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RESEARCH ARTICLE

Navigating Culinary Choices: An Exploration of AI Chatbots for Personalized Restaurant Recommendations

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ABSTRACT

Malaysia's rich and diverse culinary heritage encompassing Malay, Chinese, Indian, and indigenous influences, navigating the plethora of dining options can be daunting for both locals and tourists alike. AI chatbots emerge as innovative solutions to this challenge, leveraging advanced algorithms and natural language processing capabilities to provide personalized restaurant recommendations tailored to individual preferences. Through an intuitive interface, users engage with the chatbot by specifying their cuisine preferences, dietary restrictions, budget constraints, and location. This preliminary study delves into the application of AI chatbots in the realm of culinary exploration, specifically focusing on recommending restaurants in Malaysia specifically state of Melaka based on various types of cuisine. Using Technology Acceptance Model (TAM), a questionnaire was designed and assigned to 35 respondents. The analysis centered on four interrelated constructs: Perceived Usefulness (PU), Perceived Ease of Use (PE), Behavioral Intention to Use (BI), and Attitude (AT), which were adjusted to align with the study's context. Cronbach's alpha and the mean analysis were carried out to assess the respondent's feedback towards "MelakaEats" AI chatbot. This is a pilot study, and the paper concludes with a discussion of some findings and conclusions.

1. INTRODUCTION

In Malaysia, a country renowned for its diverse culinary landscape, the process of selecting a restaurant can often be overwhelming, given the plethora of options available, ranging from traditional local eateries to international franchises. With the advent of artificial intelligence (AI) technologies, particularly AI chatbots, the task of navigating these culinary choices has been revolutionized. This study aims to explore and evaluate the respondents' acceptance towards the use of AI chatbots in providing personalized restaurant recommendations for their dining experience.

Malaysia's rich cultural tapestry is reflected in its cuisine, which encompasses influences from Malay, Chinese, Indian, and indigenous traditions. The country's vibrant street food culture, characterized by bustling markets and hawker stalls, coexists with upscale restaurants offering gourmet experiences. Amidst this culinary diversity, consumers often seek guidance in selecting dining establishments that align with their preferences, dietary restrictions, and budgetary constraints.

The emergence of AI chatbots presents a promising solution to the challenges of navigating Malaysia's culinary landscape. These intelligent virtual assistants leverage machine learning algorithms and natural language processing techniques to understand user preferences and provide tailored restaurant recommendations. By analyzing factors such as past dining history, cuisine

preferences, and location, AI chatbots offer personalized suggestions that enhance user satisfaction and streamline the decision-making process.

While AI chatbots have gained traction in various sectors globally, their adoption and impact in the Malaysian restaurant industry remain relatively unexplored. Existing studies have primarily focused on Western contexts, overlooking the unique cultural and culinary nuances of Malaysia. This study seeks to fill this gap by investigating how AI chatbots can effectively cater to Malaysian consumers' diverse preferences and dining habits.

The primary objective of this study is to explore and assess respondents' acceptance of using "MelakaEats" AI chatbots for personalized restaurant recommendations Malaysia particularly states of Melaka. "MelakaEats" is a recommended AI chatbot for restaurant recommendation systems, according to Lajis et al. (2023). This year is a “Visit Melaka Year 2024”. It is not only about exploring historical sites and cultural events but also an excellent opportunity for food enthusiasts to indulge in the diverse and rich culinary scene of Melaka.

Ultimately, this study endeavors to shed light on the transformative potential of AI chatbots in navigating Malaysia's culinary choices, offering insights into their efficacy, challenges, and broader implications for consumer behavior and the hospitality sector. Hence, AI chatbots represent a powerful tool in navigating Malaysia's vibrant food scene, offering tailored recommendations that enrich dining experiences, promote cultural understanding, and support local businesses.

2. LITERATURE REVIEW

The burgeoning field of artificial intelligence (AI) has revolutionized numerous aspects of daily life, including how individuals navigate culinary choices and make dining decisions. In the multicultural context of Malaysia, where a diverse array of culinary traditions converge, the role of AI chatbots in providing personalized restaurant recommendations presents a promising avenue for enhancing the dining experience. This literature review aims to explore the existing research on AI-driven recommendation systems in the context of restaurant choices, highlighting their potential benefits, challenges, and implications for Malaysian consumers and the hospitality industry.

AI-driven recommendation systems have witnessed significant advancements in recent years, fueled by developments in machine learning algorithms, natural language processing (NLP) techniques, and big data analytics. These systems leverage user preferences, past behaviors, and contextual information to generate personalized recommendations tailored to individual needs (Linden et al., 2003). In the realm of restaurant recommendations, AI chatbots have emerged as intelligent virtual assistants capable of understanding user queries, preferences, and constraints to provide relevant dining suggestions (Cellina et al., 2020).

Research indicates that AI chatbots have the potential to significantly enhance the effectiveness of personalized restaurant recommendations. Jung et al. (2019) conducted a study on chatbot-based recommendation systems for customized food products and recipes, demonstrating the ability of AI chatbots to understand user preferences and dietary restrictions to offer tailored suggestions. Similarly, Chen et al. (2018) developed a hybrid recommendation model that integrates collaborative filtering and content-based filtering techniques, resulting in more accurate and personalized restaurant recommendations. These findings underscore the efficacy of AI chatbots in facilitating personalized dining experiences by leveraging advanced recommendation algorithms.

User acceptance and satisfaction play a crucial role in the success of AI-driven recommendation systems for restaurant choices. Studies have shown that consumers generally exhibit positive attitudes toward AI chatbots for personalized recommendations, citing convenience, efficiency, and relevance as key drivers of acceptance (Zhang et al., 2019). Choi et al. (2017) conducted research on a customized food recommendation system using a hybrid model, reporting high levels of user satisfaction with the AI-driven recommendations. However, concerns such as privacy, transparency, and trust in AI algorithms remain important considerations that influence user acceptance (Yao et al., 2020). Addressing these concerns is essential for fostering trust and confidence in AI chatbots among Malaysian consumers.

The multicultural and diverse nature of Malaysian society presents unique challenges and opportunities for AI-driven restaurant recommendation systems. Malaysia's culinary landscape encompasses a wide range of cuisines, including Malay, Chinese, Indian, and indigenous traditions, each with its own distinct flavors and culinary practices. AI chatbots must navigate this cultural diversity to provide recommendations that resonate with Malaysian consumers' preferences and tastes (Jung et al., 2019). Additionally, contextual factors such as geographic location, religious dietary restrictions, and cultural dining norms further complicate the task of personalizing restaurant recommendations in Malaysia (Cellina et al., 2020). Understanding and incorporating these cultural and contextual factors are critical for the success of AI chatbots in the Malaysian market.

Despite the potential benefits, AI-driven restaurant recommendation systems face several challenges and limitations. Algorithmic bias, where recommendation algorithms inadvertently perpetuate stereotypes or preferences based on limited data, poses a significant ethical concern (Li et al., 2021). Furthermore, the reliance on user data raises privacy and security issues, necessitating robust data protection measures to safeguard user information (Yao et al., 2020). Technical challenges such as algorithm scalability, data sparsity, and model interpretability also present obstacles to the development and deployment of AI chatbots for restaurant recommendations (Nguyen et al., 2021). Addressing these challenges is crucial for ensuring the ethical and responsible implementation of AI-driven recommendation systems in Malaysia.

The adoption of AI chatbots for personalized restaurant recommendations has far-reaching implications for the hospitality industry in Malaysia. By leveraging AI technologies, restaurants can enhance customer engagement, increase sales, and improve overall dining experiences (Chen et al., 2018). AI-driven recommendation systems enable restaurants to better understand customer preferences and behaviors, allowing for targeted marketing efforts and menu customization (Zhang et al., 2019). Moreover, AI chatbots can streamline the reservation and booking process, optimize seating arrangements, and facilitate feedback collection, leading to greater operational efficiency and customer satisfaction (Choi et al., 2017). Embracing AI technologies can position Malaysian restaurants at the forefront of innovation and differentiation in an increasingly competitive market.

2.1 The domain

Melaka, situated in the southern region of Malaysia, stands as a testament to the intricate interplay of cultural influences, reflected notably in its diverse culinary landscape. Recognized as a UNESCO World Heritage Site, Melaka's cuisine embodies a rich amalgamation of Malay, Chinese, Indian, Portuguese, Baba Nyonya culinary traditions, shaped by centuries of historical interactions. This overview of the literature endeavors to delve into the multifaceted dimensions of Melaka cuisine, examining its historical evolution, cultural significance, ingredient diversity, cooking techniques, and contemporary manifestations, drawing upon a range of scholarly sources and culinary studies.

Melaka's culinary journey can be traced back to its pivotal role as a vibrant entrepôt along the ancient Spice Route, facilitating the exchange of goods, ideas, and culinary practices among diverse cultures. Early interactions with Arab, Indian, and Chinese traders introduced spices, herbs, and cooking techniques that profoundly influenced indigenous Malay cuisine. (Wazir-Jahan Begum Karim, 2018) The establishment of the Melaka Sultanate in the 15th century further catalyzed culinary innovation, with royal feasts showcasing elaborate dishes reflective of the multicultural milieu.

Melaka's cuisine serves as a cultural mosaic, symbolizing the fusion and integration of various ethnic culinary traditions. Malay, Chinese, and Indian communities coexist harmoniously, each contributing unique flavors and cooking methods to the gastronomic tapestry. Nyonya cuisine, a fusion of Chinese and Malay culinary elements, exemplifies this cultural synergy, characterized by dishes such as laksa lemak and ayam pongteh. (Siti Hawa Hj Salleh, 2017) Portuguese colonization left an indelible mark on Melaka's culinary heritage, evident in dishes like devil's curry and Eurasian specialties such as sugee cake and vindaloo.

The abundance of locally sourced ingredients, including fresh seafood, tropical fruits, aromatic herbs, and exotic spices, forms the cornerstone of Melaka's culinary repertoire. Staples such as lemongrass, galangal, turmeric, and belacan (shrimp paste) impart distinctively bold flavors to traditional dishes. (Amriah Buang, 2019) Cooking techniques range from stir-frying and steaming to grilling and slow simmering, emphasizing the importance of precision and balance in flavor profiles.

In recent years, concerted efforts have been made to preserve and promote Melaka's culinary heritage as a means of cultural conservation and tourism development. Culinary tourism initiatives, including food trails, cooking classes, and heritage food festivals, have gained traction, attracting both domestic and international visitors eager to explore the region's rich gastronomic offerings. (Yusmarwati Yusof, 2020) However, challenges related to culinary authenticity and sustainable tourism practices necessitate community engagement and collaboration among stakeholders.

While traditional recipes remain foundational to Melaka cuisine, contemporary chefs and restaurateurs are embracing innovation and experimentation to cater to evolving tastes and preferences. Fusion cuisine, blending traditional Malay, Chinese, and Western elements, has emerged as a dynamic culinary trend, offering reinterpretations of classic dishes. (Azizan Abu Samah, 2021) Moreover, the rise of organic, farm-to-table dining reflects a growing emphasis on sustainability and health-consciousness in the culinary landscape.

2.2 TAM model

The Technology Acceptance Model (TAM), developed by Davis in 1989 (refer Figure 1.0), has served as a foundational framework for understanding users' acceptance and adoption of new technologies. In the context of chatbots, TAM provides valuable insights into the factors influencing users' attitudes and intentions towards interacting with chatbot systems. This literature review aims to examine existing research applying TAM to the adoption of chatbots, highlighting key findings and implications.

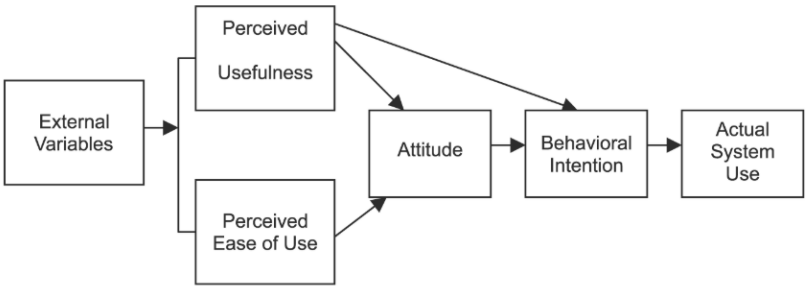

Figure 1: Technology acceptance model

Several studies have applied TAM to investigate the adoption of chatbots across various contexts, including customer service, healthcare, and education. Findings suggest that users' perceptions of PU and PEOU significantly influence their intentions to use chatbots. For instance, research by Li et al. (2019) found that perceived usefulness positively affects users' attitudes towards chatbots in customer service interactions.

Beyond the core constructs of PU and PEOU, researchers have identified additional factors that may impact users' acceptance of chatbots. These include trust, perceived enjoyment, social influence, and perceived risk. For example, Wu et al. (2020) found that trust in chatbot capabilities positively influences users' attitudes and intentions to use chatbots for online shopping assistance.

Understanding the factors driving users' acceptance of chatbots is essential for designing effective and user-friendly systems. Insights derived from TAM can inform the development of chatbot interfaces that prioritize usability, functionality, and trustworthiness. Moreover, addressing users' concerns regarding privacy, security, and reliability is crucial for fostering widespread adoption of chatbot technology.

3. METHODOLOGY

This research aims to investigate the efficacy and user acceptance of AI chatbots for personalized restaurant recommendations in Malaysia. The quantitative method was used in this investigation. The survey is used to provide a comprehensive understanding of consumer perceptions and experiences.

The questionnaire items were assessed using a Likert Scale, a widely employed method for gauging respondents' levels of agreement with the statements provided. In this research, a 5-point Likert scale was utilized, featuring anchors ranging from (1) "Strongly disagree" to (5) "Strongly agree."

The research included 35 undergraduate students from Multimedia University (MMU), representing a diverse range of majors. The primary aim of this investigation was to assess the respondents' receptiveness to utilizing AI chatbots for personalized restaurant recommendations. The questionnaire consisted of two parts: Section A focused on gathering demographic data from the participants, while Section B comprised 12 items designed to assess various constructs of the Technology Acceptance Model (TAM), including perceived usefulness, perceived ease of use, attitude, and behavioral intention to use.

The online experiment was structured as outlined below:

- Participants engaged with the MelakaEats chatbot for a duration of 15 minutes to receive restaurant recommendations corresponding to their prompts.
- Following the completion of their interaction with the chatbots, participants were promptly directed to complete a questionnaire.

3.1 "MelakaEats" AI Chatbot

MelakaEats, an AI-driven chatbot, leverages the GPT-3.5 Turbo model to deliver expert guidance within the realm of food and restaurant exploration in Melaka, Malaysia (Lajis et al., 2020). MelakaEats integrates a user-friendly interface constructed using Streamlit, empowering users to input inquiries and requests concerning food and dining venues. Through its natural language processing algorithms, fueled by the GPT-3.5 Turbo model, the chatbot adeptly comprehends conversations and furnishes precise responses. The developmental process encompassed knowledge acquisition, knowledge base design, coding, user interface implementation, and rigorous testing to ensure accurate recommendations.

As demonstrated by MelakaEats (refer Figure 2.0, Figure 3.0), AI-driven chatbots offer numerous advantages over rule-based counterparts (Lajis et al., 2023), including adept handling of complex queries, scalability, and round-the-clock customer assistance. These chatbots are gaining traction across diverse sectors, heralding the prospect of even more sophisticated applications as NLP technology continues to evolve.

Figure 2: The MelakaEats AI chatbots

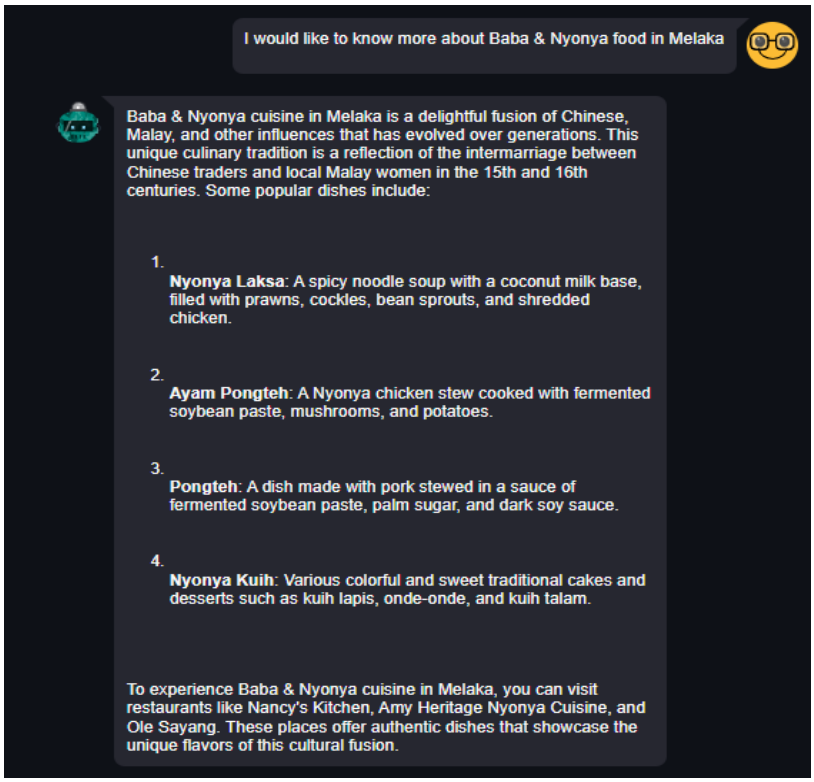

Figure 3: Sample prompt and answers for Baba & Nyonya food in Melaka

4. RESULTS AND DISCUSSION

The primary theory employed in this study is the TAM model, which suggests that perceived usefulness, perceived ease of use, attitude, and behavioral intention to use technology are key elements of the acceptance of "MelakaEats" AI chatbot.

Perceived usefulness

Perceived usefulness pertains to the user's belief about whether utilizing technology, specifically a "MelakaEats" AI chatbot, can help them in finding personalized restaurants. In this pilot study, perceived usefulness was assessed using three items (refer Table 1).

Table 1: Perceived of usefulness items

Construct	Measured Items
Perceived of Usefulness (PU)	PU1: Using an AI chatbot for restaurant recommendation would enhance my dining experience in Melaka.
	PU2: An AI chatbot would help me discover new restaurants in Melaka that I may not have found otherwise.
	PU3: I believe that using an AI chatbot for restaurant recommendation would save me time and effort in decision-making.

Perceived ease of use

Perceived ease of use refers to the extent to which a person believes that using a particular technology will be free from effort or difficulty. In this pilot study, perceived ease of use was assessed using three items (refer Table 2).

Table 2: Perceived ease of use

Construct	Measured Items
Perceived Ease of Use (PEU)	PEU1: Using an AI chatbot for restaurant recommendation would be easy for me.
	PEU2: I would find it easy to navigate and interact with an AI chatbot for restaurant recommendation.

	PEU3: Learning to use an AI chatbot for restaurant recommendation would be straightforward for me.

Attitude

Attitude construct refers to an individual's positive or negative evaluation of using a particular technology. In this pilot study, attitude was assessed using three items (refer Table 3).

Table 3: Attitude

Construct	Measured Items
Attitude (ATU)	ATU1: I would enjoy using an AI chatbot for restaurant recommendation in Melaka.
	ATU2: I believe that using an AI chatbot for restaurant recommendation would make me more likely to explore different dining options in Melaka.
	ATU3: Using an AI chatbot for restaurant recommendation aligns with my personal preferences.

Behavioural intention to use

Behavioural intention to use refers to an individual's readiness and willingness to use a specific technology. In this pilot study, behavioural intention to use was assessed using three items (refer Table 4).

Table 4: Behavioural intention to use

Construct	Measured Items
Behavioural Intention to Use (BIU)	BIU1: I intend to use an AI chatbot for restaurant recommendation in the future.
	BIU2: I am likely to recommend the use of an AI chatbot for restaurant recommendation to others.
	BIU3: I would actively seek out opportunities to use an AI chatbot for restaurant recommendation in Melaka.

To make sure the items in the questionnaire had internal consistency and reliability, this study also performed a reliability analysis. Pallant (2007) states that a scale's Cronbach's Alpha coefficient, which indicates that the items are homogeneous and measure the same constant, should be 0.70 or above for an item to be considered reliable. Below are the findings from the measurement scales' reliability tests (refer Table 5). The questionnaire is a reliable measuring tool since all of the items for each construct have a very good reliability, as indicated by the Cronbach's alpha reliability scores for all of the constructs exceeding 0.75.

Table 5: Reliability and mean of construct

Construct	N	No. of Items	Alpha	Mean
Perceived of Usefulness (PU)	35	3	0.852	4.286
Perceived Ease of Use (PEU)	35	3	0.871	4.143
Attitude Toward Use(ATU)	35	3	0.769	4.181
Behavioural Intention to Use (BIU)	35	3	0.911	4.057

For every construct, the mean is greater than 4.0. Based on the questions they asked in the MelakaEats AI chatbot, it appears that the respondents agree that the chatbot assists them in locating their preferred restaurant.

5. CONCLUSION

AI chatbots hold tremendous potential for revolutionizing personalized restaurant recommendations in Malaysia. By leveraging advanced algorithms and user data, AI chatbots can offer tailored dining suggestions that cater to diverse preferences and cultural contexts. However, challenges such as algorithmic bias, privacy concerns, and technical limitations must be addressed to ensure the ethical and effective deployment of AI-driven recommendation systems. Through

continued research and innovation, AI chatbots have the opportunity to reshape the way Malaysian consumers navigate culinary choices and engage with the hospitality industry.

In conclusion, this preliminary study aimed to explore and evaluate respondents' willingness to use "MelakaEats" AI chatbots for personalized restaurant recommendations, focusing specifically on the Malaysian state of Melaka. After thorough data analysis and in-depth discussions adopting Technology Acceptance Model by Davis, (1989), we have gained valuable insights into the respondents' acceptance of the "MelakaEats" AI chatbot. The main data for this study were gathered via a questionnaire consisting of 12 items related to the four constructs mentioned earlier. These questionnaire items underwent reliability and validity testing to ensure their suitability and accuracy for this preliminary study. Further research needs to be focused on bigger data sample, applying TAM2 and TAM3 model. Both TAM2 and TAM3 build upon the foundation of the original TAM but expand the scope to better account for the complexities and dynamics of technology acceptance and usage in various contexts. Therefore, it will lead to the concrete hypothesis development of why this research is needed.

In addition, “MelakaEats” AI chatbot needs to be enhance with exploring the integration of emerging technologies such as augmented reality (AR) and virtual reality (VR). By addressing technology improvement, scholars can contribute to the ongoing advancement and refinement of AI-driven recommendation systems in the culinary domain.

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