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RECO: An AI-Powered Chatbot System for Optimizing Reverse Agri-Food Logistics and Fighting Food Insecurity in Colombia

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Abstract

Food waste management has become a critical global issue with significant economic, social, and environmental impacts. In Colombia, approximately 9.7 million tons of food are wasted annually, impacting food security and malnutrition. This research explores the role of artificial intelligence, particularly chatbots, in optimizing food distribution and minimizing waste. The proposed system, RECO Donation Manager, employs AI-powered chatbots integrated with PostgreSQL databases and geolocation services like Bing Maps to streamline food donations. The AI in the chatbots, powered by natural language processing (NLP) and machine learning (ML), improves user interaction, automates resource allocation, and ensures efficient food redistribution. The initial implementation highlights challenges in geolocation accuracy, data validation, and understanding NLP, emphasizing the need for further refinement. This study demonstrates the potential of AI-based solutions to mitigate food waste and foster sustainable resource management, offering a promising foundation for future advances in automated food donation systems. © The Author(s), under exclusive license to Springer Nature Switzerland AG 2026.

Author keywords

AI; Chatbot; optimization; waste management

Indexed keywords

Engineering controlled terms

Agri-food; Chatbots; Food security; Food supply; Food waste; Resource allocation; Sustainable development; Waste management

Engineering uncontrolled terms

Chatbots; Colombia; Food insecurity; Food logistics; Food waste; Geolocations; Global issues; Language processing; Natural languages; Optimisations

Engineering main heading

Artificial intelligence

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