CUSTOMER SUPPORT CHAT-BOT WITH ML

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Abstract: Customer support is one of the major factors in the shaping of customer experiences and brand loyalty in modern business. With an increase in demand for instant response and 24/7 availability, organizations are increasingly using AI to enhance the efficiency and effectiveness of their customer service operations. This project will design and develop an intelligent customer support chatbot that utilizes the power of machine learning and natural language processing techniques in order to provide automated but personalized customer assistance. The core objective of this project is to build a machine learning-based chatbot that can understand and respond to a wide array of customer queries in real-time. Traditional customer service models often require significant human resources, leading to high operational costs and long response times. By integrating an AI-powered chatbot into the customer support process, businesses can streamline operations, reduce response time, and provide customers with timely, accurate information. This would not only make operations more efficient but also enhance the general satisfaction of customers because the issues are solved much quicker. The project focuses on several key components in developing the chatbot, including data collection, natural language understanding, and response generation. One critical aspect of the design is the ability of the chatbot to comprehend user input and determine the intent behind each query. The system uses supervised learning models to classify user queries into predefined categories, which include billing inquiries, product information, technical support, and general inquiries. Through the training of such a large dataset of interactions of customers, the model can learn patterns in text and improve over time by training on large datasets and can be implemented through techniques such as tokenization, stemming, lemmatization, that will process and normalize input texts, whereas more sophisticated models like neural networks, transformers (such as BERT or GPT) work towards understanding the context, as well as to determine suitable responses.The architecture of the chatbot also includes a feedback loop, which allows it to learn and adapt from previous interactions. The more customers interact with the bot, the more feedback data is collected, allowing the system to refine its predictions and responses. This mechanism of continuous learning enables the chatbot to evolve and become more accurate and sophisticated in handling more complex queries. The system is also designed to escalate conversations to human agents when necessary, so customers always get the best support possible in situations beyond the bot's capability.

IndexTerms - Component, formatting, style, styling, insert.

INTRODUCTION

The current landscape of the globalized and highly industrialized business world makes it difficult for businesses to reach customers and address their issues in an effective manner. Most traditional customer support models suffer from scalability issues, lack of responsiveness, and a low level of efficiency, which creates customer frustration and dissatisfaction. AI-powered chatbots, especially those driven by machine learning, promise to be an efficient solution for automating and improving customer interactions. By effectively understanding and interpreting customer queries, chatbots can accurately determine the intent behind each inquiry and deliver relevant, real-time responses. This not only facilitates faster issue resolution but also enhances the overall customer experience by offering immediate assistance, eliminating the wait time

associated with human agents. Furthermore, chatbots operate round the clock, ensuring continuous support, which significantly improves customer satisfaction and loyalty.

The central idea of a chatbot implementation into customer support is to make it easy to communicate, be timely and relevant in solving problems, and increase business operations efficiency. By the automation of the process for handling typical inquiries, a business will redirect human resources toward more challenging tasks, hence saving on labor costs while still ensuring customer satisfaction. Therefore, chatbots relieve the support teams but, at the same time, help develop stronger connections with customers by being personal and engaging in interaction.

1.1 The Role of Chatbots in Modern Customer Support

In the digital-first world, customers expect fast, efficient, and effective service. This growing demand has led businesses to increasingly implement chatbots as a key element in their customer support strategies. A chatbot is an AI-powered tool that automates communication between customers and service teams. Such systems are capable of providing real-time assistance 24/7 so that customers can get an immediate response to their questions. Under the scope of customer support, these chatbots are meant to deal with a number of things such as FAQs, taking the user through troubleshooting steps, and providing instant help in solving a range of problems.

Traditional customer support models, which usually rely on human agents, are usually characterized by long wait times, especially during peak demand periods. Chatbots minimize this issue because they handle a large volume of queries simultaneously, preventing the formation of long queues and ensuring that customers receive prompt responses. By integrating chatbots into customer service operations, businesses can deliver accurate and consistent answers to common customer queries, reducing the need for human intervention in routine matters. This shift not only enhances customer satisfaction but also reduces operational costs by minimizing the workload of human agents.

Traditionally scripted and narrow reply-oriented chatbots, however fail to catch the subtlest essence of human language, mainly at the face of unclear and complex questions. That very makes the customer support process via these chatbots not possible; at times completely unable, the role of machine learning would begin, providing a sophisticatedly robust solution that would increase its capabilities by learning data through it and adapting diverse types of customer inputs.

1.2 Machine Learning for Improved Intelligence of Chatbots

Modern, intelligent customer support chatbots are based on machine learning. In contrast to the traditional, rule-based systems based on predefined scripts and rigid decision trees, these machine learning algorithms enable continuous learning from data, adaptation to new inputs, and improvement over time. This shift from static to dynamic systems allows ML-powered chatbots to handle a much wider range of customer queries with increased accuracy and flexibility.

This capability hinges on the use of NLP, which is a machine learning branch aimed at giving machines the ability to read and process human language. Through NLP algorithms, an organization analyzes and interprets the input from its customers and retrieves the meaning, as well as the intent of each question. For example, if a customer asks for the "status of my order" or inquires "Where is my package?

Therefore, an effectively trained ML model would realize that both the queries are related to the tracking of orders and then respond accordingly. ML models learn over time by assessing past conversations, identifying the patterns, and changing responses based on the data collected. This iterative learning process helps the chatbot become more efficient and precise in handling complex and varied questions. It further enables the chatbot to be contextual and have a coherent response over multiple exchanges, in addition to giving personalized answers based on prior interactions.
This makes the customer-support experience more dynamic and context-aware while helping the chatbot to be more human-like and responsive.
With advanced machine learning techniques, chatbots can be more adaptable, efficient, and effective in enhancing customer satisfaction and reducing operational costs. This is the functionality that makes ML-

powered chatbots a very valuable tool in customer service, allowing businesses to scale their support operations while maintaining a high level of service quality.

1.3 Benefits and Challenges of ML-Powered Customer Support Chatbots

The integration of machine learning into customer support chatbots brings many benefits. One of the most important advantages is the improvement in the overall customer experience. ML-powered chatbots are capable of delivering more accurate, personalized, and contextually aware responses compared to traditional rule-based systems. This ability to understand and address customer queries with greater precision results in faster issue resolution, which is crucial in a competitive marketplace where customer expectations are continually on the rise. These have a significant advantage that they are available round-the-clock. Unlike human agents, which have limited hours of working, the machine learning-powered chatbots can support all the time; this can be a major boon to businesses that have operations spread across multiple time zones or global customers. Freeing up human agents to perform more complex or specialized tasks, such as resolving tough issues or providing deeper support, is achieved by the ML-powered chatbots as they automate routine inquiries.

This means that it brings about greater operational efficiency and tremendous cost savings.

What is more, machine learning-enabled chatbots can support an unlimited number of simultaneous conversations at any given time, which proves highly effective in peak hours when traditional support systems get overwhelmed. This helps ensure that businesses can deliver timely support to customers with minimal dependence on demand levels and thus contributes to better service levels and customer retention. However, there are a few challenges associated with the implementation of machine learning in customer support chatbots. One of the major challenges is the quality and quantity of data required to train the algorithms effectively. Machine learning models require large datasets to learn and improve. Poor or biased data can lead to inaccurate predictions and poor performance, which could undermine the effectiveness of the chatbot. Furthermore, while ML-based chatbots can autonomously handle most of the queries, there are times when human intervention is needed for more complex or sensitive issues. It is a key challenge in designing systems that can correctly identify when a query needs to be escalated to a human agent.

Making sure that the chatbots are accurate and know when to pass on to human expertise is the key to the success of AI-powered customer support systems. In summary, although the use of machine learning in customer support chatbots has a number of advantages, such as enhancing the customer experience, efficiency, and cost-effectiveness, it also raises several challenges that need to be overcome for the optimal performance and scalability of such systems. With further development in machine learning, NLP, and chatbot design, these challenges will likely be overcome, allowing for even more sophisticated and reliable customer support systems.

NEED OF THE STUDY.

Rapid growth of artificial intelligence and machine learning technologies has led to the development of systems that are interactive, efficient, and automated. The paper focuses on the development of a customer support chatbot powered by machine learning that delivers real-time accurate and personalized answers to user queries. An effective NLP framework is utilized with a well-structured database to offer better experience for users, minimize the workload of human customer support agents, and perform all its duties. The system integrates advanced techniques, including intent recognition, sentiment analysis, and contextual understanding, to provide accurate and relevant answers to user questions. Unlike traditional rule-based chatbots, which are limited in understanding the complexities of human language, the proposed chatbot uses machine learning models such as neural networks to comprehend and generate nuanced responses. This intelligent system aims to automate repetitive tasks, reduce response times, and improve customer satisfaction by offering a more human-like interaction.

3.1Population and Sample

The population in this study refers to the huge number of customer support systems that organizations are currently employing in different sectors. The focus of the study is on the systems that are integrated with machine learning and natural language processing technologies. For sampling, the study targets datasets of customer support interactions from publicly available repositories and companies that operate in industries with high customer engagement.

The dataset used for this project is a customer query-response pair obtained from open datasets and actual customer support logs. The training and testing of the chatbot were done using a sample of 30,000 customer support interactions, thereby providing diversity across e-commerce, finance, healthcare, and technology industries.

3.2 Data and Sources of Data

This study performs training and testing on the developed chatbot using secondary data. The data is obtained from the publicly accessible repositories like Kaggle, customer service transcripts, and domain-specific question-answer datasets. The training dataset consists of textual data - user queries along with agent responses, cross-domain, so that the variation is developed in the chatbot.

Further, datasets such as sentiment analysis and intent recognition are used for the improvement of the chatbot in understanding emotions of the users and classifying queries appropriately. In the preprocessing and feature extraction stage, tokenization, stop-word elimination, and TF-IDF as well as word embeddings like GloVe and Word2Vec can be used for vectorization techniques.

3.3 Theoretical framework

The study incorporates both dependent and independent variables. The dependent variable in this context is the chatbot's performance, measured in terms of metrics such as accuracy, precision, recall, F1-score, and user satisfaction. The independent variables include:

Input Data: User queries and historical customer support interactions.
Model Architecture: Machine learning models (e.g., Recurrent Neural Networks, Transformers like BERT).
Preprocessing Techniques: Text normalization, tokenization, and embedding methods.
This would be based on the evaluation of responses from the chatbot in terms of delivering accurate and contextually relevant solutions. The theoretical framework would focus on leveraging supervised and unsupervised machine learning techniques, with an emphasis on natural language processing and model optimization for the desired performance metrics.

RESEARCH METHODOLOGY

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3.3 SOFTWARE SPECIFICATIONS:

a) FRONT-END PART:

- HTML(Hyper-Text Markup Language)
- CSS(Cascading Style Sheets)
- JAVASCRIPT

b) BACK-END PART:

- FLASK
- PyTorch
- NLTK

OUTCOMES:

The integration of a Machine Learning (ML) powered Customer Support Chatbot yields significant improvements for both businesses and customers, fostering dynamic, efficient, and intelligent customer service solutions. ML chatbots enhance the way businesses interact with their customers, offering timely, accurate, and personalized responses, all while optimizing internal processes. Below are key outcomes that stem from the deployment of machine learning-based chatbots within customer support systems.

8.1. Enhanced Customer Satisfaction

Most influential effects in using ML-based chatbots would be customer satisfaction. With regards to today's customers, they expect prompt, personalized, and seamless service, which an ML chatbot would achieve through ensuring that the response was quick and tailored to their needs.

Real-Time Response: ML chatbots process customer queries in real-time and respond to them immediately. This eliminates the delay seen with traditional customer support methods and helps provide fast service to customers in today's fast-paced environment.

Context-Aware Accuracy: Machine learning enables the chatbots to understand fully what the customer is asking as well as the intent beneath, beyond just keyword recognition, so that the answers are more accurate and relevant. This improves customer issue resolution quickly, minimizing frustration from irrelevant and/or incorrect responses.

This, coupled with the fact that such an ML-powered chatbot could run 24/7 like a machine, whereas humans do not, would make a more favorable agent around-the-clock because customers can reach it for support at any given time. This is very crucial for businesses with international clientele or customers who work from different time zones.

By delivering on these features, customers feel that their needs are being met promptly and with precision, which in turn elevates satisfaction. When customers are happy with the support they receive, they are more likely to remain loyal to the brand, promoting customer retention and fostering positive word-of-mouth, which strengthens the overall reputation of the business.

8.2. Increased Operational Efficiency

The deployment of machine learning in customer support chatbots also drives operational improvements by making the most of resource allocation and cost reduction, thereby ensuring that businesses streamline their support systems.

Automation of routine queries: The ML chatbot can efficiently manage repetitive queries that include questions regarding the order status, product details, and account inquiries. By automating these routine tasks, businesses can reduce the involvement of human agents in dealing with these issues, thus freeing them up for more complex problems that require human empathy and judgment.

Cost Efficiency: Through automation, it will significantly bring down the cost of running any business. The use of chatbots in managing routine queries will reduce the size of customer support teams and the cost that comes with hiring and training large support staff. With ML chatbots, it is possible to scale the customer support operations without corresponding increases in staffing.

Rapid Issue Resolution: The chatbots can understand queries immediately and process them without delays, leading to faster resolution of issues. This reduction in average handling time (AHT) improves the speed of support and also increases overall throughput, thereby making the support process more efficient.

Essentially, ML-powered chatbots help businesses optimize support workflows, maximize resource utilization, and generally speed up and reduce the cost of customer service operations.

8.3. Improved Customer Retention and Loyalty

One less obvious but just as vital outcome of the use of ML chatbots is strengthening customer retention and loyalty. Consistent, personalized, and responsive service fosters long-term relationships with customers.

Personalized Experiences: Machine learning enables chatbots to learn from each customer interaction, allowing them to tailor responses based on the customer's past behavior or preferences. This personalization creates a sense of familiarity and trust, which enhances the customer's overall experience.

Proactive Support: ML chatbots will foresee what customers may need by looking at the pattern of previous interactions. For example, if a customer constantly asks for a specific product, the chatbot will be proactive in suggesting the right things to the customer so that he or she finds the solutions even before asking for them. Thus, proactive customer support improves user experience and enhances customer satisfaction.

Cross-Channel Support: All of these ML chatbots deliver the same, fast responses and ensure consistency across multiple websites, mobile apps, and all the other social media platforms. Thus, customers will always encounter the same high-quality service no matter where they might engage with the brand - greater customer loyalty is thereby created.

With ML-powered chatbots, one is able to develop a sense of customer loyalty by offering personalized and proactive support systems that help reduce churn and drive long-term retention.

8.4. Scalability and Adaptability

The major advantage of ML chatbots is their scalability. This is particularly true for businesses that expand and where customer demand grows. Scaling these chatbots seamlessly allows businesses to deal with volumes of customer inquiries without necessarily compromising service quality.

Manage the Increased Volume With peak seasons or specific promotions, the number of customer queries rises dramatically. Unlike human representatives, an ML-powered chatbot can process thousands of interactions in a given period, ensuring no customer waits for support to be served. This gives businesses a high level of service when demand is heightened, not frustrating customers because of waiting time or services bottlenecks.

Adaptability to Evolving Needs: ML chatbots are very adaptable, able to change with the evolving needs of businesses. As businesses expand their product offerings, enter new markets, or change their service models, chatbots can be retrained to address new types of inquiries. This makes the chatbot adapt to the growth and diversification strategies of the company.

Consistent Quality Service: One of the things businesses may find challenging when they start to scale is keeping high service quality. However, through ML-powered chatbots, this quality of service can remain uniform, irrespective of how many interactions there are. Therefore, the customers can expect the same level of support at all times and whatever the number of queries in processing.

The scalability and adaptability of the ML-powered chatbot ensure businesses can grow with such high quality customer support service regardless of how large their customers' number may be.

8.5. Data-Driven Insights and Continuous Improvement

A salient outcome from the employment of an ML-based chatbot is its ability to generate a ton of data from customer engagements. Through analysis, a company gains valuable insights into customer behavior, can identify common pain points and continuously improve the chatbot performance.

Identifying Trends and Patterns: ML chatbots collect data with each customer interaction, which facilitates businesses to find recurring queries or frequent problems. The outcome of such data can contribute to knowledge base improvement, optimization in chatbot responses, and even enhancements in products or services. It can help businesses make intelligent decisions by understanding the patterns for customer behavior that will directly influence their ability to modify the customer experience.

Real-time performance analytics: With the machine learning models, chatbots' performance can be monitored in real time. Response accuracy, customer satisfaction, and query resolution time can be calculated with this model. These insights from performance help businesses gauge how effective their chatbots are and where they can be improved.

Continuous Learning and Self-Improvement: The most prominent feature of ML chatbots is that they learn and improve over time. The more they interact with customers, the better they understand different queries

and adapt to meet the needs of customers. This process of iterative learning ensures that the chatbot becomes more competent in handling complex and nuanced interactions.

With data analytics and continuous learning, businesses can perfect their chatbots to ensure that the bot is always providing correct and relevant customer support efficiently.

IV. RESULTS AND DISCUSSION

4.1 PAPERLESS ADMINISTRATION

A customer support chatbot with machine learning does away with the paperwork and administrative procedures. This, in turn, promotes a paperless environment. The organization can save a lot of money on paper, printing, and physical storage by adopting this digital approach. Along with a robust DBMS, the chatbot provides for secure storage and quick retrieval of customer interaction records. Digital data also enables encryption with regard to information, which prevents the unauthorized leakage of sensitive details regarding customers while allowing access as necessary. Furthermore, this optimized approach also results in effective workflow efficiency; quick resolution to queries; and environmental benefits resulting from reduced dependence on paper forms..

4.2 RECISE HANDLING CUSTOMER QUERIES

By utilizing NLP and intent detection algorithms, it deals with every query from its customers with extreme accuracy. Advanced machine learning models, such as transformer-based architectures (e.g., BERT), are used to identify user intent and provide accurate responses. This eliminates the errors often associated with manual query handling, ensuring consistent and high-quality support. The technology's ability to adapt to diverse customer needs ensures precise handling of a wide range of queries, from basic FAQs to complex issue resolution.

4.3 REAL-TIME RESPONSE AND QUERY ROUTING

One of the most exciting features of the chatbot is its ability to give real-time responses to the queries of users. This has reduced wait times and enhanced customer experience. The system also routes complex queries to human agents when necessary for seamless escalation and resolution. Real-time query routing ensures efficient workload distribution among agents, enabling them to focus on higher-priority tasks while the chatbot manages repetitive queries.

4.4 DATABASE INTEGRITY

Database integrity is very important for the success of the chatbot. It ensures that customer interaction data is accurate, consistent, and reliable throughout its lifecycle. Standard procedures and policies are implemented to maintain database integrity, which plays a crucial role in generating insightful analytics and improving decision-making processes. Unlike data security, which protects data from unauthorized access, data integrity focuses on preventing errors and inadvertent modifications to customer data. Sustaining database integrity will enhance trust and ensure that the chatbot performs with maximum reliability, providing accurate and relevant information to users.

V.CONCLUSION

There are numerous benefits to the development of customer support chatbots that are based on ML and NLP, programmed in Python, as opposed to traditional rule-based solutions. With the aid of ML, these chatbots can learn and improve with time, incorporating the insights garnered from every user interaction and feedback. That gives a very impressive nature to the chatbot as it can handle such a vast range of inquiries with increased accuracy, not to mention even when posed ambiguously, using slangs, or less used phrases. Therefore, diverse customer needs are better taken care of, making the chatbot an invaluable asset for the support system.

NLP techniques are significantly responsible for the effectiveness of interpretation and comprehension by the chatbot in regard to customers' intent. Unlike scripts-dependent traditional systems, NLP allows the chatbot not only to recognize the keyword but to understand what's going on in the conversation as a whole. This

would lead the chatbot into much more meaningful, dynamic, and personalized dialogues with users. Consequently, the chatbot can offer more accurate, contextually relevant responses, which elevates the overall customer experience, leading to higher satisfaction levels and fostering greater brand loyalty. Customers feel valued when their inquiries are handled swiftly and correctly, contributing to a positive and lasting relationship with the brand.

The tangible business benefits of a self-learning, ML-powered chatbot include reduced operational costs. This is one of the most significant advantages of using a chatbot. Chatbots can work 24/7, constantly engaging and supporting customers even when no human staff is available. This way, customers can access help at their convenience, whether it's in the middle of the night or during holidays. Additionally, the chatbot can effectively manage a large number of interactions at the same time without human intervention, enabling businesses to scale up customer support operations without proportional staff increases. The capacity for handling large-scale support demands ensures that customer service levels remain consistent, even during peak periods, such as product launches or promotional events.

These efficiencies free human customer service agents from the burden of addressing routine or repetitive tasks. They are thus able to concentrate their expertise on much more complex and specialized problems that demand human judgment and problem-solving. This benefits the support team's productivity in general, while businesses can efficiently use resources to prioritize intricate customer concerns and leave the routine questions to be sorted out by the chatbot.

In conclusion, the adoption of machine learning and natural language in customer support chatbots offers the potential to revolutionarily change the way businesses approach their customers. Such advance systems not only enhance an organization's operational efficiency but also provide a more prompt, personalized, and empathetic understanding of the customer. Advanced machine learning and natural language understanding technologies will continue changing the nature of future, more intuitive, capable, and even indispensable chatbots in customer support. They will meet not only the changing expectations of customers but also, to some extent, be ahead of customers' expectations. Thus, it will become an always-smooth and efficient ecosystem for customer service. Over time, these chatbots will certainly define the future of customer service, establishing new paradigms for interaction, engagement, and satisfaction.
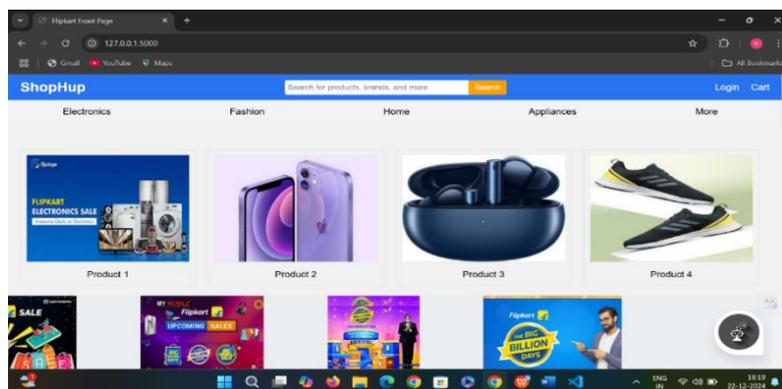
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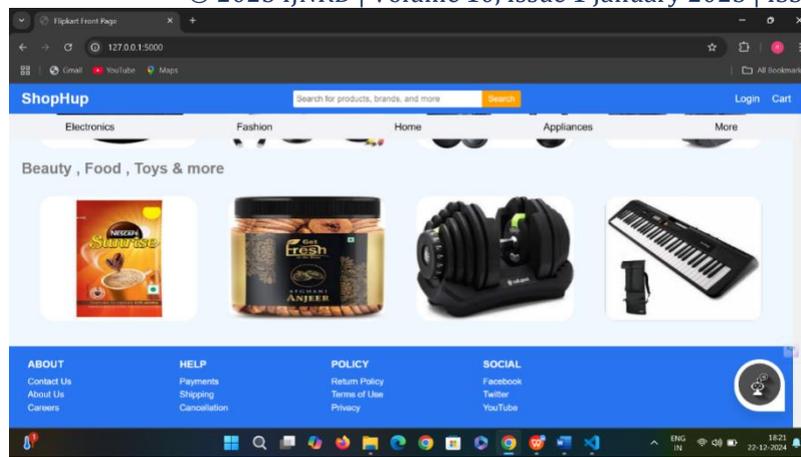

Fig 4.1 Display the home page
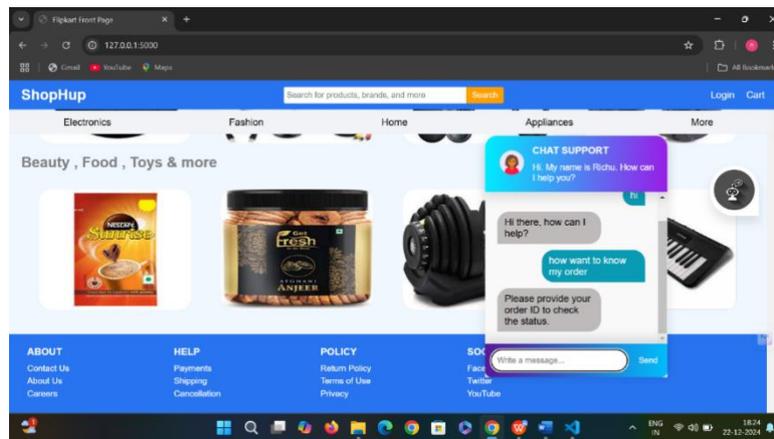
Fig 4.2 Display the home page footer

Fig 2.0 Query 1

Asking information about my order

REFERENCES

[1] Madana Mohana, R., Bharat Institute of Engineering and Technology, Hyderabad, Telangana, and N. Pity, Indian Institute of Science, Bangalore, India. "Advances in Intelligent Systems and Computing (2020) - Customer Support Chatbot Using Machine Learning." Retrieved from [ResearchGate](https://www.researchgate.net/publication/343980800_Customer_Support_Chatbot_Using_Machine_Learning).

[2] Jwala, K., G.N.V.G. Sirisha, and G.V. Padma Raju. "Developing a Chatbot Using Machine Learning." International Journal of Recent Technology and Engineering (IJRTE), Volume-8 Issue-1S3, June 2019. Retrieved from [IJRTE](https://www.ijrte.org/wp-content/uploads/papers/v8i1S3/A10170681S319.pdf).

[3] "A Step-by-Step Guide to PDF Chatbots with ML and Ollama." Analytics Vidhya, July 2024. Retrieved from [AnalyticsVidhya](https://www.analyticsvidhya.com/blog/2023/10/a-step-by-step-guide-to-pdfchatbots-with-langchain-and-ollama/).

[4] Vyas, Binny. "6 Key Metrics to Measure the Performance of Your Chatbot." Chatbots Life, November 9, 2017. Retrieved from [Chatbots Life] (https://chatbotslife.com/).

[5] Arsovski, Sasa, Imagineering Institute, and City, University of London, and Idris Muniru, Universiti Teknologi Malaysia. "Analysis of the Chatbot Open-Source Languages AIML and Chatscript: A Review." February 2017. Retrieved from [ResearchGate](https://www.researchgate.net/publication/323279398_ANALYSIS_OF_THE_CHATBOT_OPEN_SOURCE_LANGUAGES_AIML_AND_CHATSCRIPT_A_Review).

[6] Gannon, Will. "An Interactive History of Chatbots." July 21, 2017. Retrieved from [Aylien Blog] (http://blog.aylien.com/interactive-history-chatbots/).

[7] Surmenok, Pavel. "Chatbot Architecture." September 11, 2016. Retrieved from [Medium](https://medium.com/@surmenok/chatbot-architecture-496f5bf820ed).