud detection module uses cutting-edge machine learning algorithms to identify and stop fraudulent transactions in real-time. It utilizes historical transaction data, user behavior patterns, and anomaly detection algorithms to identify potential fraudulent activities. The module continuously adapts and improves its fraud detection capabilities through the use of supervised learning algorithms that learn from labeled examples of fraudulent and legitimate transactions. By integrating this module into the system, businesses can significantly reduce financial losses caused by fraudulent activities, enhance customer trust, and comply with security standards and regulations.

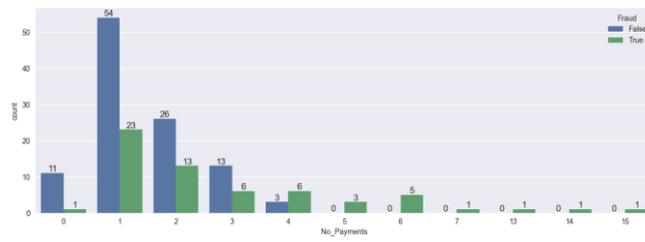


Fig. Comparison between No Payments and Fraud

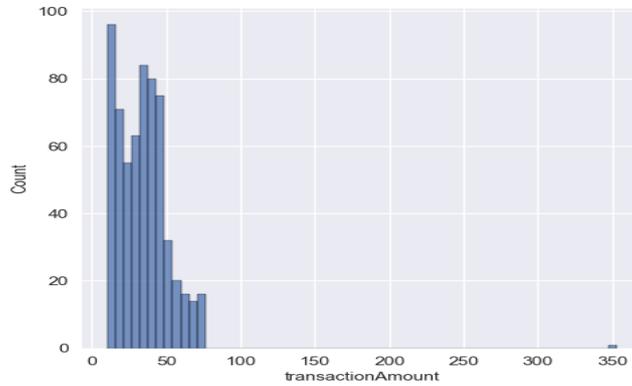


Fig. Transaction Amount

3. Chat-bot's Proposed System:

The proposed chat-bot system of the Smart Bot aims to provide exceptional customer support and engagement. This module utilizes using natural language processing (NLP) tools to comprehend and provide conversational answers to consumer inquiries, grievances, and comments. The system is capable of handling a broad range of customer support inquiries by providing accurate and timely responses, suggestions, and solutions. With the use of sentiment analysis algorithms, the chat-bot can also gauge customer satisfaction and sentiment, allowing businesses to identify areas for improvement and take proactive measures to enhance the customer experience. The proposed system is designed to learn from user interactions, continuously improving its responses and understanding of customer needs over time. By implementing this chat-bot module, businesses can automate their customer support processes, reduce response times, and improve overall customer satisfaction levels.

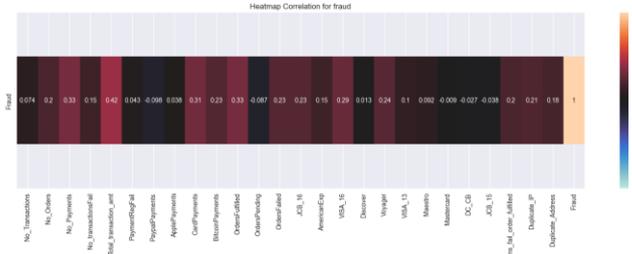


Fig. Heatmap correlation for fraud

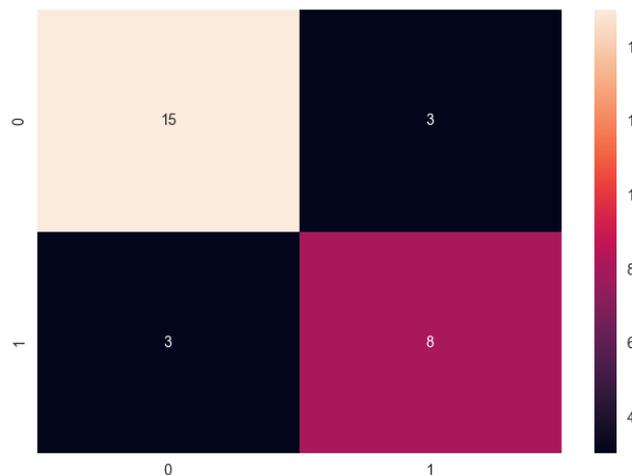


Fig. Confusion matrix

VII. RESULT AND DISCUSSION

The Smart Bot system for e-commerce incorporates machine learning algorithms to identify and stop fraudulent credit card transactions offers a chat-bot interface to enhance user experience. This advanced system utilizes various ML techniques to analyze transaction data for patterns indicative of fraudulent activity. By continually training the algorithm with new data, the Smart Bot becomes increasingly accurate in identifying potential fraud cases, thereby minimizing financial losses for both consumers and merchants. With its real-time monitoring capabilities, the system can promptly flag suspicious transactions and notify the relevant parties for further investigation.

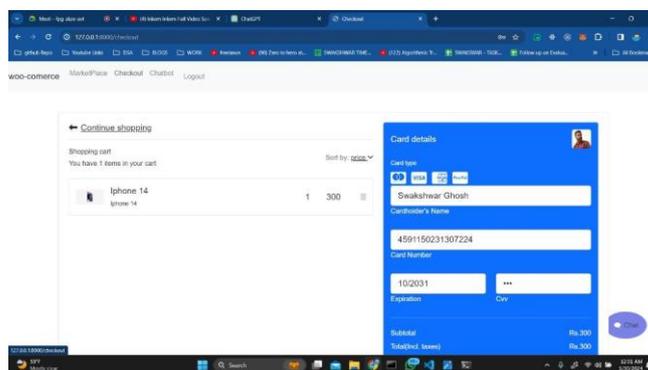


Fig. User Interface 1

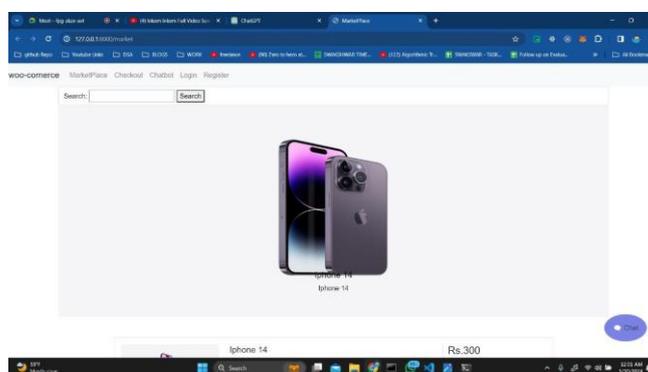


Fig. User Interface 2

Additionally, the chat-bot feature enhances the user experience by providing personalized assistance and support. Users can interact with the chat-bot to inquire about product information, troubleshoot issues, or seek recommendations. The chat-bot uses machine learning and natural language processing to comprehend and reply to user inquiries effectively. By integrating this chat-bot functionality into the e-commerce platform, the system provides a seamless and convenient shopping experience for customers. The Smart Bot system for e-commerce with credit card fraud detection and chat-bot capabilities is an innovative solution that combines ML algorithms to ensure secure transactions while delivering exceptional customer service.

VIII. CONCLUSION

In conclusion, the integration of a machine learning system with credit card fraud detection and a chat-bot in an e-commerce platform offers a comprehensive and dynamic solution. This system provides multiple benefits, including enhanced security measures to prevent fraudulent transactions, improved customer experience through real-time interaction and personalized assistance via the chat-bot, and increased efficiency in identifying and mitigating potential risks. By leveraging machine learning algorithms, the system continuously learns and adapts, enabling more accurate and efficient fraud detection while minimizing false positives. With these combined features, the system offers a secure and user-friendly e-commerce platform that is equipped to handle potential fraud risks and provide a seamless shopping experience for customers.

IX. FUTURE WORK

The future work for the proposed Smart Bot system includes the integration of advanced machine learning algorithms to enhance its performance in detecting credit card fraud. This can be achieved by implementing anomaly detection techniques and pattern recognition algorithms to analyze transaction data in real-time. Additionally, the system can be further enhanced by incorporating deep learning models, such as recurrent and convolutional neural networks, to increase the precision of fraud detection. Furthermore, integrating a chat-bot feature into the system would allow for more seamless and interactive customer experiences. This can be achieved by designing and implementing natural language processing algorithms that can effectively Recognize consumer questions, address them, and provide tailored suggestions. The chat-bot component can also be enhanced by integrating sentiment analysis techniques to gauge customer satisfaction and sentiment, enabling the system to provide proactive solutions to customer issues and improve overall customer service. Overall, this future work for the Smart Bot system will contribute to the development of an efficient and fraud-resistant e-commerce platform, delivering a smooth and safe buying experience to users.

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