SKINSIGHT

Skin Disease Detection and Skin Care App

Done by :-

Monesha. Ra

22BPS1190

1.ABSTRACT

Skin diseases and skincare concerns are common and often require timely diagnosis and consistent management for effective treatment. SkinSight is a machine learning-powered mobile application designed to assist users in diagnosing various skin conditions and receiving personalized skincare recommendations. Utilizing advanced image processing and classification techniques, the app allows users to upload images of skin abnormalities, which are then analyzed by a pre-trained deep learning model to predict potential skin conditions. SkinSight employs the ResNet50 architecture, a deep convolutional neural network well-suited for image classification tasks, to identify and classify skin conditions such as acne, eczema, melanoma, and more. This approach offers users a convenient, accessible tool for initial assessments, which may help guide further medical consultations or care.

Beyond diagnostic capabilities, SkinSight features a skincare quiz to assess users' skin types and primary concerns, such as hydration, acne management, or anti-aging. Based on quiz results, the app recommends products tailored to each user’s needs by querying a skincare products database. The quiz aims to provide targeted advice for effective skincare, promoting a holistic approach to skin health by addressing individual preferences and challenges.

To further enhance user engagement and facilitate health monitoring, SkinSight offers progress tracking capabilities. Users can view their diagnostic history and track changes over time, helping them understand the effectiveness of different skincare routines or treatments. This visual tracking feature provides insights into the user’s skin health journey, enabling adjustments to routines based on observed trends.

SkinSight is built with a robust tech stack, featuring a React Native front end for a seamless mobile experience and a Flask-based backend for efficient data processing and model handling. MySQL is used to store user data, diagnostic results, and skincare routines securely, allowing personalized information retrieval across sessions. The application prioritizes user-friendly design and secure data management, with token-based authentication and password hashing for login and registration.

By integrating disease diagnosis, skincare recommendations, and progress tracking, SkinSight provides a unique platform that empowers users to take proactive steps in managing their skin health, promoting informed self-care, and potentially preventing more serious dermatological issues through early detection and personalized skincare guidance.

2. METHODOLOGY

Data Collection

1. **Skin Disease Image Dataset**: This dataset, sourced from Kaggle, comprises labeled images for a variety of common skin conditions. Each condition is categorized to aid in accurate classification, covering categories such as acne, eczema, melanoma, and other dermatological conditions. The dataset is divided into training and testing subsets, stored in Google Drive for easy access from Google Colab.
2. **Cosmetics Dataset**: A second dataset of skincare products, also from Kaggle, is used to provide tailored skincare recommendations. This dataset includes product names, categories, and ingredients, which are matched to user-reported skin types and concerns from the quiz.

Model Selection and Training

- **Model Choice**: The ResNet50 architecture was chosen for its high accuracy in image classification tasks. This deep learning model is pre-trained on the ImageNet dataset, allowing for transfer learning on the skin disease dataset. ResNet50's design, with its residual connections, helps avoid gradient vanishing issues, enabling deeper network training and better performance.
- **Training Environment**: Google Colab was selected as the training platform due to its free GPU support, which significantly speeds up the training process. Images are preprocessed by resizing and normalizing them to match the input requirements of ResNet50.
- **Fine-Tuning and Testing**: The model was fine-tuned on labeled skin disease images to achieve optimal performance. Training was evaluated against a test set to ensure generalization, with key metrics like accuracy and precision used for assessment. The trained model is then saved to Google Drive and loaded into Flask for real-time predictions.

App Development

1. **Frontend Development**: SkinSight's frontend is built with React Native and Expo, chosen for cross-platform compatibility and ease of development. Expo's router library enables smooth navigation across app pages such as Home, Diagnose, Track, and Skincare Quiz. Android Studio was used for testing and debugging on various device configurations.
2. **Backend Development**: Flask is the core framework for the backend, responsible for processing image uploads, quiz responses, and user authentication. The backend connects to a MySQL database hosted on a server to store user data, diagnoses, and skincare recommendations. API endpoints were developed for each function, ensuring secure and efficient data transfer between the app and the server.
3. **Database Structure**: A MySQL database named "skinsight" stores essential information:
    - **Users Table**: Stores user details such as name, email, and hashed password.
    - **Diagnoses Table**: Records the skin conditions diagnosed for each user, including timestamps.
    - **Skincare Routine Table**: Contains recommended skincare routines based on quiz results, with one routine per user at any time.

3.IMPLEMENTATION

Image Diagnosis

1. **Image Upload and Preprocessing**:
    - On the Diagnose page, users can upload images of their skin conditions. This feature is built using React Native's image picker, allowing users to select images from their device gallery or capture new photos.
    - Once an image is selected, it's sent to the Flask backend, which handles processing. Here, the image is pre-processed (e.g., resizing, normalization) to match the input requirements of the ResNet50 model used for classification.
2. **Model Prediction**:
    - The processed image is fed into the ResNet50 model trained on skin disease categories, providing a probable diagnosis based on visual features.
    - The model outputs the disease class with the highest probability, and this diagnosis is then mapped to the specific disease name (such as "Acne," "Eczema," etc.) with additional details if available.
3. **Diagnosis Report**:
    - The result, including the diagnosed condition, is displayed on the Diagnose page. Users also receive general advice, such as recommended actions or alerts for conditions that may require professional consultation.
    - Diagnosis reports include not only the name of the condition but also common causes to provide users with more context about their skin issues.
4. **Saving Diagnosis**:
    - Each diagnosis is stored in the MySQL database under the Diagnoses table, linked to the user's profile. The table includes fields for user_id, disease_id, diagnosis_date, and other relevant data, ensuring that each diagnosis is associated with a specific user.

- This functionality allows users to view their diagnostic history over time, creating a comprehensive record of their skin health journey.

Skincare Quiz and Product Recommendation

1. **Quiz Setup**:
    - The skincare quiz is implemented in the skincare.jsx component in React Native. Users answer a series of questions to assess their skin type (dry, oily, or combination) and identify concerns such as glow, hyperpigmentation, hydration, or anti-aging.
    - The quiz follows a multiple-choice format, designed to gather information that will tailor product recommendations based on individual needs.
2. **Data-Driven Product Matching**:
    - Once the user completes the quiz, the responses are used to query the cosmetics dataset stored in MySQL. The query filters products based on tags that match the user's skin type and main concerns.
    - Using an SQL ranking query, the backend identifies the top fifteen products suited to the user's preferences. Recommendations may focus on concerns like moisturizing for dry skin, oil control for oily skin, or anti-inflammatory products for sensitive skin.
3. **Routine Management**:
    - For each user, only one skincare routine is active in the database at any given time. When a new quiz is taken, the previous routine entries are removed, and a fresh set of recommendations is stored in the skincare table.
    - The app ensures that the current routine is available for the user to view or edit at any time. Users can continue to see this recommended routine even after logging out, as the information is retrieved from the skincare table when they log back in.

Progress Tracking

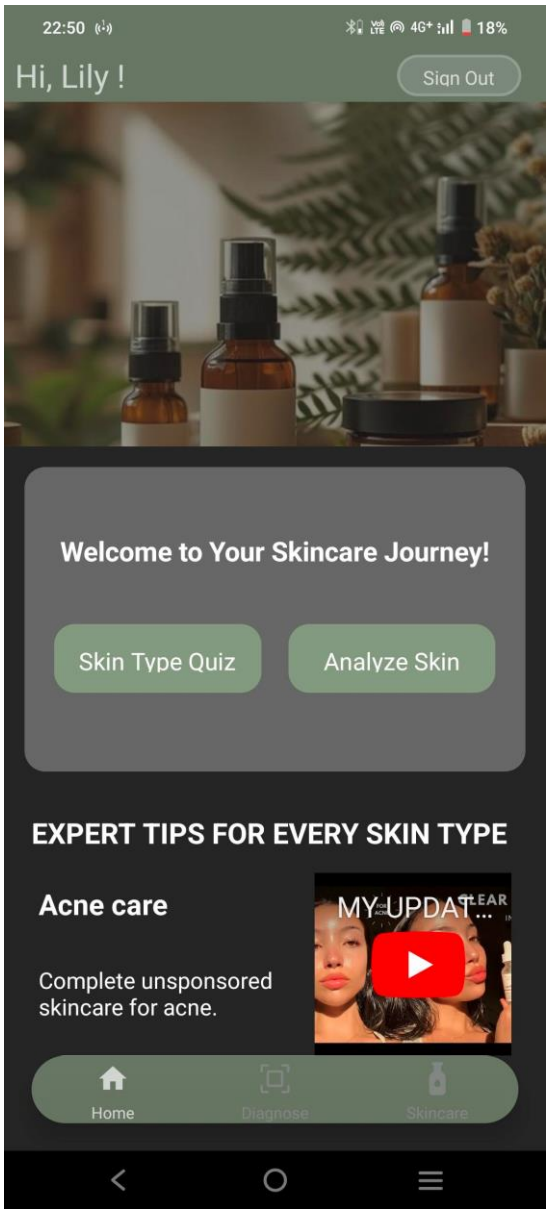
1. **Tracking and Visualization**:
    - On the Track page, users can review a timeline of their skin condition history, which includes every past diagnosis and timestamp. The diagnoses table in the MySQL database stores these records, helping to create a complete diagnostic history.
    - Visual progress bars are generated using React Native charting libraries. These visualizations plot the frequency of diagnoses or display changes over time to provide users with a visual representation of their skin health journey.
2. **Progress Insights**:
    - By analyzing diagnostic trends, the app provides users with insights, such as identifying recurring issues or noticing improvements. This information empowers users to understand how their skin responds to different treatments or routines.

User Authentication

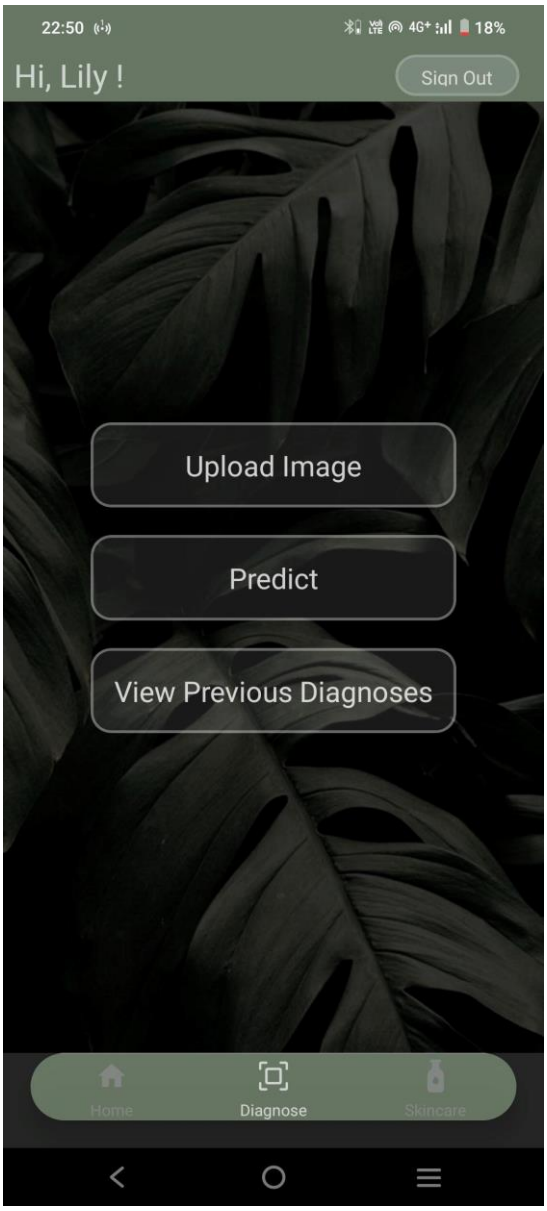
1. **Secure Login and Sign-Up**:
    - The authentication system is built with Flask and MySQL. Users can register or sign in using the React Native login and sign-up pages.
    - The MySQL users table includes columns for id, name, email, password, and created_at, capturing all essential details.
2. **Session Management and Persistence**:
    - After logging in, users remain authenticated between sessions, allowing for a seamless experience. This is achieved through token-based authentication, stored on the device securely to prevent unauthorized access.
    - When users log back in, the system automatically fetches their profile information, diagnostic history, and the current skincare routine from the database. This setup guarantees that each user's experience remains personalized and consistent across sessions.

4.RESULT

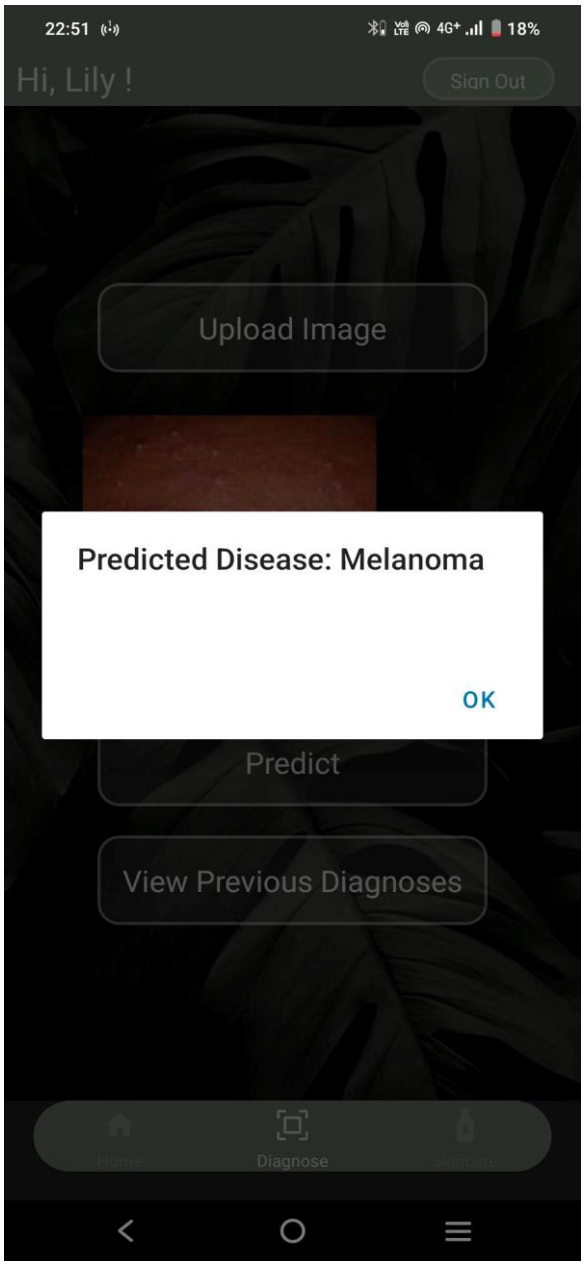
1.Home Page



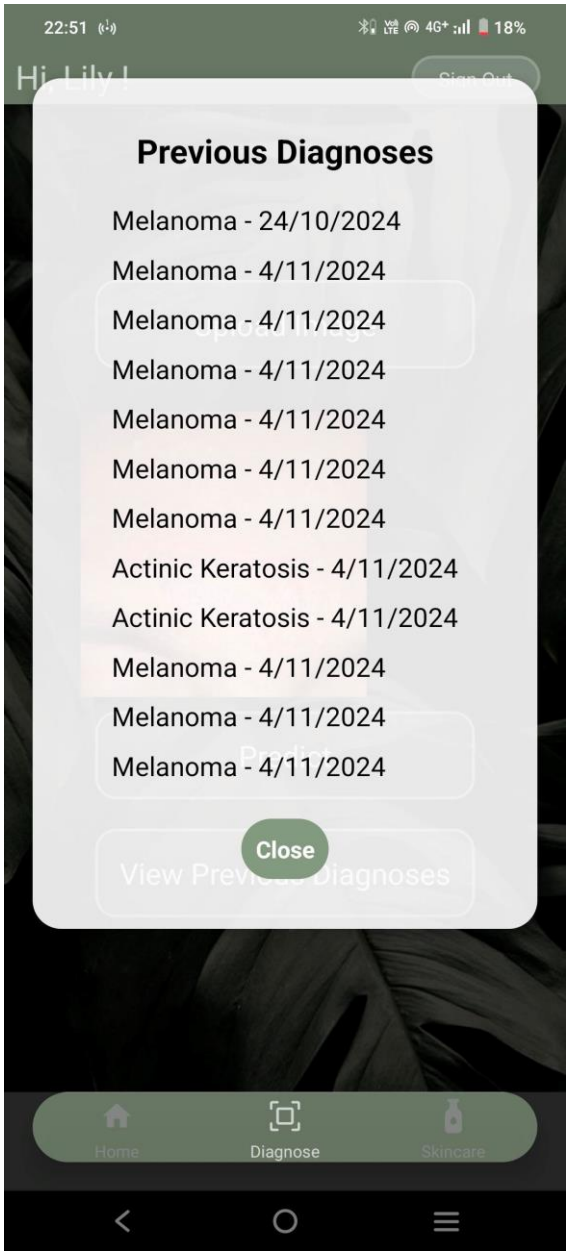
2.Diagnose Page



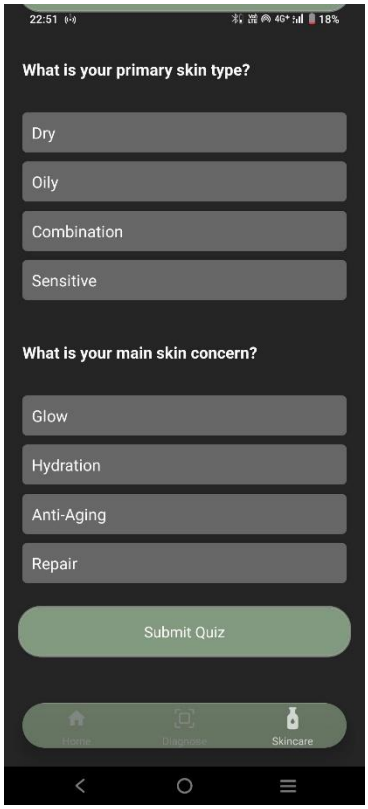
3.Disease Prediction

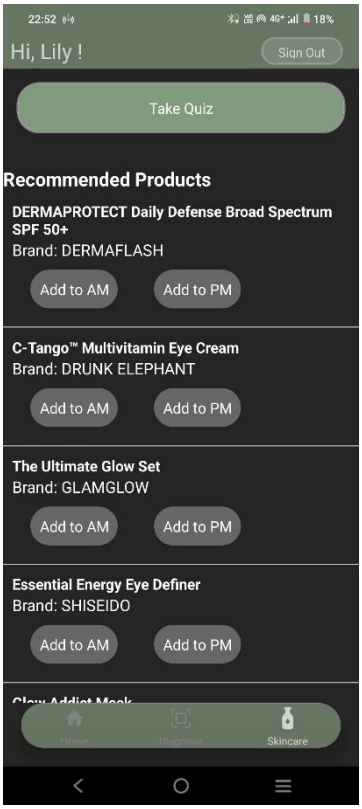


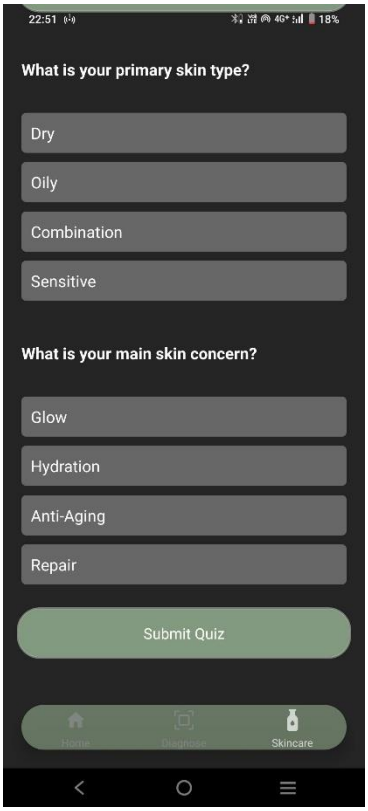
4.User History



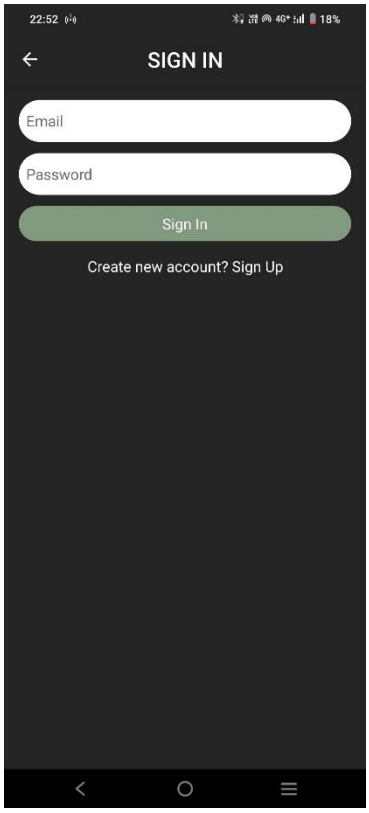
5.Skincare Page

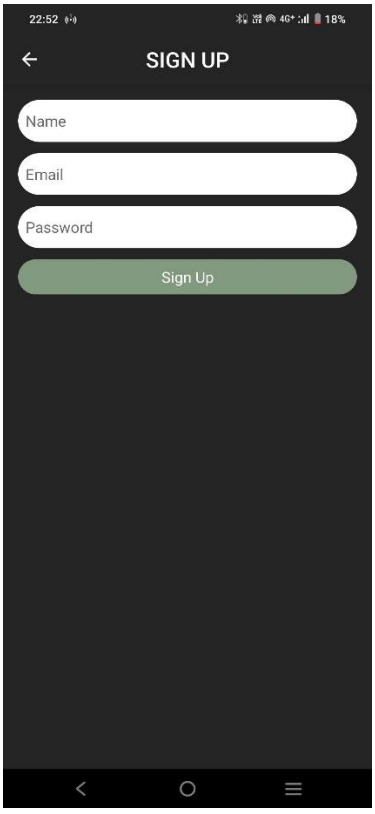






6.Sign Up and Sign In





5.CONCLUSION

The SkinSight project successfully integrates machine learning with mobile technology to offer a convenient solution for skin health management. Through its image classification feature, users can perform an initial self-assessment of skin conditions simply by uploading a photo. This approach increases accessibility, providing a starting point for users who may not have immediate access to dermatological care. By delivering a preliminary diagnosis, SkinSight encourages users to make informed choices about seeking further professional guidance if necessary.

In addition to diagnosis, SkinSight enhances user experience with personalized skincare recommendations based on a quiz that considers skin type and specific concerns like hydration or acne. This tailored approach acknowledges the complexity of individual skincare needs and aims to assist users in building effective daily routines. The app also provides tracking features, enabling users to monitor their skin's progress over time, adjust their routines as needed, and gain insights into the efficacy of their skincare habits.

Overall, SkinSight demonstrates the potential of combining technology with self-care in the realm of dermatology. By offering accessible skin health support and empowering users with data-driven insights, SkinSight fosters informed, proactive skin management. Future versions of the app could further enhance its capabilities by incorporating additional user data or environmental factors, aiming for even more personalized and effective recommendations. In its current form, SkinSight marks a meaningful advancement in making skin health support available to a wider audience, contributing to better self-care and skin health awareness.