GroShelf: Grocery Tracking & Food Waste Management App

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Abstract- *GroShelf is a smart food waste management app that helps users organize groceries, minimize waste, and make informed consumption decisions. Built with the PERN stack and Supabase for real-time updates, it features an OCR module for automated grocery extraction, expiration alerts, and recipe suggestions based on available ingredients. The Impact Calculator tracks discarded food, highlighting its financial and environmental impact. A USDA-based expiration database eliminates manual input by assigning estimated shelf lives to groceries. By integrating grocery management, waste tracking, and sustainability insights, GroShelf promotes smarter meal planning, reduces unnecessary purchases, and fosters an eco-friendly lifestyle.*

Keywords- Food Waste, Grocery Management, Expiration Alerts, Recipe Suggestions, Impact Calculator, Sustainability, Waste Tracking, Meal Planning, Financial Impact, Environmental Impact, OCR, USDA Expiration Database, PERN Stack, Supabase.

I. INTRODUCTION

Food waste is a significant global issue, with households being one of the primary contributors due to poor grocery management, ineffective meal planning, and lack of awareness about expiration dates. GroShelf is a smart grocery tracking and food waste management app designed to help users organize groceries efficiently, minimize waste, and optimize consumption. Built with the PERN stack (PostgreSQL, Express.js, React.js, Node.js) and Supabase, GroShelf offers automated grocery tracking, expiration alerts, recipe suggestions, and an Impact Calculator to analyze discarded food's financial and environmental impact. The app integrates OCR technology to extract grocery details from receipts, enhanced with synonym matching and category filtering for accuracy. A USDA-based expiration database eliminates manual input by estimating shelf life for groceries. By combining waste tracking, meal planning, and sustainability insights, GroShelf helps users reduce unnecessary purchases, save money, and adopt an eco-friendly lifestyle.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Food waste is a pressing global concern, with households playing a significant role in its escalation. Studies indicate that a large portion of food waste stems from poor grocery management, unplanned shopping, and a lack of awareness about expiration dates. Consumers often purchase more than they need, leading to spoilage and unnecessary disposal. According to the United Nations Food and Agriculture Organization (FAO), nearly one-third of all food produced globally is wasted, contributing to environmental degradation and economic losses. This issue is particularly concerning in urban areas, where busy lifestyles result in inefficient meal planning and forgotten perishable items. Research also highlights that grocery bills do not typically include expiration dates, making it difficult for users to track food freshness. Furthermore, the manual entry of groceries into tracking apps is often tedious, discouraging individuals from maintaining an organized food inventory. These challenges emphasize the need for an automated, user-friendly system that minimizes waste and promotes responsible consumption.

To address food waste, GroShelf integrates modern technology for seamless grocery tracking and waste reduction. Built with the PERN stack and Supabase, it leverages OCR technology to extract grocery details from scanned bills, eliminating tedious manual entry. Using synonym matching and category-based filtering, it ensures accurate tracking while a USDA-based expiration database provides automated expiration alerts. The Impact Calculator quantifies discarded food, offering insights into financial and environmental impact. Additionally, recipe suggestions based on available groceries help users optimize meal planning. A user- friendly interface ensures easy navigation, making food tracking effortless for individuals and families. By combining automation, waste tracking, and sustainability insights, GroShelf makes food management more efficient, reducing waste and promoting eco-friendly habits while also encouraging smarter shopping decisions.

III. STUDIES AND FINDINGS

Research conducted by the United Nations Food and Agriculture Organization (FAO) indicates that nearly one-third of all food produced globally is wasted, leading to severe environmental and economic consequences. The Environmental Protection Agency (EPA) highlights that food waste contributes significantly to greenhouse gas emissions due to decomposition in landfills. Additionally, studies show that households are the largest contributors to food waste, primarily due to improper grocery management, unplanned purchases, and lack of awareness about expiration dates. The financial impact is also substantial, with an average family wasting hundreds of dollars annually on discarded food. These findings stress the need for effective food tracking and waste reduction solutions.

Technology-Driven Solutions for Waste Reduction

Studies on food waste management applications have demonstrated that smart tracking systems can significantly reduce waste at the household level. Research on OCR-based food tracking apps shows that automation reduces manual effort and improves accuracy in inventory management. Additionally, expiration alert systems have proven to be effective in prompting timely consumption of perishable goods. The USDA FoodKeeper database, widely used in food tracking solutions, has been validated for its reliability in estimating food shelf life. Studies also reveal that apps providing recipe suggestions based on available groceries help users utilize ingredients efficiently, reducing unnecessary waste and optimizing meal planning.

Findings Supporting GroShelf's Approach

The research findings align with GroShelf's approach to food waste management and grocery tracking. By integrating OCR technology, expiration alerts, and the USDA FoodKeeper database, the app addresses key challenges identified in studies, such as manual data entry issues and unawareness of food freshness. The inclusion of an Impact Calculator further enhances user awareness by quantifying financial and environmental losses due to waste. Studies suggest that real-time tracking and smart notifications encourage responsible consumption habits, reinforcing GroShelf's effectiveness in promoting sustainability and cost savings

IV. GET PEER REVIEWED

To ensure the accuracy and effectiveness of GroShelf, the project underwent a peer review by faculty, mentors, and experts. The evaluation assessed its OCR accuracy, expiration tracking, and user interface, providing insights for improvement. Reviewers also examined the Impact Calculator's accuracy in quantifying food waste and financial losses. Feedback will guide future enhancements,

1. Faculty and Mentor Feedback

The project was checked by faculty members, including M r s . D i v y a J o s e (Project Guide) and Mrs. Liya prakash (Project Coordinator) from the Faculty of Information Engineering, ICCS University' s Department of Engineering Management and Management. Her feedback for GroShelf highlighted key areas for improvement. Experts suggested exploring machine learning to enhance expiration tracking accuracy and recommended optimizing OCR processing speed for handling large grocery bills more efficiently. These insights will guide future enhancements, ensuring GroShelf remains an effective and user-friendly food waste management solution.

2. Feedback from Peers and Test Users

Peers and fellow students tested GroShelf to assess its user-friendliness and practical application. Their observations included:

- Ease of Use: Users found the interface intuitive and easy to navigate, with simple grocery tracking and expiration alerts.
- Dual Output Benefit: The combination of visual grocery tracking and automated notifications helped users stay organized and reduce waste.
- Tracking Accuracy: While expiration tracking was effective, some users suggested enhancing predictions with machine learning for better accuracy.
- OCR Performance: Users appreciated bill scanning automation but recommended improving processing speed for larger receipts.
- Recipe Suggestions: The meal planning feature was helpful, but users suggested personalized recommendations based on dietary preferences and eating habits.

V. IMPROVEMENT AS PER REVIEWER COMMENTS

Feedback from faculty mentors and peer reviewers provided valuable insights into GroShelf's functionality and user experience improvements. One key recommendation was to enhance expiration tracking accuracy by integrating machine learning models instead of relying solely on predefined shelf-life estimates. This would allow GroShelf to

make dynamic adjustments based on storage conditions and user behavior, improving prediction accuracy and reducing food waste.

Additionally, while the OCR-based bill scanning was effective, reviewers suggested optimizing its processing speed for handling larger and more complex receipts. Implementing advanced text recognition models and refining the storage management system could enhance efficiency and ensure faster grocery extraction.

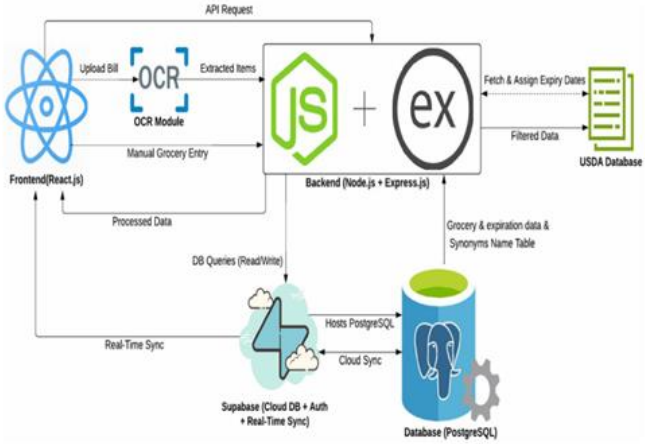
Reviewers also appreciated the recipe suggestion feature but recommended adding personalized recommendations based on user preferences and dietary habits. This would allow for smarter meal planning, helping users make better use of available ingredients. Future enhancements may also include AI-driven insights for better grocery management and waste reduction.

VI. CONCLUSION

GroShelf successfully addresses the challenge of food waste by providing an efficient and user-friendly grocery tracking system. By integrating OCR-based bill scanning, expiration alerts, recipe suggestions, and an impact calculator, the app helps users organize groceries, reduce waste, and save money. The use of real- time updates and automation ensures accuracy and ease of use, making grocery management effortless. Future improvements, such as AI-driven expiration predictions, smart meal planning, and multilingual support, will further enhance its functionality. GroShelf serves as a step toward sustainable food consumption, promoting cost savings and environmental responsibility. With its scalable and innovative approach, the app has the potential to significantly reduce household food waste and encourage smarter consumption habits. It provides a practical solution for individuals and families looking to optimize their grocery usage. By leveraging advanced technologies, GroShelf ensures a seamless and effective user experience. Ultimately, the project contributes to a more sustainable and cost-efficient lifestyle, benefiting both users and the environment.

APPENDIX

A. System Architecture



B. Tools And Tecnologies

• Frontend: React.jsc

Provides a dynamic & interactive user interface.
Handles client-side logic & UI updates efficiently.

• Backend: Node.js & Express.js

Handles API requests, authentication, and business logs Express.js simplifies routing and request handling

• Database: PostgreSQL (Via Supabase)

Stores user data, grocery inventory, recipes, and waste logs.
Supabase for Cloud-hosted database for authentication

• FoodKeeper DB: USDA

Contains standard shelf life data of various groceries. Matches grocery items with shelf-life details.

• OCR-Based Bill Processing:

Uses OCR to extract grocery items from uploaded bills Automates data entry and expiration date assignment.

• Non-Grocery Filtering:.

Removes non-grocery items before adding groceries

C. System Specification

Node.js with Express.js for backend logic, and PostgreSQL via Supabase for secure database management and real-time updates. The system integrates Tesseract OCR for automated grocery extraction from bills, enhanced by synonym matching and category filtering to improve accuracy. Expiration tracking relies on the USDA FoodKeeper Database, ensuring reliable shelf-life estimates, while real-time alerts notify users before food spoils. The Impact Calculator analyzes discarded food to provide insights into financial and environmental impact.

V. ACKNOWLEDGMENT

We sincerely express our gratitude to all those who contributed to the successful completion of our project,

G r o S h e l f : G r o c e r y Tr a c k i n g & F o o d Wa s t e M a n a g e m e n t A p p , We extend our heartfelt thanks to Dr. Vibin Antony P, Principal, ICCS College of Engineering and Management, for his continuous motivation and support. We also express our deep appreciation to our Executive Director, Prof. Dr. Jai M Paul, for his guidance and encouragement throughout our academic journey.

We are especially grateful to our Project Coordinator, Ms. Liya Prakash, Assistant Professor, and our Project Guide, Ms.Divya Jose, Head of computer science department, for their valuable insights, technical guidance, and encouragement during the development of this project. Their expertise and feedback have been instrumental in shaping our work.

We extend our gratitude to all the faculty members and staff of the Department of Computer Science and Engineering, ICCS College of Engineering and Management, for their continuous support and assistance. Lastly, we would like to thank our family, friends, and classmates for their encouragement, motivation, and valuable suggestions, which played a significant role in the successful completion of this project.

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