E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025

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HALALMATE: AN AI-BASED HALAL FOOD RECOMMENDATION APPLICATION

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ABSTRACT

Finding trustworthy halal food information remains challenging for the global Muslim population, projected to reach 2.2 billion by 2030 (Research Nester, 2024). Despite a significant recovery in Muslim travel, reaching approximately 145 million international arrivals in 2023, about 90% of pre-pandemic levels of accessibility to verified halal options remain problematic, particularly in diverse regions. HALALMATE is an AI-powered mobile application addressing this need through three core features: (1) nearby halal restaurant search and validation, (2) personalised food recommendations, and (3) packaged food scanning for instant halal verification. The application integrates Google Maps scraping, OpenAI OCR for menu extraction, Open Food Facts API for product verification, and an AI chatbot for interactive recommendations. Supported by a dynamic halal database and intelligent filtering system, HALALMATE enables users to make accurate, faith-compliant food choices anywhere. This innovation combines AI technology with real-world Muslim community needs, empowering confident halal consumption decisions in the digital era.

Keywords: halal food, AI recommendation, food scanner, Muslim lifestyle, halal product verification, smart eating

1. INTRODUCTION

Access to halal food is a core religious need for the Muslim population, projected to reach 2.2 billion by 2030 (Research Nester, 2024). Despite the significant recovery in Muslim travel, reaching approximately 145 million international arrivals in 2023, about 90% of pre-pandemic 2019 levels (Crescent Rating, 2024), many still face difficulty finding trustworthy halal options, especially in non-Muslim majority countries where verification and accessibility remain challenging.

HALALMATE was developed as an AI-powered mobile application aimed at helping Muslim travelers find halal food with confidence. Branded with the tagline #EatWithConfidence, HALALMATE delivers real-time, verified information on halal food through a combination of intelligent features such as a chatbot, image and text analysis of menus, and ingredient validation for packaged products. The app also integrates halal databases like Open Food Facts and official certification APIs to enhance data accuracy.

By combining map scraping, computer vision, and natural language processing, HALALMATE provides an end-to-end solution tailored for tech-savvy, mobile users. Available on both Android and iOS, the app represents a modern tool that empowers Muslims to navigate food choices that are both syariah-compliant and practical, wherever they are in the world.

2. METHODOLOGY

2.1 Requirements Analysis

User needs constitute the fundamental foundation for the design and implementation of system features. This phase entails a comprehensive identification and understanding of the specific challenges encountered by Muslim travelers in locating reliable halal food options.

Table 1 Requirements Analysis

No	User Needs	System Features
1	Finding halal restaurants around the user's location	Contains a list of features and tasks such as scraping restaurant data from Google Maps, menu extraction with OpenAI OCR, barcode scanning with Open Food Facts API, and an AI-based food recommendation system.
2	Quickly obtaining detailed information about packaged food products	Barcode scanning of products connected to the Open Food Facts API to display product name and ingredients.
3	Receiving food recommendations according to preferences	An AI chatbot-based food recommendation system that accepts natural language input from the user.
4	Interacting with the system easily and without confusion	An interactive chatbot-based interface and a simple and user-friendly UI design.
5	Knowing the rating, reviews, and photos of a restaurant or menu before making a decision	Scraped information that includes star ratings, user reviews, and photos from Google Maps.
6	Ensuring food or products comply with halal principles	Integration of product ingredient data from the barcode scanner and chatbot-based dialogue that considers halalness.

2.2 Feature Descriptions

The system developed in this research incorporates three primary features, designed to work cohesively in delivering AI-driven halal food recommendations. These features are detailed below:

2.2.1 Restaurant Data Acquisition and Processing

This feature compiles a comprehensive restaurant database through:

i. Google Maps Scraping: Automated collection of restaurant details (name, location, ratings, reviews, photos) near the user using chromedp, followed by data cleaning.
ii. Menu Extraction with OCR: OpenAI OCR processes scraped menu images to extract text, identify items, prices, and categorize dishes.

2.2.2 Packaged Food Product Scanning and Halal Verification

This feature facilitates quick assessment of packaged food items:

i. Barcode Scanning: Users scan product barcodes; data is sent to Open Food Facts API to retrieve product name and ingredients.
ii. Multi-Stage Image Fallback: If barcode scanning fails, users can photograph product packaging (front, then back if needed). OCR and OpenAI process these images.

2.2.3 AI-Powered Chatbot for Personalised Food Recommendations

This interactive feature provides tailored food suggestions:

i. Conversational Interface: An OpenAI-powered chatbot allows users to state food preferences, dietary restrictions, and queries in natural language.
ii. Contextual Recommendation Engine: The chatbot delivers personalised recommendations by analysing user input, chat history, and data from the system’s restaurant (including reviews) and product databases, utilising OpenAI's language understanding for relevant suggestions.

2.3 Public Implementation Strategy

Upon completion of thorough testing and refinement, HALALMATE's public implementation will involve a phased rollout on major mobile platforms, facilitating systematic user response monitoring and the timely addressing of any emergent issues to ensure a stable and well-received application.

3. FINDINGS

Existing literature highlights persistent challenges faced by Muslim consumers—especially travelers—in accessing real-time, reliable halal food information. These stem from a fragmented certification system lacking unified global standards, inconsistent international regulations, and limited integrated digital halal databases, resulting in mismatches among certifying bodies like JAKIM, BPJPH, and GSO (Hidayati et al., 2024).This issue is critical given the halal food market's projected rise from USD 2.64 trillion in 2024 to USD 9.67 trillion by 2037 (CAGR: 10.5%) (Research Nester, 2024).

To address this, HALALMATE was developed as an AI-driven halal food recommendation system that integrates real-time location-based restaurant data acquisition, multi-source packaged food verification through barcode and image scanning, and an intelligent chatbot for personalised suggestions. Early-stage implementation results, illustrated in Figure 1 (UI) and Figure 2 (database).

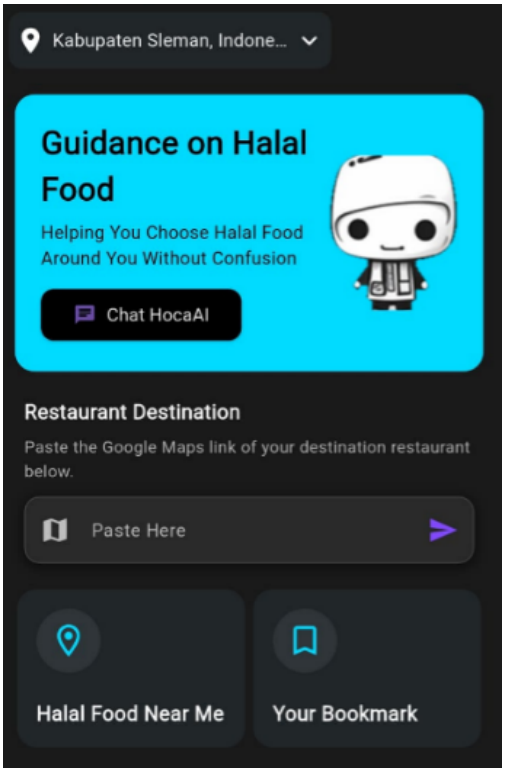

Figure 3 Implementation of UI/UX

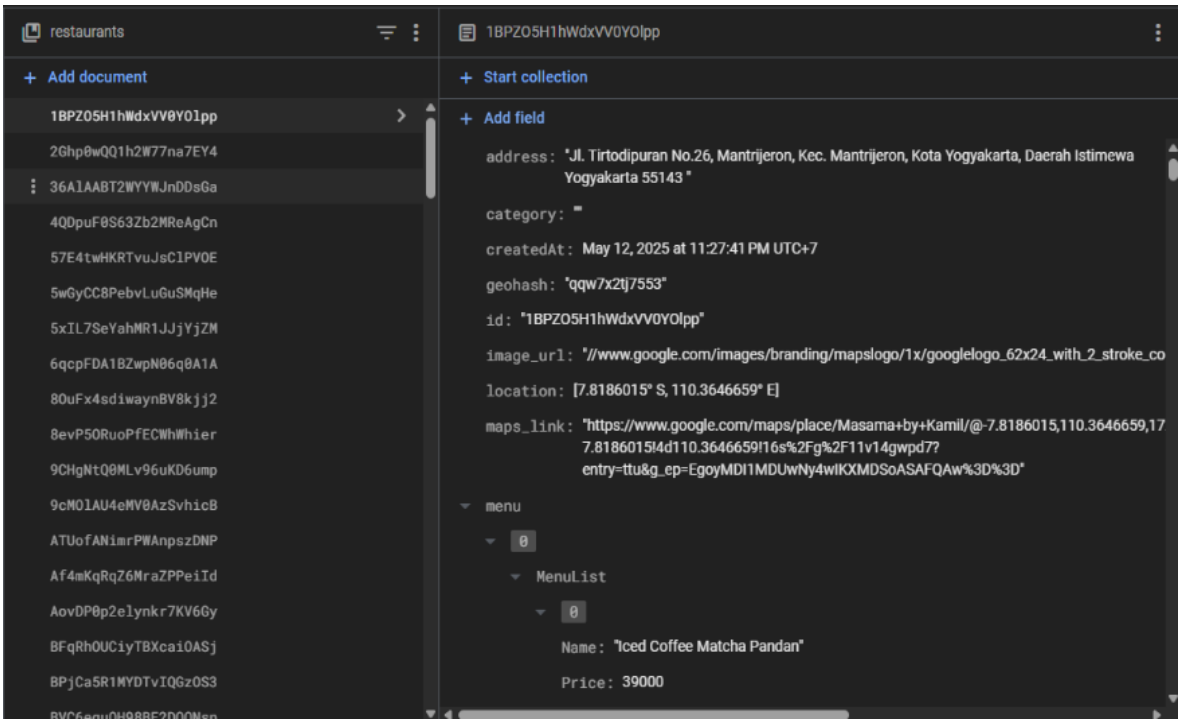

Figure 4 Result of Scrapping Maps

4. CONCLUSION

This paper has detailed the development of HALALMATE, an AI-powered mobile application specifically designed to address the significant challenges Muslim consumers, particularly travelers, encounter in locating trustworthy halal food options. HALALMATE delivers a practical and comprehensive solution by integrating key features: intelligent restaurant discovery, robust packaged food scanning, and personalised food recommendations via an interactive AI chatbot.

HALALMATE empowers its users to make informed, faith-compliant dietary choices with greater confidence and ease, directly supporting the aspiration to #EatWithConfidence. This innovation represents a significant step in leveraging artificial intelligence and mobile technology to meet the real-world needs of the Muslim community for accessible, reliable, and real-time halal information, thereby simplifying adherence to a halal lifestyle in an increasingly complex digital and globalized world.

In conclusion, HALALMATE stands as a valuable contribution to the field of applied AI and digital Islamic services. It provides a smart, user-centric platform that not only assists Muslims in finding halal food but also empowers them to navigate their consumption choices confidently and comfortably, in accordance with their religious principles.

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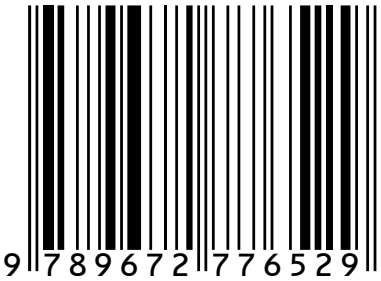

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