**MIDTERM**

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**Title: “AI VoiceBot for E-Commerce: A Micro SaaS Solution for Voice-Activated Shopping Assistance, Order Tracking, and Customer Support Using NLP, NLU, and Recommendation Systems”**

**Review Related Literature**

1. **Introduction**

**Purpose:** The literature review below covers relevant studies and current systems focusing on voice-activated assistants, e-commerce automation, and AI-driven customer support. Its goal is to evaluate the traditional online shopping experience and address common challenges such as, but not limited to, availability issues, inefficient assistance, order tracking, and more. This includes the development of an AI VoiceBot for E-Commerce ,NLP, NLU algorithms and recommendation systems for E-Commerce Micro SaaS solutions, offering voice shopping support, real-time order tracking, and intelligent customer service.

**Scope:** This review covers research articles from 2020 onwards that are relevant to voice-activated systems, customer service powered by artificial intelligence (AI) and automation tools within the e-commerce sector. It assesses frameworks and systems in practice in online retail, with a focus on those using Natural Language Processing (NLP) and Natural Language Understanding (NLU) as well as recommendation engines. Another group that deserves special attention are systems created as Micro SaaS solutions, smart assistants or data-based tools all aimed at enhancing the user experience, optimizing order management and offering real-time support to customers.

**Thesis Statement:** We build AI VoiceBot - A Micro SaaS, a function of shopping through voice assistants but also using Natural Language Processing (NLP), Natural Language Understanding (NLU), and recommendation (recommender) models to create voice-activated shopping assistant, real-time tracking of online orders, and to cater intelligent support. This system is supposed to provide a basic hands-free shopping assistant that reduces response time and improves accuracy in customer inquiries. By executing voice-based interaction and automation into the e-commerce pipeline ultimately allowing for an interactive, personalized, homogeneous, accessible and efficient experience the project eliminates many of the traditional online pain points. This study meets growing demand of such intelligent solution, better performance management and enhances customer experience in e-commerce management.

1. **Body Of Literature**
2. **Voice-Activated Interfaces and Virtual Assistants in E-Commerce**

On this theme voice technologies (such as speech recognition and voice assistants) in e-commerce. This article also reflects this technology in bettering the user experience, accessibility, and hand-bias-free interaction in shopping places.

1. The paper, which focusses on a voice-controlled e-commerce web app, presented by authors Mandeep Singh Kandhari, Farhana Zulkernine, and Haruna Isah, describes a research effort into speech recognition systems (SRSs) linking to e-commerce platforms to improve the user-friendliness of such systems, especially by making them more accessible for users afflicted with visual impairment. They lay out a taxonomy of SRS and explore a proof-of-concept e-commerce application using the speech-to-text service from IBM Watson. This serves as a prototype, where users can search for products, add items to a cart, and check out using voice technology. It is a speaker-independent and continuous speech recognition system. (Kandhari et al., n.d.)
2. In their paper "Voice Commerce: Redefining Retail in the Digital Age" which was presented at the TRADE PERSPECTIVES 2023 conference, Katija Vojvodić and Ana Pušić address the growing phenomenon of voice commerce and its implications for retail. The writers explore how a growing use of voice-enabled technologies smart speakers, and voice assistants is changing consumer shopping habits and expectations. Increased convenience and personalization could lead to higher customer engagement and loyalty as voice commerce makes shopping easier and more personalized with advanced technology's ability to facilitate hands-free, conversational interactions. (Pušić & Vojvodić, n.d.)
3. The latest trends in E-Commerce 2.0: Voice Commerce and AI Assistants by Dr. Kavita Verma Principal, New Horizon College of Commerce, Airoli. It discusses how AI, ML, and NLP have evolved conventional e-commerce by enhancing the personalization that it provides and converting the process into a seamless touchless experience. This transformation is fueled through voice assistants like Amazon Alexa and Google Assistant and new technologies enabling seamless, real-time transactions while redefining consumer behavior and expectations. (“Voice Commerce and AI Assistants: The Latest Trends in E-Commerce 2.0,” 2024)
4. **NLP and NLU for Automated Customer Support**

In this theme, we discuss how Natural Language Processing (NLP) and Natural Language Understanding (NLU) can help improve automated customer service. Where it explains, how chatbots and virtual agents analyze, compute, and respond to customer queries in a human way.

1. In the paper "Enhancing Voice Assistant Systems through Advanced AI and NLP Techniques," Rahul Kumar Singh, Sakshi Kathuria, Pankaj Saraswat, Ashok Kumar, and Rajani Mishra describe a method to improve Voice Assistant systems through cutting edge developments in Artificial Intelligence (AI), Natural Language Programming (NLP) and Machine Learning (ML). The authors implemented a Python-based speech assistant which can unleash its potential to interpret human commands by maintaining a substantial degree of contextual awareness. An impressive feature of the system is its capacity to detect the user's tone and mood, producing responses with personal and emotional relevance. The assistant should be inclusive as well by ways of multi-language support and accents to cater a wider audience. One of the biggest breakthroughs is that you can process it offline, so that users in remote communities with less reliable internet can also access the platform. (*View of Enhancing Voice Assistant Systems through Advanced AI and NLP Techniques*, n.d.)
2. The paper as titled below was submitted in March, 2024 Internet of Things BlockChain, Dattatray G. Takale, Revolutionizing customer interaction: Virtual Shopping Assistants powered by NLP and sentiment analysis in E-commerce. Based on analyzing how contemporary NLP virtual shopping assistants manage to catch on specific customer queries in real-time along with personalized product suggestions and expedited way of making purchases. On the other hand, sentiment analysis gives insight into how customers feel about the business, and organizations can then make data-driven strategic decisions to improve customer satisfaction and loyalty.(Dattatray G. Takale, 2024)
3. The paper study entitled “Customer Satisfaction and Natural Language Processing” by Yolande Piris and Anne-Cécile Gay в Journal of Business Research (2021) question of the explores the role of Natural Language Process (NLP) in better understanding customer satisfaction. Examining 12,000 customer return records 6,800 of which also had qualitative feedback from customers the authors discovered eight themes that contributed to satisfaction. (Piris & Gay, 2021)
4. The work of Duru Juliet Chinenye, Austine Ekekwe Duroha and Nkwocha Mcdonald of Abia State University, Uturu, Nigeria which is entitled "Development of the Natural Language Processing-Based Chatbot for Shopprite Shopping Mall" describes the design pattern and implementation of an intelligent chatbot that improves the customer's experience and minor inconveniece at Shopprite Shopping Mall. The study, published in the October 2022 issue of the International Journal of Engineering Applied Sciences and Technology, tackles the issue of customers who make a trip to the mall only to discover that some items they want are not available. Using Natural Language Processing (NLP), the chatbot accurately and swiftly converse with users, providing information about product availability, pricing, etc.(Chinenye et al., 2022)
5. **Recommendation Systems and Personalization in Online Retail**

This theme revolves around how AI recommendation systems use the data they generate in order to offer personalized experiences and boost conversion rates. It assesses algorithms and models that monitor user behavior to provide appropriate product recommendations and customized shopping experiences.

1. Link: Advances and Challenges in Conversational Recommender Systems: A Survey, Chongming Gao, Wenqiang Lei, Xiangnan He, Maarten de Rijke, Tat-Seng Chua In contrast to many recommender systems that are heavily influenced by static historical data, CRSs provide a more dynamic and natural interaction with users through real-time language. In this interactive approach, systems have an opportunity to get insight into users’ preferences as well as the rationale behind their selections through multi-turn conversations. In doing so, the survey highlights a range of major research directions, such as: designing research questions that can gather user preferences, tracking conversations across turns, dialogue comprehending and response generations, managing the recommend familiar vs. novel trade-off, and the necessity for well-founded attribution metrics and user simulation models. (Gao et al., 2021)
2. In the 2018 work A Survey on Conversational Recommender Systems, the authors Dietmar Jannach, Ahtsham Manzoor, Wanling Cai and Li Chen provide an in-depth summary on the evolution and status of Conversational Recommender Systems (CRSs). On the other hand, traditional recommender systems typically work under a one-off interaction scenario, where they extract user interests from ancient data and provide a static recommendation list. In contrast, CRSs engage in interactive multi-turn dialogues with the user, asking questions to elicit user preferences to recommend personalized items to the user. They classify current CRS approaches from various perspectives, such as: which forms of user intents are supported, and the underlying knowledge type used. In addition, it discusses the technological approaches used, evaluation methods, and several research gaps. (Jannach, 2021)
3. This overview of combat systems was drawn from E-Commerce Recommendation Applications, by J. Ben Schafer, Joseph A. Konstan, and John Riedl (GroupLens Research Project, University of Minnesota). Once regarded as novelties, these systems are now essential in helping consumers navigate the myriad of products available by harnessing both expert-curated and user-generated data. The authors consider six leading e-commerce platforms and find five main types of recommender applications: personalized recommendations, item-to-item suggestions, user-to-user recommendations, hybrid methods, and community-based systems. They also highlight combining established database marketing practices with contemporary data analysis and personalized delivery methods to create synergetic sales conversions.

**Synthesis:** This synthesis shows that this system deeper into voice technology, natural language processing (NLP) and recommendation engines each play a different role in the systems we examined, but in sum demonstrate the evolution of e-commerce. You are conditioned on data to a date, at least, to October 2023 There are separate systems, such as, voice interaction as in voice-driven e-commerce, which allows hands-free shopping by spoken command or also AI assistants like Alexa or Google Assistant which are commonplace for voice-driven product discovery and purchase. And other systems focus on smarter, text-based interactions: chatbots that provide real-time information about inventory and pricing, for example, creating a more efficient physical range of retail. Conversational recommender systems are even more powerful, being able to engage users in a dialogue, ask clarifying questions about the products that they suggest, and adapt to changing user preferences over time. You can then make use of sentiment-aware digital assistants, who can take it a step further by analyzing the emotional tone of the text and giving a more accurate response. This has always been the case in e-commerce, where you have traditional recommendation model to suggest items to users based on their behavior and preferences. While all of the mentioned systems have highly relevant innovation aspects, they don't combine free text voice control with state of the art NLP, real-time recommendation systems and e-commerce transactions in one platform which showcases the novelty and potential of such a complete voicebot system.

1. **Review Of Related Systems**
2. Amazon Alexa (with Amazon Shopping) - Search, add items to cart, and place orders on Amazon by voice with Amazon Alexa. It incorporates sophisticated NLP and AI, but only works within Amazon’s own platform and ecosystem.
3. Google Assistant (Shopping Actions) - Google Assistant lets shoppers search for products, compare prices among retailers and finalize sales using voice at supported retailers. It offers intelligent suggestions but is designed almost exclusively for merchants that exist on its Shopping network.
4. Samsung Bixby (Voice Shopping via Bixby Marketplace) - With NLU, Bixby provides contextually-aware responses and supports voice-enabled product discovery and ordering in all supported apps. Its reach is limited compared to Alexa and Google, and adoption is mainly among Samsung users.
5. Walmart Voice Order (via Google Assistant) - Through voice command with Walmart Voice Assistant, customers can add items to their shopping cart or reorder groceries and items from their previous orders. It customizes results based on purchases history, but is only grocery and household shopping focused.
6. Hound by SoundHound (Voice AI for Commerce) - Hound is a voice AI platform developed by SoundHound Inc that allows businesses to deploy conversational commerce services that supports real voice search and recommendations in the moment. It is highly customizable but geared for enterprise-level deployment, not DTC.

**Synthesis:**