

# Safeglow: A Smart Personalized Skincare Recommendation System

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**Abstract:** In recent years, the demand for personalized skincare solutions has increased significantly due to growing awareness about skin health and cosmetic safety. Traditional skincare product selection methods are often confusing because users may not know which products are suitable for their specific skin type. To address this issue, *SafeGlow* is proposed as a smart mobile application that provides personalized skincare product recommendations based on user skin analysis. The system combines a skin-type questionnaire and facial skin image capture to identify user skin characteristics such as dry, oily, normal, combination, and sensitive skin. Based on the detected skin type, the application recommends suitable skincare products and redirects users to trusted shopping platforms for purchasing. The application is developed using React Native for the frontend, Node.js for backend services, and MongoDB for user data management. The system also includes secure login and registration features to provide a personalized user experience. Experimental results show that the application successfully delivers user-friendly skincare recommendations through an interactive and accessible mobile interface. Future enhancements may include AI-based skin condition detection, real-time ingredient analysis, and dermatologist consultation support.

**Keywords:** Personalized Skincare, Skin Type Detection, Mobile Application, React Native, Product Recommendation System, Facial Image Analysis, Node.js, MongoDB, Skin Quiz.

## INTRODUCTION

In today's digital world, personalized skincare solutions are becoming increasingly important due to growing awareness about skin health and cosmetic safety. Many users find it difficult to choose suitable skincare products because different skin types require different treatments and ingredients. Using inappropriate products can lead to skin irritation, acne, dryness, or other skin-related issues. Most existing skincare platforms provide general recommendations that may not match individual skin conditions. Therefore, there is a need for a smart and user-friendly system that can help users identify their skin type and receive personalized skincare recommendations.

*SafeGlow* is a mobile application developed to provide personalized skincare product suggestions based on user skin analysis. The system uses a skin-type questionnaire along with facial skin image capture to identify skin characteristics such as dry, oily, normal, combination, and sensitive skin. Based on the detected skin type, the application recommends suitable skincare products and redirects users to trusted shopping platforms for product exploration and purchase. This helps users save time and make better skincare decisions according to their personal needs.

The application is developed using React Native for the frontend, Node.js for backend services, and MongoDB for database management. It also includes secure login and registration features to maintain personalized user information and improve user experience. The system is designed with a simple and interactive interface so that users can easily navigate through the application, complete the skin quiz, capture skin images, and view product suggestions. The main aim of the project is to simplify skincare product selection and provide users with an accessible, efficient, and personalized skincare recommendation platform.

## LITERATURE SURVEY

Research on intelligent skincare and skin-analysis systems has evolved significantly over the years, beginning with studies on image-based dermatological analysis and progressing toward personalized recommendation systems. Esteva et al. demonstrated that deep neural networks could achieve dermatologist-level performance in skin-image classification, proving the effectiveness of AI-based skin analysis in healthcare applications [1]. Raj and Singh later explored image-processing techniques for extracting facial skin features such as wrinkles, pores, and texture patterns, establishing the foundation for digital skin analysis systems [2]. Around the same period, studies on cosmetic safety standards identified harmful ingredients and their effects on different skin types, emphasizing the importance of ingredient-awareness in skincare applications [3].

In 2020, research shifted toward mobile and personalized skincare solutions. Liu and Chen introduced a mobile-based skincare recommendation system that generated product suggestions using questionnaire responses and user preferences [4]. Wang and Lee proposed a hybrid filtering recommendation approach that combined user preferences with product attributes to improve recommendation accuracy [5]. Suresh et al. also highlighted the importance of accessibility and user-friendly mobile interfaces through mobile-based skin health monitoring systems [6]. These studies demonstrated the growing demand for smart skincare applications that are both personalized and mobile-friendly.

Further advancements focused on ingredient analysis, artificial intelligence, and intelligent recommendation techniques. Park et al. used Natural Language Processing (NLP) methods to identify harmful cosmetic ingredients and classify them according to safety [7]. Sharma discussed the use of Google APIs and real-time data retrieval methods in intelligent applications, enabling systems to fetch updated information dynamically from online sources [8]. AI-driven beauty recommendation systems introduced by Chen and Wong emphasized personalization using intelligent recommendation algorithms and user-specific data [9]. Sharma et al. later explored automated skin-disease detection using machine learning and image processing, demonstrating the effectiveness of facial image analysis for skin-related predictions [10].

Recent studies have focused on advanced intelligent skin-classification systems. Jeyakumar reviewed computer-aided intelligent methods for identifying and classifying skin characteristics using image processing and machine learning techniques [11]. Eapen further analyzed different methods of skin-type classification, including self-report questionnaires and photographic scales, while discussing the limitations of subjective skin assessment [12]. Kumar et al. proposed deep-learning-based skin-type classification models using facial images, achieving high accuracy but requiring large datasets and high computational resources [13]. These recent developments collectively influenced the design of SafeGlow, which combines questionnaire-based analysis, image-supported skin assessment, real-time product retrieval, and ingredient-safety evaluation to provide personalized skincare recommendations.

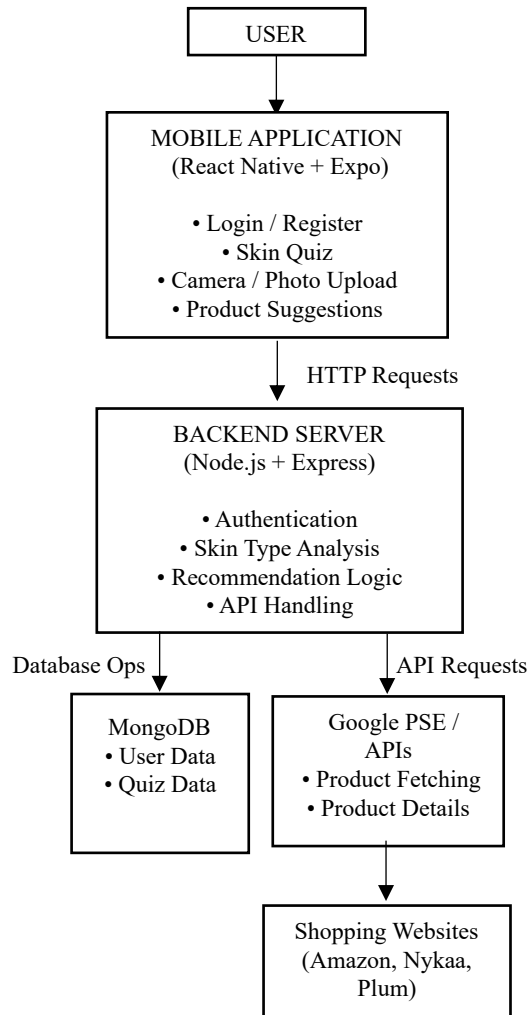
## SYSTEM DESIGN

### A. System Model

SafeGlow is a personalized skincare recommendation system designed as a mobile application that assists users in identifying their skin type and receiving suitable skincare product suggestions. The system consists of two main entities: the User, who interacts with the application through login, skin quiz, and product exploration, and the Backend System, which processes user inputs, analyzes skin characteristics, and generates personalized

recommendations. The application combines questionnaire-based skin analysis with photo-supported input to improve the accuracy of skin-type detection. Based on the identified skin type, the system recommends suitable skincare products and redirects users to trusted online shopping platforms.

### B. Architectural Overview



The system follows a layered architecture consisting of the following components:

#### 1. Presentation Layer (Mobile Application)

The frontend of SafeGlow is developed using React Native with Expo. It provides screens for user registration, login, skin quiz, camera input, and product recommendations. The interface is designed to be simple, interactive, and mobile-friendly.

#### 2. Application Layer (Backend Services)

The backend is developed using Node.js and Express.js. It handles user authentication, skin-type analysis, recommendation logic, and communication with external services. REST APIs are used to transfer data between the frontend and backend.

#### 3. Database Layer

The system uses MongoDB for storing user information, login credentials, and application-related data. MongoDB provides flexibility and scalability for handling user records efficiently.

#### 4. Recommendation & Analysis Layer

This module processes quiz responses and image-supported inputs to determine the user's skin type. Based on the detected skin category, the system filters and recommends skincare products suitable for the user.

#### 5. External Product Retrieval Layer

The application uses Google Programmable Search Engine (PSE) to retrieve real-time skincare product information from trusted online platforms such as Amazon, Nykaa, and Plum.

### C. Component Responsibilities

#### • Mobile Application:

- Provides registration and login interfaces.
- Displays skin-type quiz and camera input module.
- Shows personalized skincare recommendations.
- Redirects users to external product pages.

#### • Backend Server:

- Processes user requests and authentication.
- Analyzes quiz responses and determines skin type.
- Handles recommendation logic and product filtering.
- Communicates with APIs and database.

#### • Database:

- Stores user login and profile information.
- Maintains application data securely.

#### • Product Recommendation Module:

- Fetches skincare products from online platforms.
- Filters products according to detected skin type.
- Displays safe and suitable product suggestions.

### D. Data Model

#### User Data:

- Name.
- Email Address.
- Password.
- Skin-Type Information.

#### Quiz Data:

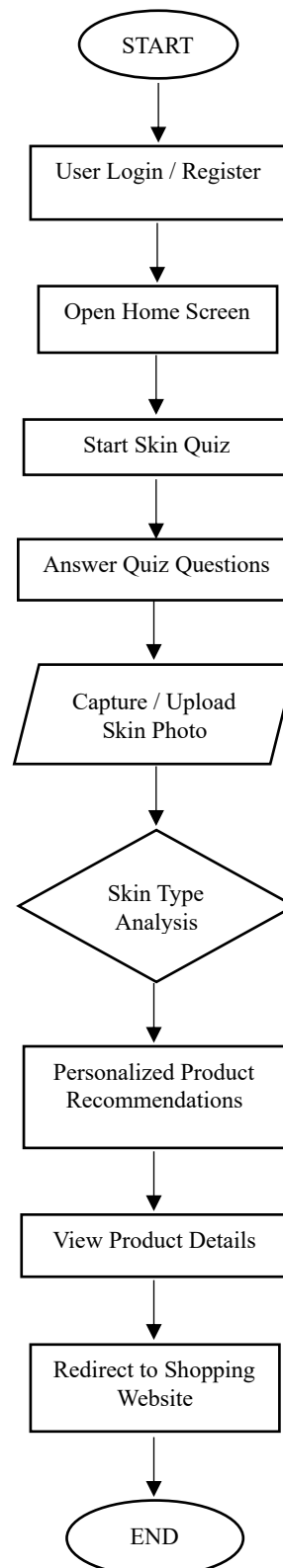
- Responses related to dryness, oiliness, acne, pores, and sensitivity.

#### Product Data:

- Product Name.
- Product Description.
- Product Link.
- Product Image.
- Recommended Skin Type.

### E. Core Workflow

#### 1) User Workflow



1. User registers or logs into the application.
2. User completes the skin-type quiz and optionally uploads a skin photo.
3. The backend analyzes the input and identifies the skin type.

4. The system fetches skincare products suitable for the detected skin type.
5. Personalized product recommendations are displayed to the user.
6. User can open the product page on external shopping websites.

#### F. Security and Privacy

- User credentials are securely managed through authentication mechanisms.
- Sensitive information is stored securely in the MongoDB database.
- API communication between frontend and backend is protected using secure HTTP protocols.
- The application does not publicly expose personal user information.

#### G. Performance and Scalability

The system is designed to provide smooth performance on mobile devices with minimal response time. Real-time product retrieval and modular backend architecture improve scalability, allowing future integration of advanced AI-based skin analysis and additional skincare features.

#### H. Extensibility

SafeGlow can be extended in the future by integrating machine-learning-based skin analysis, dermatologist consultation modules, ingredient-level product evaluation, personalized skincare routines, and cloud deployment for wider accessibility.

### METHODOLOGY

The SafeGlow skincare recommendation system follows a systematic methodology to provide personalized skincare suggestions based on user skin analysis. The development process began with requirement analysis, where common skincare problems such as incorrect product selection, lack of skin-type awareness, and difficulty in understanding cosmetic ingredients were studied. Existing skincare applications and research papers were analyzed to identify limitations in current systems and determine the need for a personalized and user-friendly skincare recommendation platform.

The system was designed using a client-server architecture consisting of a React Native mobile application, Node.js backend services, MongoDB database management, and external product retrieval APIs. The frontend provides interfaces for user registration, login, skin quiz, camera input, and recommendation display. The backend processes user inputs, manages authentication, analyzes skin characteristics, and generates suitable skincare recommendations. MongoDB is used for storing user information and application data securely.

The methodology for skin-type detection combines a questionnaire-based approach with optional image-supported input. Users answer questions related to oiliness, dryness, acne, pores, and skin sensitivity. The backend evaluates these responses and classifies the user into categories such as dry, oily, normal, combination, or sensitive skin. The captured skin image serves as supportive input for improving recommendation accuracy. After identifying the skin type, the system retrieves real-time skincare products using Google

Programmable Search Engine (PSE) and filters products according to user suitability.

The implementation phase involved integrating frontend and backend communication using REST APIs. Authentication features such as login and registration were implemented to provide personalized user sessions. The recommendation module was designed to display suitable skincare products along with external links for product exploration and purchase. Extensive testing was carried out to verify user authentication, quiz functionality, recommendation accuracy, and smooth navigation across all application modules.

Finally, the system was optimized for mobile performance, usability, and scalability. The modular architecture allows future enhancements such as AI-based skin analysis, ingredient-level safety evaluation, dermatologist consultation support, and cloud deployment. This methodology ensures that SafeGlow provides an efficient, accessible, and personalized skincare recommendation experience for users.

### IMPLEMENTATION

The implementation of SafeGlow integrates mobile application development, backend services, database management, and real-time product retrieval to provide a personalized skincare recommendation platform. The system is designed using a modular architecture where each component performs a specific task such as user authentication, skin-type analysis, product recommendation, and external product redirection.

The frontend of the application is developed using React Native with Expo, which provides a responsive and user-friendly mobile interface. The frontend includes screens for registration, login, skin quiz, image capture, home page navigation, and product recommendation display. Expo Camera API is used to capture skin images from the mobile device, while React Navigation manages smooth transitions between screens. AsyncStorage is implemented to store user session information locally for improved user experience.

The backend services are implemented using Node.js and Express.js. The backend handles user authentication, processes quiz responses, analyzes skin characteristics, and manages communication between the frontend and external services. REST APIs are developed for secure data exchange between the mobile application and the server. User credentials and application data are stored in MongoDB, which provides scalable and flexible database management.

The skin-type detection module is implemented using a rule-based analysis approach. User responses from the skin quiz are evaluated to classify skin types such as dry, oily, normal, combination, and sensitive skin. The captured facial image is used as additional supportive input for improving recommendation accuracy. After determining the skin type, the backend fetches real-time skincare product information using Google Programmable Search Engine (PSE) and filters products according to user suitability.

The recommendation module displays personalized skincare products along with product details and external shopping links from trusted platforms such as Amazon, Nykaa, and Plum. The application allows users to directly open these product pages for further exploration and purchase. Extensive testing was performed to ensure proper login functionality, smooth navigation, accurate

recommendation generation, API communication, and overall system reliability. The final implementation demonstrates that SafeGlow successfully delivers a personalized, accessible, and interactive skincare recommendation experience.

## RESULTS AND ANALYSIS

The implementation of SafeGlow resulted in a fully functional mobile application capable of providing personalized skincare recommendations based on user skin analysis. The system successfully integrated user authentication, questionnaire-based skin analysis, image-supported input, real-time product retrieval, and personalized recommendation generation into a single platform. The application was tested across different workflows to verify functionality, usability, and recommendation accuracy.

From a functional perspective, the application successfully allowed users to register and log in securely through the authentication module. The skin quiz operated smoothly by collecting user responses related to dryness, oiliness, acne, pores, and skin sensitivity. Based on these responses, the backend accurately classified users into different skin types such as dry, oily, normal, combination, and sensitive skin. The camera module also functioned correctly by allowing users to capture facial skin images as supportive input for analysis.

The recommendation module successfully fetched real-time skincare product information using Google Programmable Search Engine (PSE). Personalized product suggestions were displayed according to the detected skin type, and users were redirected to trusted shopping platforms such as Amazon, Nykaa, and Plum for product exploration and purchase. The integration between frontend, backend, database, and external APIs functioned effectively without major communication issues.

In terms of user experience, the React Native frontend provided a simple, responsive, and interactive interface for navigating between application modules. Testing confirmed smooth transitions between login, quiz, camera, and recommendation screens. The system also demonstrated reliable performance on mobile devices with minimal response delay during quiz submission and product retrieval.

The overall results indicate that SafeGlow successfully achieves its objective of providing personalized skincare recommendations through an accessible and user-friendly mobile platform. The project demonstrates the practical implementation of mobile technologies, backend integration, and real-time product retrieval in the skincare domain while also providing a scalable foundation for future AI-based enhancements and advanced skin-analysis features.



Fig 1: App Logo

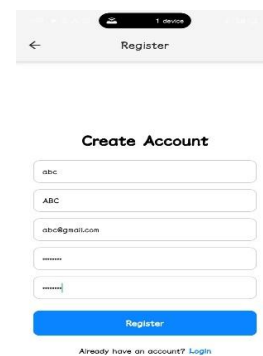


Fig 2: Register Screen

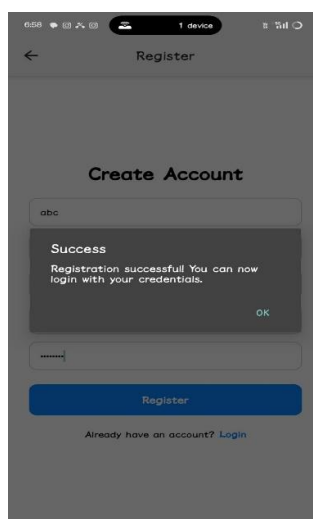


Fig 2.1: Successful Registration

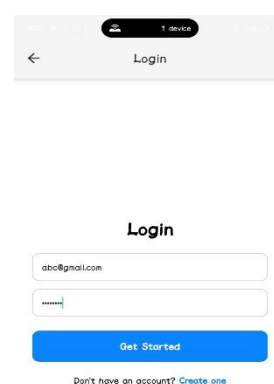


Fig 3: Login Screen

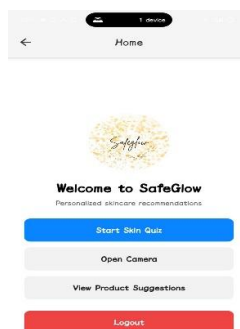


Fig 4: Home Screen

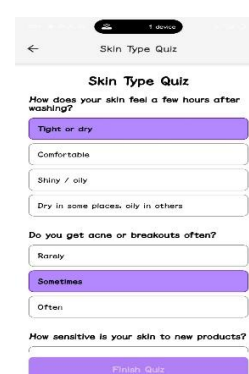


Fig 5: Quiz Screen



Fig 6: Camera Screen



Fig 7: Product Loading Screen

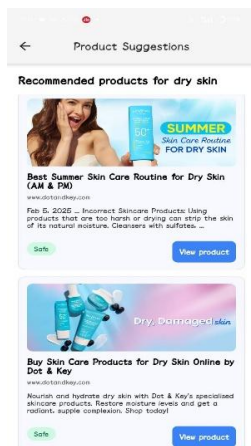


Fig 8: Product Suggestion Screen

## CONCLUSION AND FUTURE SCOPE

SafeGlow successfully demonstrates the implementation of a personalized skincare recommendation system using mobile technologies and intelligent skin analysis techniques. The application integrates user authentication, skin-type questionnaires, image-supported input, real-time product retrieval, and personalized recommendation generation into a single user-friendly platform. By analyzing user skin characteristics and recommending suitable skincare products, the system helps users make informed skincare decisions and reduces the risk of using unsuitable cosmetic products. The project also demonstrates the effective integration of React Native, Node.js, MongoDB, and Google Programmable Search Engine to provide a scalable and interactive mobile application experience.

The results obtained from the implementation confirm that the system performs its core functionalities efficiently, including secure login, skin-type detection, recommendation generation, and product redirection to trusted shopping platforms. The modular architecture of the application ensures smooth communication between frontend, backend, database, and external APIs while maintaining good usability and performance on mobile devices.

Although the current system provides personalized skincare recommendations effectively, there are several opportunities for future enhancement. Advanced AI and deep-learning models can be integrated for more accurate facial skin analysis and automatic detection of conditions such as acne, pigmentation, and wrinkles. Ingredient-level safety evaluation and dermatologist consultation

support can also be added to improve recommendation reliability. Future versions may include cloud deployment, chatbot assistance, multilingual support, and personalized skincare routine generation to enhance accessibility and user engagement. These improvements can further transform SafeGlow into a comprehensive intelligent skincare assistance platform.

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