Development of a Family Meal Plan Application with Voice Recognition, Siri Integration, and Nutrition Management Using Data-Driven Approach

[1]Livanty Efatania Dendy, [2]Celinka Eira Jove, [3]Rinabi Tanamal
[1,2,3] Information System for Business
Universitas Ciputra, Surabaya, Indonesia
[1]lefatania@student.ciputra.ac.id, [2]ceirajove@student.ciputra.ac.id, [3]r.tanamal@ciputra.ac.id

Abstract— Maintaining a healthy diet has become increasingly important as fast-food consumption rises and nutritional balance is often overlooked. This research proposes a technology-based Family Meal Plan Application equipped with voice recognition, Siri integration, nutrition management, and automated grocery lists to assist home cooks in planning healthier meals more efficiently. The application was designed using Figma, developed with Flutter, and integrated with the Siri API to provide a seamless hands-free experience during cooking. A nutrition prediction model was also developed using a Kaggle dataset and deployed locally to generate real-time nutritional analysis. The final results of this study show that the application prototype successfully meets user needs in simplifying weekly meal planning, providing accurate voice-based cooking guidance, and offering automated nutrition calculations for each family member. User testing involving home cooks indicated increased efficiency in meal preparation, reduced cognitive load during recipe execution, and improved awareness of daily nutritional intake. The voice command system operated with high accuracy and responsiveness, while the automated grocery list feature significantly streamlined weekly shopping activities. Overall, the application demonstrates strong potential to support healthier family eating habits through an intelligent, data-driven, and user-friendly solution.

Keywords— Application development, Voice recognition, Siri API integration, home cook app, Nutrition management

I. INTRODUCTION

A. Background

The health of every family is greatly influenced by lifestyle and the daily diet they consume. In today's increasingly modern era, the growing number of fast-food restaurants combined with the convenience offered by online food delivery applications has provided families with a wide range of options, from healthy to unhealthy foods. Such convenience has made food delivery applications an inseparable part of modern life, especially in urban areas where time constraints and demanding schedules are common [1]. Consequently, many families tend to choose daily meals based primarily on desire and convenience rather than considering the nutritional needs of each family member. A lack of knowledge about proper dietary habits, nutritional calculation, and family members' specific lifestyles in preparing meals can lead to serious negative consequences in the future. This situation may result in families experiencing declining health conditions due to unbalanced dietary patterns and inadequate nutritional intake.

According to BPS data in 2025, Indonesia's population reached 284,438,800,000. Indonesia also ranks as the country with the third-highest prevalence of child stunting at 36.4%, just below Nigeria at 32.9%. Eating patterns and food choices in children are typically formed from an early age within the family environment, where parents serve as role models who strongly influence the development of lifelong eating habits [2]. These habits not only affect a child's current health status but can also profoundly influence their future well-being based on the

nutritional intake provided within the family setting [3]. This condition highlights the urgency of increasing education related to food preparation, nutrition, and dietary needs, emphasizing the importance of structured guidance for families.

To address this problem, strong changes and proper nutritional education are necessary. However, one of the biggest challenges is that family members who wish to improve their eating habits or understand the daily nutritional needs of each individual often lack the time or adequate knowledge to do so. This situation demonstrates the need for applications that can support family meal management, particularly regarding health and diet optimization. Designing and implementing an application that facilitates the creation of varied weekly meal recipes for every family member can help overcome this issue by simplifying meal planning and ensuring nutritional balance [4]. The implementation of a weekly meal planning feature within such an application can also assist parents, especially in the context of food security and children's nutrition education, in making more informed meal choices [5]. Parents who actively utilize technology to manage family eating habits tend to select healthier food options, which positively influences the dietary patterns of their children and other family members [6].

Furthermore, technological developments in the health and lifestyle sectors increasingly demonstrate that digitalization can be an effective solution in helping people adopt healthier eating habits. Previous studies have confirmed that the use of nutrition apps, meal planning tools, and supporting features such as voice assistants can reduce the cognitive burden on users when determining daily menus and calculating their family's nutritional needs [7]. This is relevant because most modern families face limited time to manually process nutritional information, often resulting in a mismatch between nutritional needs and daily food consumption.

Furthermore, the growing public interest in a healthy lifestyle also presents a significant opportunity to introduce technology-based innovations that can simplify the meal planning process [8]. Apps equipped with voice recognition, data-driven menu recommendations, and automated shopping lists can help families reduce food waste, increase menu variety, and maintain daily nutritional adequacy. With the right technology integration, families can enjoy a more practical, efficient, and focused cooking experience that leads to a balanced, nutritious diet. Therefore, the development of this data-driven Family Meal Plan app is a strategic step in supporting efforts to improve family health in the modern era [9].

B. Literature Review

There is a study by Amiri, Li, and Hasan that developed an AI-powered personalized meal planner for individuals with diet-related health concerns. The findings showed that the system was able to provide flexible and individualized meal recommendations and was beneficial in helping users plan healthier meals according to their conditions and preferences [10]. However, before designing a system, it is very important to conduct a thorough analysis. This analysis helps us understand how the system works, identify existing problems, and determine the system requirements. A relevant example can be seen in a study that developed a web-based system for recording service transactions, where the researchers focused on improving recording accuracy, accelerating administrative processes, and reducing manual errors. The development approach involved needs analysis, interface design, and the implementation of real-time data recording demonstrating how a structured and well-planned system design can effectively address user needs and operational challenges [11].

The use of AI has proven to have significant potential for enhancing meal planning apps such as the "Diet-Meal Chatbot" designed to provide personalized diet recommendations [12]. This system utilizes Natural Language Processing (NLP) and machine learning algorithms to understand users' preferences, nutritional needs, and physical condition, then suggests appropriate diet and activity

patterns. In addition to text-based chatbots, there are also voice-assisted systems for food logging that allow users to record food consumption quickly and in real-time via smart speakers or smartphones, thereby increasing the accuracy and convenience of personal diet assessments [13]. Voice technologies like Siri have proven to be highly beneficial because they can simplify user interaction with devices through voice commands, increasing the efficiency and accuracy of tasks. This is evident in their application in various fields, from medical records to health monitoring, demonstrating their flexibility and effectiveness in supporting a wide range of user activities [14,15]. This approach demonstrates that the integration of AI and voice technologies, such as voice recognition and Siri, can improve accuracy, personalization, and user engagement, which can be applied to the development of our Family Meal Plan app for more effective nutrition management and meal planning.

Furthermore, recent technological advancements highlight how AI-driven meal planning and voice-based systems can greatly reduce decision fatigue and support healthier lifestyle choices. Several studies emphasize that combining automation, nutrition databases, and contextual user data can significantly enhance the relevance of dietary recommendations. This trend aligns with the increasing demand for personalized health solutions within households, where convenience and accuracy are crucial. By integrating these approaches, the Family Meal Plan application can offer a more adaptive and intelligent user experience, ensuring that meal suggestions, nutritional calculations, and cooking assistance are tailored to each family member's needs and daily routines.

C. Operational Definition

1. Flutter

Flutter is an open-source SDK for developing high-performance and more reliable mobile applications for operating systems like iOS and Android [16]. Flutter can build cross-platform mobile apps for android, iOS, web and desktop [17]. With Flutter, developers can create fast, responsive, and engaging user interface (UI) applications using the Dart programming language.

2. Firebase

Firebase can be used for real-time databases, authentication, and cloud storage on iOS and Android devices. Firebase was first developed in 2011 by Firebase Inc. as a platform for web and mobile applications and was acquired by Google in 2014. Firebase is a NoSQL database that stores data in JSON format and enables fast app synchronization as long as an internet connection is available [18].

3. Figma

Figma is a design tool that is usually used to create mobile, desktop, website, and other applications [19]. We designed the UI display and prototype using Figma to make it easier for the frontend to create the display code for this application.

4. Speech-to-Text API & Siri

Speech-to-text (STT) is transcription software that automatically recognizes speech and transcribes what is spoken into an equivalent written format [20]. STT is a technology that can recognize human speech and then convert it into text. This technology has begun to be adopted by Apple in the form of the Siri app embedded in the iPhone, and Google Voice, which is embedded in Android smartphones [21]. Powered by artificial intelligence (AI) and personalized speech recognition, Siri can answer user questions through voice and display relevant information from various apps, such as web search or calendars [22].

5. SDLC

Software Development Life Cycle (SDLC) is a systematic and structured approach used in software development [23]. SDLC is a system development process carried out regularly with a top-down approach, often called the waterfall method. This process includes six main stages, defining needs to identify problems and system requirements, analyzing user needs, designing the interface and application structure, building the system through the coding process, conducting

testing to ensure the system is error-free, and the maintenance stage which includes improvements and feature development to maintain the system's optimal performance. [11] This foundation also supports the argument that a meal-planning application must adopt a structured and well-designed system, similar to the approach used in the study by Wahyudi and Tanamal. Their work demonstrates that systematic methods such as SDLC and technology-driven design have been widely applied and proven effective for developing modern applications.

II. METHOD

The method used to build this application is the Software Development Life Cycle (SDLC), which provides a structured and systematic approach to software development. The development of the Family Meal Plan with Voice Recognition and Nutrition Management application began with the Requirements Analysis phase. At this stage, the team identified user needs, functional requirements, and system specifications by observing daily challenges in meal planning, cooking, and nutritional tracking. This phase ensured that every feature developed would directly address real user problems.

Following this, the project entered the System and UI Design phase. The system architecture was designed at a high level by integrating the Flutter framework as the frontend with Firebase as the backend infrastructure supporting authentication, database management, and cloud storage. External services such as SiriKit for voice recognition and a nutrition API for nutrient calculation were also incorporated to enhance system capabilities. The user interface design was developed using Figma, following a clean and intuitive flow that includes the Onboarding screen, Voice Command interface, Meal Plan View, Grocery List, Recipe Instructions, and Cooking Timer.

In addition, an initial data model was created to outline the relationships between core entities such as users, recipes, nutrition data, and meal plans. This model helped ensure that data would be stored, retrieved, and processed efficiently throughout the application. The complete application flow is illustrated in Figure 1, showing how users move through different features in a seamless and organized manner.

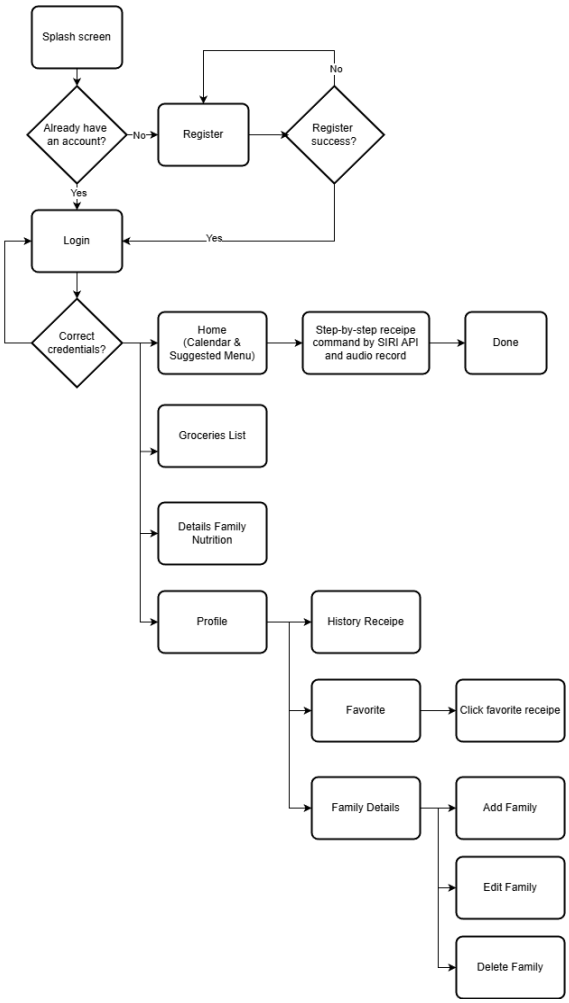

Figure 1. Application Flowchart

The Implementation phase was carried out using Flutter as the primary framework for building a responsive and cross-platform interface. Firebase functioned as the backend system, providing essential services such as user authentication, real-time data synchronization, cloud functions for automated processes, and file storage for recipe images and user-related data. To enable the voice interaction capability, the speech recognition feature was integrated through SiriKit on iOS. This integration was handled by a dedicated voice handler module that translated user voice commands into system

actions, ensuring smooth and accurate hands-free operation during cooking.

For nutrition features, a nutrition dataset sourced from Kaggle was processed using a machine learning algorithm to predict nutritional values including protein, carbohydrates, fat, fiber, and calories based on selected menu items. The trained model was exported in .h5 format and embedded directly into the iOS application. This approach allowed nutrient calculations to run locally on the device, increasing efficiency and reducing dependency on external APIs, especially in areas with unstable internet connections.

During the Testing phase, multiple test types were conducted. Unit testing using Dart ensured that individual functions worked as intended, while integration testing with Flutter Driver validated the interaction between UI components. Acceptance testing for voice commands was also performed to evaluate recognition accuracy and response performance. Additional performance, security, and usability testing involved real target users such as housewives and family cooks—to ensure the application was practical and easy to use in daily cooking activities. Finally, in the Deployment and Maintenance phase, the Continuous Integration and Deployment (CI/CD) pipeline was managed through GitHub Actions, automating the building, testing, and deployment processes to ensure consistent updates and long-term maintainability.

III. RESULTS AND DISCUSSION

A. RESULT

The initial screen when first accessing the application is the login page, which serves as the main gateway for users to enter the system securely. After successfully logging in, users will enter the home screen or main page of the application. This home screen is designed to be intuitive and user-friendly, allowing users to easily navigate through the different features provided. At the bottom of the interface, there are four main tabs: Home, Nutrition, Shopping List, and Account. Each tab plays an essential role in helping users manage their daily meal planning and nutritional monitoring in a structured way.

On the Home page, users will find a weekly date selection located at the top of the screen. This calendar component allows them to choose a specific date within the week. Once a date is selected, the application will automatically display the menu planned for that day, categorized into three mealtimes: Morning, Afternoon, and Evening. This structure enables users to plan their meals more efficiently by organizing their cooking activities according to nutritional needs, personal schedules, and family preferences. This feature ensures that the planning process becomes seamless, reducing the time needed to decide what to cook each day.

This page is also designed to be the first screen that appears after a successful login because it acts as the central hub where users can immediately view their daily recipes. The recipes displayed are adjusted based on user preferences, dietary restrictions, and previously entered nutritional requirements. The calendar at the top provides a comprehensive weekly overview, helping users prepare meals for upcoming days and ensure nutritional balance throughout the week.

At the bottom section, several quick-access buttons are provided to streamline navigation: a button directing users to the Nutrition section for viewing detailed nutrient breakdowns, a button leading to the Shopping List page where weekly groceries are automatically generated, and an Account button where users can edit personal information and customize app settings. When a recipe is selected, the system will display complete recipe details, ingredient lists, preparation time, and step-by-step cooking instructions. This interaction is supported by a clean visual interface, as illustrated in the splash screen and home screen shown in Figure 2.

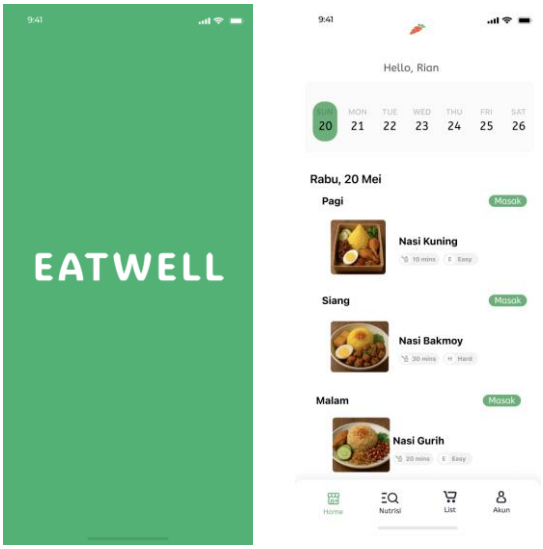

Figure 2. Splash screen and home Screen

On the Shopping List tab, users can access a weekly grocery list that is automatically generated and updated every Sunday. This list compiles all ingredients required to prepare the selected menus for the upcoming week, ensuring that users have a complete overview of what needs to be purchased. By automating this process, the application helps users save time and reduce the effort typically spent on manually planning and writing shopping notes. The feature is designed to be practical and organized, allowing users to shop more efficiently and avoid missing essential ingredients during meal preparation. Additionally, the structured list helps reduce food waste, as users only buy items based on planned meals rather than impulsive purchases. This ensures that all ingredients are utilized according to the weekly menu, supporting both cost efficiency and healthier meal habits. The shopping list interface is visually presented in Figure 3.

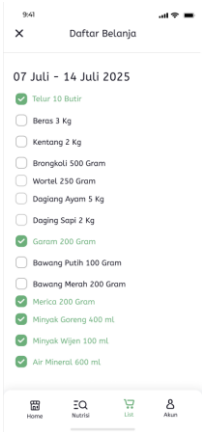

Figure 3. Shopping List

On the recipe page, users can view the menu they want to cook, complete with a detailed overview of the dish. This includes the estimated preparation and cooking time, allowing users to manage their schedules more efficiently. The page also displays the difficulty level of the dish, helping users assess whether the recipe matches their cooking skills and available time. By presenting this information upfront, users can make more informed decisions before beginning the cooking process.

The main highlight of the recipe page is the comprehensive cooking instructions feature. These instructions are arranged step-by-step, starting from ingredient preparation to the final cooking process, ensuring clarity and ease of understanding. After users read the general overview and confirm that they are ready to start cooking, they are directed to the next page containing the detailed recipe instructions. This interface is designed to be clean, intuitive, and highly supportive during the cooking process.

On this instruction tab, users can follow each step guided directly by the application. The integrated voice recognition feature enhances the cooking experience by reading instructions aloud and enabling hands-free navigation. Users can proceed to the next step simply by using voice commands, eliminating the need to touch the screen while cooking, which is especially useful when their hands are occupied or messy. This hands-free interaction increases convenience, safety, and efficiency in the kitchen. Overall, the recipe page and the voice-guided instruction system provide an

interactive and user-friendly cooking experience. The visual layout of both the recipe page and the instruction interface is presented in Figure 4.

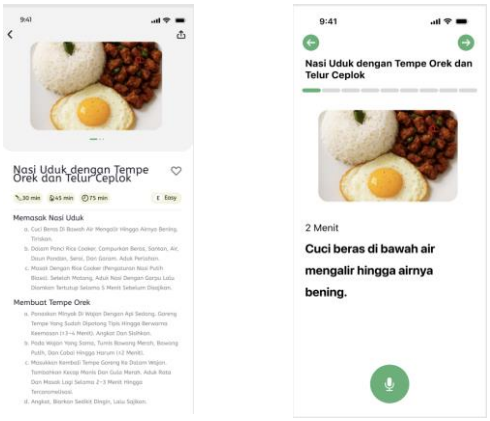

Figure 4. Receipt Page and Instruction

Once the user has finished cooking a recipe, a "Complete" page will automatically appear, as shown in Figure 5. This page serves as a summary screen that confirms the successful completion of the cooking process. It provides two main options for the user. The first option is Check Nutrition Information, which allows users to view the nutritional value obtained from the cooked dish. Through this feature, users can see detailed nutritional breakdowns such as calories, protein, carbohydrates, and fat along with how the meal contributes to the daily nutritional needs of each family member. This helps users monitor whether their dietary targets for the day are being met.

The second option is Return to Main Page, which redirects users back to the application's home screen. From there, users can continue planning their next meals, check upcoming menus, or navigate to other features such as the Shopping List or Nutrition tab. This page ensures a smooth transition after the cooking process is completed.

Figure 5. Page Done

On the Nutrition tab, users can view the nutritional records previously entered for each family member. This page allows users to monitor nutrient intake for every meal, including detailed information on protein, carbohydrates, fiber, fat, and total calories consumed throughout the day. The application automatically calculates these values based on the selected menu, ensuring that users receive accurate and real-time nutritional data without needing manual input.

Through this feature, families can easily track whether their daily nutritional needs are being met according to each member's dietary requirements and health goals. The clear presentation of nutrient distribution helps users evaluate eating patterns, identify deficiencies or excesses, and make necessary adjustments to maintain a balanced diet. By providing continuous monitoring, the Nutrition tab supports healthier lifestyle habits and helps prevent long-term nutritional issues. The layout and design of this page are shown in Figure 6.

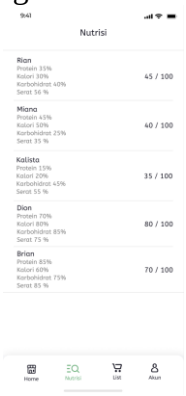

Figure 6. Nutrition Page

When users want to update their personal information, such as name, contact details, or home address, they can access the Profile page. This page also allows them to modify the delivery address for ingredients previously ordered, ensuring that groceries are sent to the correct location. In addition, users can change their preferred payment method to match their current needs, whether for convenience or security purposes. The Profile page also provides access to order status, enabling users to track whether their ingredient purchases are being processed, shipped, or delivered.

Another important feature available on this page is the notification settings. Users can customize reminders related to the application, such as alerts for upcoming cooking schedules, notifications when it is time to prepare a recipe, or reminders for weekly meal planning. These settings help users stay organized and maintain consistent cooking routines. The layout of the Profile page is illustrated in Figure 7.

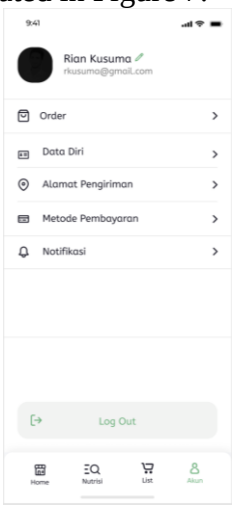

Figure 7. Profile Account

IV. CONCLUSION

This study successfully developed a prototype of a Family Meal Plan Application designed to simplify healthy meal planning and nutrition management through a comprehensive, data-driven approach. The application offers various features such as voice recognition, Siri integration, automated grocery lists, and real-time nutritional analysis that collectively help users make healthier and more informed food decisions. During testing, the system proved effective in reducing the time and cognitive effort required for daily meal preparation, while also increasing users' awareness of their nutritional intake. The prototype's hands-free cooking guidance and personalized menu suggestions further enhanced usability, particularly for busy families seeking practical solutions to maintain balanced diets. Although the results show strong potential for real-world implementation, the application still requires further development, including expanding its recipe database, refining machine-learning accuracy, improving cross-platform compatibility, and conducting large-scale user evaluations. These improvements will help ensure the application becomes a more robust, adaptable, and widely beneficial tool for supporting healthier family eating habits.

REFERENCES

[1] Asyati, M., et al. (2022). Manajemen penyelenggaraan makanan institusi di Pondok Pesantren Baitul Arqom Polinggona, Kecamatan Polinggona, Kabupaten Kolaka tahun 2022. Jurnal Gizi dan Kesehatan Indonesia. https://doi.org/10.37887/jgki.v3i3.29260

[2] Zadeh, M. S. A. T. (2024). AI Approaches in Personalized Meal Planning for a Multi Criteria Problem (Doctoral dissertation, North Dakota State University).

[3] Damayanty, A. E., Nuralita, N. S., & Thristy, I. (2021). Pentingnya Nutrisi Keluarga Di Masa Pandemi Dalam Upaya Pencegahan Penyakit Covid-19. JURNAL PRODIKMAS Hasil Pengabdian Kepada Masyarakat, 6(2), 133-138.

[4] Chaerul, M., & Zatadini, N. (2020). Pengurangan limbah makanan melalui perencanaan makan yang baik. Jurnal Ilmu Gizi, 18(3), 455–466. https://doi.org/10.14710/jil.18.3.455-466

[5] Jakob, D., Wilhelm, S., Gerl, A., Ahrens, D., & Wahl, F. (2025). Adapting voice assistant technology for older adults: A

comprehensive study on usability, learning patterns, and acceptance. Digital, 5(1), 4. https://doi.org/10.3390/digital5010004

[6] Swamilaksita, N., et al. (2024). Visualisasi rencana makan sebagai metode edukasi untuk mengurangi limbah makanan pada ibu rumah tangga. Jurnal Pendidikan Gizi, 3(2), 133–145. https://doi.org/10.35842/ilgi.v3i2.133

[7] Li, J., Maharjan, B., Xie, B., & Tao, C. (2020). A Personalized Voice-Based Diet Assistant for Caregivers of Alzheimer Disease and Related Dementias: System Development and Validation. Journal of medical Internet research, 22(9), e19897. https://doi.org/10.2196/19897

[8] Amiri, M., Li, J., & Hasan, W. (2023). Personalized Flexible Meal Planning for Individuals With Diet-Related Health Concerns: System Design and Feasibility Validation Study. JMIR formative research, 7, e46434. https://doi.org/10.2196/46434

[9] Jayabhaduri, R., Prabanjan, U. V., Gunashekara Reddy, M. R., Santhosh, G., & Yashas, M. R. (2025, April). AI-Driven Nutritional Intelligence: A Predictive Data Analytics Framework for Personalized Dietary Optimization. In 2024 International Conference on IT Innovation and Knowledge Discovery (ITIKD) (pp. 1-6). IEEE.

[10] Chikwetu, L., Daily, S., Mortazavi, B. J., & Dunn, J. (2023). Automated Diet Capture Using Voice Alerts and Speech Recognition on Smartphones: Pilot Usability and Acceptability Study. JMIR formative research, 7, e46659. https://doi.org/10.2196/46659

[11] Wahyudi, P., & Tanamal, R. (2024, September). Design and Development a Web-Based System for Recording Transactions of Contracted Service for Industrial Machine Repair at CV. Elmectro Mandiri. In 2024 2nd International Conference on Technology Innovation and Its Applications (ICTIIA) (pp. 1-5). IEEE.

[12] Samad, S., Ahmed, F., Naher, S., Kabir, M. A., Das, A., Amin, S., & Islam, S. M. S. (2022). Smartphone apps for tracking food consumption and recommendations: Evaluating artificial intelligence-based functionalities, features and quality of current apps. Intelligent Systems with Applications, 15, 200103.

[13] Liang, X., Batsis, J. A., Yuan, J., Zhu, Y., Driesse, T. M., & Schultz, J. (2022, June). Voice-assisted food recall using voice assistants. In International Conference on Human-Computer Interaction (pp. 92-107). Cham: Springer Nature Switzerland.

[14] Sezgin, E., Oiler, B., Abbott, B., Noritz, G., & Huang, Y. (2022). "Hey Siri, Help Me Take Care of My Child": A Feasibility Study With Caregivers of Children With Special Healthcare Needs Using Voice Interaction and Automatic Speech Recognition in Remote Care Management. Frontiers in public health, 10, 849322.

[15] Akturk, H. K., Snell-Bergeon, J. K., & Shah, V. N. (2021). Continuous glucose monitor with Siri integration improves glycemic control in legally blind patients with diabetes. Diabetes Technology & Therapeutics, 23(1), 81-83.

[16] Tashildar, A., Shah, N., Gala, R., Giri, T., & Chavhan, P. (2020). Application development using flutter. International Research Journal of Modernization in Engineering Technology and Science, 2(8), 1262-1266.

[17] Tyagi, P. (2021). Pragmatic flutter: building cross-platform mobile apps for android, iOS, web & desktop. CRC Press.

[18] Suparman, M., Rosada, M., Lutfi, M., Kamaliya, P., Sabaniah, F., Alfaro, I., & Rosdiana, M. (2023). Mengenal aplikasi figma untuk membuat content menjadi lebih interaktif di era society 5.0. Abdi Jurnal Publikasi, 1(6), 552-555.

[19] Lubis, N., Siambaton, M. Z., & Aulia, R. (2024). Implementasi Algoritma Deep Learning pada Aplikasi Speech to Text Online dengan Metode Recurrent Neural

Network (RNN). sudo Jurnal Teknik Informatika, 3(3), 113-126.

[20] Nugroho, K. (2019). Implementasi Sistem Speech To Text Berbasis Android Menggunakan APP Inventor Speech Recognizer. Jurnal Ilmiah Infokam, 15(1).

[21] Thakare, U. A., Thakare, P. B., & Dhawale, V. R. (2020). Siri-The Intelligent Personal Assistant. International Research Journal of Innovations in Engineering and Technology, (1), 17.

[22] Rohman, A. T., & Panglipury, G. S. (2024). Implementasi metode sdlc dalam transformasi desa melalui inovasi aplikasi pengaduan masyarakat berbasis android. Jurnal Informatika Dan Teknik Elektro Terapan, 12(1).

[23] Saputra, R., Ahmadi, D., Prastiyo, R., Hermawan, R., & Maulana, A. (2022). Aplikasi Media Pembelajaran Alat Musik Gitar Berbasis Android Menggunakan Metode SDLC: indonesia. Computer Science (CO-SCIENCE), 2(2), 90-99.