

Product Recommendation System Using AI

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ABSTRACT

In today's fast-paced and ever-evolving e-commerce landscape, the ability to provide customers with personalized product recommendations is not just a luxury but a necessity. Our project is a dynamic and responsive recommendation system designed to transform the online shopping experience into a seamless and enjoyable journey. Consider the online shopping platforms you visit regularly, where you're bombarded with a multitude of product options. It's easy to become overwhelmed, searching for that perfect item, and often, the shopping process can be time-consuming and frustrating. This is where our project comes into play, redefining how customers discover products.

Imagine a system that not only understands your preferences but also adapts and evolves with every interaction. This is similar to a friendly and knowledgeable in-store sales associate who remembers your preferences and guides you to the products that suit your style and needs. Our system does precisely that, but in the virtual realm. Whether you're exploring a range of products, delving into detailed product information, or moving through the checkout process, our project streamlines every step, making the entire journey more efficient and enjoyable. Just as a trusted friend might recommend products, they know you'll love, our system uses your past interactions and preferences to provide tailored recommendations.

This project brings a personalized touch to the world of online shopping, enhancing the customer experience, and making it more enjoyable and efficient. As you engage with the system, it learns and adapts to your unique tastes, ensuring that you have a more rewarding shopping experience and discover the products that truly resonate with you.

Keywords: - Recommendation Engine, Deep Learning (TensorFlow/Keras), Natural Language Processing (NLP) etc.

1.INTRODUCTION:

"In today's fast-paced world, our daily lives are increasingly intertwined with technology and convenience. Whether it's shopping for groceries, picking out the perfect outfit, or searching for that ideal gift, e-commerce platforms have become our go-to destination. Just as a helpful friend might recommend a book you'd love or a restaurant you've never tried, we aim to replicate this personal touch in the digital realm. Imagine a virtual shopping assistant, much like your trusted shopping companion, who understands your preferences, offers tailored suggestions, and ensures that your online shopping experience is not just efficient but enjoyable. This project aims to bring the essence of a personal shopping assistant to the digital world. By harnessing the power of AngularJS and Python, along with advanced algorithms like deep learning or matrix factorization, we're building a recommendation system that learns from your choices, understands your needs, and provides you with product suggestions that resonate with your unique preferences. To make it even more intuitive, we've integrated a chatbot that's ready to assist you. So, whether you're hunting for the perfect pair of shoes or searching for that ideal gift, our system is here to ensure your e-commerce journey is as personalized and satisfying as it would be in your day-to-day life.

2. LITERATURE SURVEY:

Deepa Sharma [1] This paper explores the impact of artificial intelligence (AI) on e-commerce in India. It highlights how AI is playing a crucial role in advancing business operations, enhancing economic growth, and improving the standard of living. The paper emphasizes the importance of AI in meeting consumer needs efficiently and quickly through e-commerce platforms. It discusses how AI helps businesses analyse consumer behaviour, adapt to changing trends, and manufacture quality products. The positive impact of AI on e-commerce growth is underscored, particularly in terms of marketing strategies and customer satisfaction. The paper also touches on the foundations of AI and its influence on e-commerce, making it more accessible and convenient for consumers, including those with limited literacy skills.

Qian Zhang et al [3] In this paper they discuss the role of artificial intelligence (AI) in recommender systems. It highlights the importance of personalized recommendations in addressing information overload and improving user experiences in the context of e-services. The paper reviews various AI techniques applied in recommender systems, including fuzzy techniques, transfer learning, neural networks, deep learning, active learning, natural language processing, computer vision, and evolutionary computing. It also outlines the core components of recommender systems and their main categories: content-based, collaborative filtering-based, and knowledge-based approaches. The paper provides valuable insights into the current state of AI-driven recommender systems and identifies research challenges and future directions in this field.

Mohamed Khoali et al [3] This paper, they provide a comprehensive overview of the application of deep learning techniques in e-commerce recommendation systems. They emphasize the significance of recommendation systems in enhancing user engagement and personalization in e-commerce platforms. The paper delves into various deep learning methods, including Multi-layer Perceptron, Auto-encoder, Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Restricted Boltzmann Machine, Attentional Models, and others, highlighting their utility in handling non-linear patterns and extracting meaningful features from diverse input data types. The authors acknowledge the benefits of deep learning in recommendation systems, such as improved modelling capabilities and automatic feature extraction, while also addressing limitations, including data requirements and model interpretability. This paper offers valuable insights into the integration of deep learning into recommendation systems, fostering advancements in the field.

Ransome Epie Bawack et al [4] In this paper they conduct a comprehensive study on the intersection of artificial intelligence (AI) and e-commerce. The study combines bibliometric analysis with an extensive literature review to synthesize existing research and propose future directions. The authors find that AI in e-commerce primarily revolves around recommender systems, with core research themes including sentiment analysis, trust, personalization, and optimization. China-based institutions emerge as leaders in this research area, and most research papers are published in computer science, AI, business, and management outlets. This study provides valuable insights for researchers and practitioners interested in leveraging AI to enhance e-commerce endeavours, offering guidance for future research in the field.

3. PROBLEM STATEMENT:

In the modern e-commerce, the sheer abundance of product choices often leaves customers overwhelmed, resulting in difficulty in finding the right products that cater to their individual tastes and needs. Existing e-commerce platforms, although extensive, often lack the finesse required to offer personalized product recommendations. The challenge lies in delivering tailored recommendations that go beyond basic algorithms and truly understand the nuances of customer preferences. The lack of a robust recommendation system hinders the efficiency and enjoyment of the online shopping experience, leading to reduced customer satisfaction and potentially lower conversion rates for businesses. This project addresses this critical issue by developing a dynamic recommendation system that combines the power of data-driven insights with natural language processing and deep learning to offer an interactive, intuitive, and personalized shopping experience. Our system aims to overcome the existing limitations and provide customers with precisely what they're looking for, making online shopping not only convenient but a genuine delight, thereby increasing customer satisfaction and optimizing business performance.

3.1 PROBLEM DESCRIPTION:

Objectives:

1. Develop a robust recommendation system to provide personalized product suggestions to users.
2. Utilize natural language processing (NLP) for understanding user queries and product descriptions.
3. Implement deep learning techniques to enhance recommendation accuracy.
4. Create an interactive user interface with features such as product listing, details, shopping cart, and checkout.
5. Integrate a chatbot for user interaction and query handling.
6. Continuously improve the recommendation system based on user feedback and interactions.
7. Monitor and maintain the system for performance and accuracy.
8. Enhance the online shopping experience by offering tailored and efficient product recommendations.
9. Increase customer satisfaction and business growth through improved recommendations.

Components used:

1. Recommendation Engine
2. Natural Language Processing (NLP)
3. Deep Learning (TensorFlow/Keras)
4. User Interface (AngularJS)
5. Chatbot Integration
6. Data Preprocessing
7. User Feedback Mechanism
8. System Monitoring and Maintenance
9. Product Data (JSON/CSV)

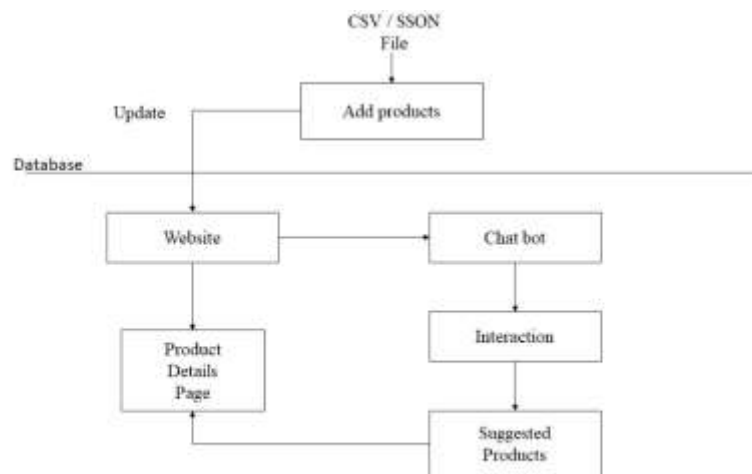
Methodology:

1. Data Collection: Gather and preprocess product data from JSON/CSV files.
2. Recommendation Model: Implement a recommendation engine using deep learning or matrix factorization techniques.
3. Natural Language Processing: Apply NLP to analyse user queries and product descriptions.
4. User Interface: Develop an AngularJS-based interface with product listing, details, shopping cart, and checkout.
5. Chatbot Integration: Include a chatbot for user interactions and queries.
6. User Feedback: Gather and use user feedback to improve the recommendation system.
7. Monitoring and Maintenance: Regularly monitor and maintain the system for performance and accuracy.

3.2 REQUIREMENT ANALYSIS:

The Requirement Analysis for this project is a critical phase that encompasses several key elements. Firstly, it involves understanding and delineating the specific needs and expectations of the end-users, thereby ensuring that the recommendation system aligns with their preferences and shopping behaviour. Equally important is the identification of the data requirements, including the sources and formats of data, such as JSON or CSV files, which are pivotal in facilitating accurate recommendations. Functionality requirements encompass the core system features, including the recommendation algorithms, chatbot capabilities, and user interface components like product listing, details, and the checkout process. Non-functional aspects such as performance benchmarks, response times, and scalability targets are also vital for ensuring an efficient and reliable system. Additionally, technical requirements encompass the choice of technologies and frameworks, which in this case involve AngularJS, Python, TensorFlow.

4 Architecture:



(Fig. 4.1 Architecture Diagram)

4.1 System's data flow in concise bullet points

Add Product Process:

- a. Product data is received from external CSV/JSON files.
- b. Data is validated and stored in the central database.

Chatbot Interaction Process:

- c. Users interact with a chatbot on the website.
- d. Chatbot responds to queries and provides product recommendations.
- e. Recommendations are based on user queries, preferences, and browsing history.
- f. Interaction is both text-based and conversational, enhancing user experience.

5 REQUIREMENT SPECIFICATION:

1. **User Requirements:** Users expect a user-friendly interface that makes their online shopping experience enjoyable and effortless. They also demand personalized product recommendations that cater to their unique preferences and needs. The chatbot should be a proficient conversational partner, understanding and responding to their natural language queries in real-time.
2. **Data Requirements:** The system should seamlessly import product data from external CSV/JSON files, which should include essential attributes like product name, description, price, and category. Data integrity and consistency should be maintained in the central database.
3. **Functional Requirements:** The "Add Product" feature must facilitate the smooth addition of new products from CSV/JSON files to the system's database. An "Update Website" function should automatically refresh the product listing page, ensuring that customers have access to the latest products. The chatbot's proficiency lies in providing meaningful and prompt responses to user queries, including text and product recommendations. To enhance accuracy, the recommendation system

leverages natural language processing (NLP) for a deeper understanding of both user queries and product descriptions.

4. **Non-Functional Requirements:** To meet user expectations, the recommendation system must maintain a minimum accuracy level, such as 90%, in providing relevant product suggestions. Additionally, system response times should be nearly instantaneous to offer a seamless and efficient user experience. The system should also scale effectively, accommodating an expanding product catalogue and growing user base without performance degradation.
5. **Technical Requirements:** AngularJS drives the front-end, creating an engaging user interface, while Python, TensorFlow, and Keras provide the backend infrastructure, enhancing recommendation accuracy. The system relies on the NLTK library to effectively implement natural language processing (NLP) for understanding and responding to user queries.
6. **Security and Privacy Requirements:** The system must uphold strict data security and privacy standards. All user data, including personal information and queries, must be handled confidentially, with adherence to data protection regulations. Secure data transmission protocols are implemented to ensure the safety of user information during interactions.
7. **Regulatory and Compliance Requirements:** Compliance with data protection laws is crucial to safeguard user privacy and ensure the responsible handling of personal data. The project also aligns with industry standards and ethical guidelines to maintain system integrity.
8. **Budget and Resource Requirements:** Adequate budget allocation is imperative for successful software development, infrastructure, and personnel resources. A skilled team of professionals in web development, NLP and database management is essential to bring this project to fruition.
9. **Timeline and Milestone Requirements:** The project must adhere to a well-defined timeline, marked by key milestones that encompass data import, recommendation model development, UI design, and chatbot integration, ensuring efficient progress and completion.

6 CONCLUSION:

In conclusion, this project addresses the need for an integrated e-commerce recommendation system that combines data management, website updates, and chatbot interactions. By seamlessly adding new products, updating the website, and enabling chatbot-driven user interactions, it enhances the online shopping experience. The project achieves its objectives of providing personalized product recommendations, leveraging natural language processing, and continuously improving accuracy. With a focus on user satisfaction and business growth, it offers a dynamic and efficient platform for tailored product suggestions, ultimately boosting customer engagement and revenue.

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