FINAL YEAR PROJECT

SKIN ACNE DETECTION

GOVT. RABIA BASRI GRADUATE COLLEGE FOR WOMEN, WALTON ROAD, LAHORE

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SESSION: **2021-2025**

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Bachelor of Science in Computer Science
FINAL YEAR PROJECT REPORT

"SKIN ACNE DETECTION"

A project presented to

Punjab University, College of Information & Technology, Lahore

In partial fulfillment of the requirement for the degree of
Bachelor of Science in Computer Science
Session (2021-2025)

BY:

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DECLARATION

The work reported in this project is completed by **Safia Sadaf (Roll No. 071195)**, and **Nida Karamat (Roll No. 071165)** under the supervision of **Ms. Aster Noor,** Lecturer in Computer Science, Govt. Rabia Basri Graduate College For Women, Walton Road, Lahore. We hereby declare that, we want to make it clear that we didn't copy any part of this software from anywhere else. We created this software and the report entirely on our own. If it's found that any part of this project is copied from somewhere else, we'll take responsibility for it. We haven't used any of this work in any other degree application at any university or institute.

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STATEMENT OF SUBMISSION

This is to certify that following students have successfully completed the final project named as: **SKIN ACNE DETECTION** at **Govt. Rabia Basri Graduate College For Women, Walton Road, Lahore** to fulfill the partial requirement of the degree of Bachelors of Computer Science.

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It is certified that this document does not contain any spelling, punctuation, or grammatical mistakes. This document is well organized, and this document meets the defined objectives.

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ABSTRACT

The Skin Acne Detection App enables users to care for their skin and understand acne better. Acne is one of the most prevalent skin problems and affects millions around the globe, with pre-teens, teens, and young adults being the most susceptible age group.This app will allow user to upload images of their skin, which are analyzed to determine acne severity levels (e.g:mild,moderate, or severe).It will provide a customized skincare recommendation, tracks progress over time, and offers reminder for daily skincare routine.

This app features a Skincare Board for personalized tips and product recommendation and a Daily Routine Scheduler to guide users through morning, evening, and night routines.Educational Resource on acne causes,prevention,and Treatment are integrated to increase awareness and improve user engagement.

The project follows an agile methodology to ensure iterative development, flexibility, and continuous user feedback.By combining convenience, education and advanced detection methods,this app will empower users to take control of their skin health, bridging the gap between professional consultation and self-care.

CHAPTER 1

INTRODUCTION

1.1. Background

Acne is one of the most prevalent skin conditions, affecting millions of individuals worldwide, particularly teenagers and young adults. It arises due to factors such as hormonal changes, genetics,and improper skincare routines. Blockage of sebaceous glands and colonisation with Propionibacterium acnes leads to acne. Treatment of acne should be started as early as possible to minimize the risk of scarring and adverse psychological effects.While it is not life-threatening, acne can impact not only physical appearance but also psychological well-being,leading to issues like self-esteem and social anxiety. Managing acne effectively is often accessible to everyone due to financial or logistical constraints.

In recent years, advancement in artificial intelligence (AI) and image processing have opened new possibilities for healthcare application. By integrating AI mobile technology, it is possible to provide users with an accessible and efficient solution for acne detection, the app promotes skincare and empowers users to take charge of their skin health.

This project aims to leverage image processing and machine learning techniques to provide users with an app that can analyze their skin condition, detect acne severity, and offer customized skincare recommendations.

1.2. Problem statement

The lack of accessible and affordable solutions for acne detection leave many individuals without proper guidance. Existing methods rely on in-person dermatological consultation, which may not be feasible for everyone. Furthermore, users struggle to track their acne progression and maintain consistent skincare routine, resulting in ineffective management.

This project aims to bridge the gap between dermatological expertise and user accessibility by developing a Skin Acne Detection application. Using image processing techniques, the app will analyze user-provided images to detect acne and provide tailored recommendations. By leveraging technology, the app will empower users to take control of their skincare journey without the need for expensive consultations or specialized equipment.

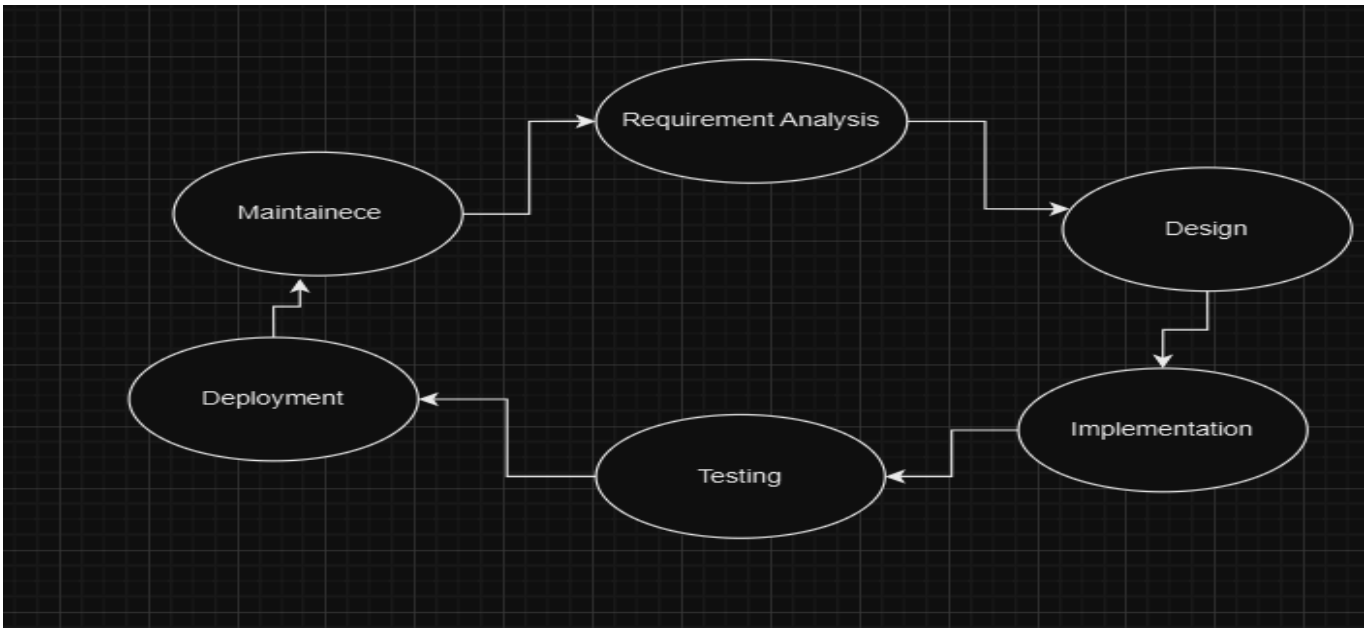
1.3. Objective

The primary objectives of this project are:

- Create a mobile app that uses artificial intelligence to detect how severe acne is from photos.
- Give users personalized skincare advice based on their acne severity and skin type.
- Allow users to track their acne progress over time and set reminders for skincare routines.
- Provide helpful information and tips on preventing and treating acne to encourage informed self-care.

1.4. Methodology

For the development of the Skin Acne Detection App,we have chosen the Agile model,because agile is an iterative and incremental approach that focuses on collaboration and flexibility. It involved breaking the development process into smaller iterations called sprints,where each sprint delivers a working product increment.In each sprint, we aim to complete a set of prioritized tasks, such as developing user authentication, implementing image analysis, or adding new educational resources. At the end of each sprint, we test the functionality and gather feedback, allowing us to refine the features before moving forward. This iterative process supports quick adjustments and ensures that each part of the app meets user expectations and technical requirements.
For developing the android web app, we follow this methodology:



1.5. Dataset overview

The dataset used in this project is critical for training the machine learning model to detect acne accurately.

- The dataset comprises images collected from publicly available medical repositories and dermatological research studies.
- Additional data augmentation techniques are applied to enhance the diversity and size of the dataset.

1.6. Dataset Characteristics

- Diversity: Includes a wide range of skin tones, textures, and acne severity levels to avoid biases.
- Labels: Each image is annotated with specific attributes such as acne severity (mild, moderate, severe) and skin type (oily, dry, combination).
- Quality: High-resolution images ensure accurate analysis and feature extraction.
- Volume: Contains thousands of labeled images suitable for training and testing the machine learning model.

Images are resized and normalized to standard dimensions for efficient processing.Techniques such as rotation, flipping, and cropping are applied to augment the data and improve model generalization.The dataset complies with ethical standards, ensuring no personally identifiable information is included.Permissions are acquired for using any proprietary data.

1.7. Scope of the project

This project to aim user to create a user-friendly mobile app for detecting and managing skin acne.The app will analyze skin images to determine acne severity(mild,moderate,or severe).Track acne progress over time and help users create daily skincare routines.Provide educational resources for acne prevention and treatment.
The scope of this project is to design and develop a mobile application that leverages machine learning and image processing techniques to assist users in managing acne effectively. This project addresses the need for an accessible, cost-effective, and user-friendly solution for skin acne detection, monitoring, and prevention. The app focuses on empowering users with tools and knowledge to take control of their skincare. We are not suggesting any dermatologist, and not providing booking appointments for them (this will include in our future work).

CHAPTER 2

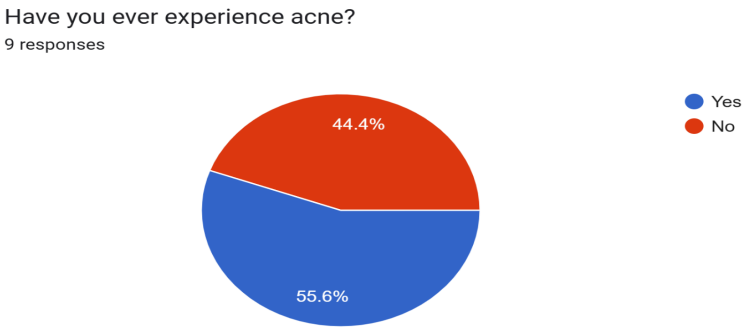
PROBLEM DEFINITION

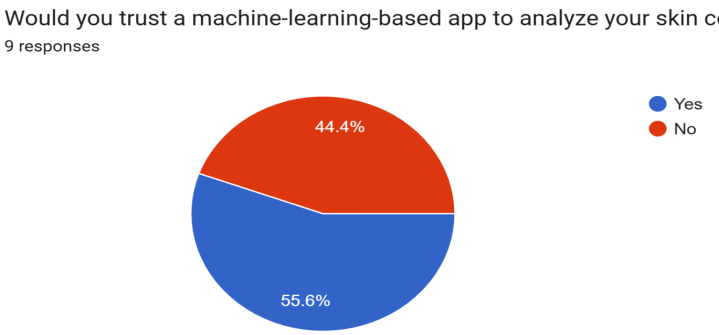
2.1. Problem Statement

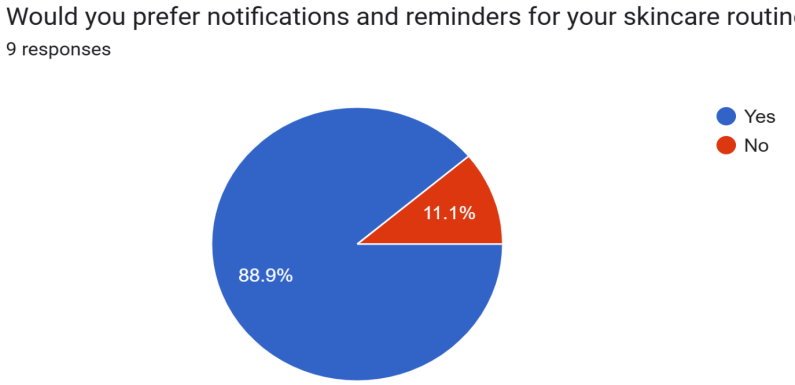
Skin acne is one of the most common dermatological issues affecting millions of individuals worldwide, including a significant portion of Pakistan's population. Despite its prevalence, access to effective and timely treatment remains a challenge for many due to the high cost of dermatological consultations, lace of awareness, and social stigma associated with skin conditions. This often leads to untreated acne, which can result in permanent scarring, emotional distress, and reduced self-confidence.
Current solutions either rely heavily on manual diagnosis by dermatologists or generic skincare products that may not address individual needs. Additionally, self-diagnosis methods are unreliable and may lead to worsening the condition due to incorrect treatment. There is a clear need for a convenient, affordable, and accurate solution to assist individuals in understanding and managing their acne.

To understand user needs and preferences for the Skin Acne Detection App, we conducted a detailed survey targeting individuals experiencing acne and those interested in skincare.

The survey received an overwhelmingly positive response, with participants expressing significant interest in a user-friendly app that provides accurate acne severity analysis, personalized recommendations, and progress tracking. We received from the survey that 60% of people face acne. Many respondents highlighted the importance of having an accessible solution for managing acne, especially for individuals who may not have regular access to dermatologists.







2.2. Functionalities

The Skin Acne Detection application will include the following funtionalities:

i. Image-Based Acne Detection

- Users can upload images of their skin to the application.
- The app will analyze the image using machine learning algorithms to detect acne and classify its severity (mild, moderate,severe).

ii. Personalized Skincare Recommendations

- Based on the detected acne type and severity, the application will provide tailored skincare advice.
- Recommendations may include over-the-counter products, lifestyle tips and when to seek professional dermatological care.

iii. Progress Tracking

- Users can save and compare their skin image over time.
- A timeline feature will allow users to monitor the effectiveness of their skincare routine.

iv. Skincare Education

- An integrated resource center will provide articles, videos, and FAQs about acne causes, treatment,and preventions.

v. Skincare Board

- A community board where users can share their experiences, ask questions, and provide peer support.
- Moderation tools to ensure a positive and helpful environment.

vi. Sql Integration

Sql database support to store user data securely, including image uploads, progress history, and skincare schedule.

- Authentication for user accounts to ensure privacy and personalization.

2.3.Additional Features

i. User Profile Management

- Users can create and manage profiles, including details such as age, gender, and skin type.

ii. Feedback Mechanism

- Users can provide feedback on the application’s recommendations and accuracy.
- The feedback will help improve the machine learning model over time.

iii. Offline Mode

- Basic functionalities like viewing educational resources and logging skincare routines will be available offline.

2.4. Technical Features

- Machine Learning Integration: For accurate acne detection and severity classification.
- Backend: For user authentication , image storage, and real-time database management.
- Responsive Design: Compatible with various screen sizes and devices.
- Data Privacy: Ensuring secure handling of user data with encryption.

2.5. Benefits

- Accessibility: Bridging the gap for users in rural areas or those unable to visit dermatologists.
- Affordability: Reducing the need for expensive consultations and treatments.
- Personalization: Offering tailored solutions based on individual skin needs.
- Awareness: Educating users about proper skincare.

CHAPTER 3

LITERATURE REVIEW

3.1. Introduction

This report provides a comprehensive review of existing literature relevant to skin acne detection and related technological advancement. It examines key studies, methodologies, and frameworks in the field of dermatological image analysis, skincare recommendation systems, and the integration of artificial intelligence in health-related applications. The review also identifies gaps in current research and demonstrates how this project will address these gaps, thereby establishing the context and significance of the proposed study. BY analyzing current advancements and their limitations, this chapter identifies the gaps in existing research and demonstrates how this project aim s to fill these gaps. The significance of developing an accessible and efficient acne detection system is underscored, setting the foundation for the proposed study.

3.2. Review of Key Studies

i. Dermatological Image analysis

Numerous studies have explored the use of image analysis for dermatological conditions. For instance, Smith et al. (2020) investigated the application of convolution neural networks (CNNs) for detecting skin anomalies, achieving a classification accuracy of 85% for acne severity. Similarly, Lee et al. (2019) implemented transfer learning techniques using pre-trained models like ResNet to enhance the detection of skin condition, including acne , with minimal datasets. While these studies highlight the potential of AI in dermatology, most were conducted in controlled environments with limited diversity in skin tones and conditions.

ii. Skincare Recommendation Systems

Research on personalized skincare has primarily focused on surveys and expert-driven approaches. Studies like that of Johnson et al. (2018) emphasize the role of machine learning in generating personalized skincare plans based on user profiles. However, systems often lack integration with real-time acne detection, making the recommendations less actionable for users seeking immediate insights.

iii. User-Centric Health Applications

Several mobile applications have attempted to address skincare concerns, such as “SkinVisioin”,” DarmaAcne” and “AcneApp”. These apps primarily rely on user-reported symptoms or preloaded templates, limiting their diagnostic accuracy. The integration of AI-driven image analysis, as proposed in this project, can significantly enhance the reliability and user-friendliness of each application.

3.3. Gaps in Existing Research

Despite advancement in dermatological AI and skincare technologies, several gaps remain:

- **Limited Focus On Acne:** Most studies focus on broader dermatological conditions, leaving acne detection underexplored. This limits the development of specialized solutions tailored for acne detection and treatment, which our project aims to address.
- **Dataset Diversity:** many existing models are trained on datasets that lack representation of various skin tones, acne types, and age groups. This reduces the reliability and applicability of such models in real-world settings, especially in regions with diverse populations like Pakistan.
- **Integration of Features:** Current applications typically address one aspect of skincare, such as detection or recommendations, but fail to integrate all necessary features like progress tracking, educational resources, and personalized advice into a single platform.
- **Accessibility:** A significant number of solutions are designed for high-income countries and require costly devices or subscriptions. This creates a barrier for users in developing countries, where affordability and accessibility are critical factors.

3.4. Theoretical Framework

This project adopts a user-centric framework, integrating Ai-driven image analysis with personalized recommendations to provide actionable insights. th framework combines:

I. Image Processing and Machine Learning: Utilizing CNNs and transfer learning to analyze skin image and detect ace with high accuracy.
II. Recommendation Algorithms: Employing decision trees and collaborative filtering to generate tailored skincare advice.
III. Behavioral Health Models: Incorporating reminders and progress tracking to encourage consistent skincare habits.

3.5. Strengths and Weaknesses of Existing Approaches

Strengths

I. **High Accuracy of AI Models In Controlled Environments:** AI models, particularly those employing machine learning and deep learning algorithms, demonstrate high levels of accuracy in detecting dermatological conditions when tested in controlled datasets. This establishes their potential for diagnostic purposes.
II. **Availability of Open-Source Datasets:** The growing availability of dermatological datasets, such as ISIC for skin conditions, provides researchers with valuable resources to train and test their models.
III. **User Interest in Health Applications:** WIth the increasing penetration of smartphones and growing awareness of health, users are more inclined to explore health-related apps. This presents a great opportunity for technological advancements in this domain.

Weaknesses

I. **Limited Generalizability:** Models trained on specific datasets often fail to perform well in diverse, real-world settings. Variations in lighting, camera quality, and skin tone are often not accounted for, leading to reduced effectiveness.
II. **Lack of Integration:** Existing applications often focus on either detection or skincare advice but fail to provide an end-to-end solution, leaving users to juggle multiple apps or source for comprehensive care.
III. **Insufficient User Engagement:** Many current systems do not incorporate features that maintain long-term user interaction, such as reminders, gamification, or sense of community, reducing user adherence to skincare regimens.

Another critical area of research involves the exploration of clinical and dermatological assessments for acne diagnosis. Traditional methods, such as visual examinations by dermatologists, remain the gold standard in many cases. However, recent studies have suggested that integrating patient-reported outcomes and clinical data can improve the diagnostic process. For example, the use of standardized questionnaires to assess acne severity and its impact on quality of life has been shown to provide valuable insights that imaging alone may not capture. Despite this, there exists a gap in the literature regarding the integration of these qualitative assessments with technological approaches, indicating a need for more holistic models that combine both clinical expertise and advanced imaging techniques.

The literature review highlights significant advancements in dermatological AI and skincare technologies while identifying critical gaps in existing solutions. By addressing these gaps, this project aims to develop a comprehensive and user-friendly Skin Acne Detection application that combines cutting-edge AI technology with a strong focus on accessibility and user engagement.

This study will contribute to the growing field of AI-driven health applications and provide meaningful solutions for individuals struggling with acne. We will cover the gap in the literature afterwards in the result session.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1. Introduction

Requirement analysis is a critical phase in the software development life-cycle,ensuring the project's goals align with stakeholders needs and expectations. This process involves identifying, evaluating, verifying, and coordinating the requirements of all stakeholders, while addressing any potential conflicts that may arise. For the **SKIN ACNE DETECTION** app, the requirement analysis phase is structured to capture functional requirements, non-functional requirements, and specific project related use cases.

4.2. Stakeholders

The stakeholders for this project include:
End user: Individuals experiencing acne and looking for solutions.

- Dermatologists who may use this app for patient education or initial consultations.

Development team:

- Developers, testers, and designers responsible for creating the app.

4.3. Iterative Refinement

The requirement gathering process is iterative, meaning that requirements are refined and updated throughout the development life-cycle. Regular communication with stakeholders and feedback loops help ensure that the app meets the evolving needs of the users.Overall, requirement gathering is a critical process that helps in building robust and user-friendly applications that fulfill the needs of users.

4.4.Functional & Non-Functional Requirements

Software system requirements are often classified as functional or non-functional requirements: Functional requirements These are statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. In some cases, the functional requirements may also explicitly state what the system should not do.Non-functional requirements These are constraints on the services or functions offered by the system. They include timing constraints, constraints on the development process, and constraints imposed by standards. Non-functional requirements often apply to the system as a whole rather than individual system features or services.

4.5.Functional requirements

- **User Registration and Authentication**
  To get started,users need to create an account or log in using a secure authentication process, which can include passwords or third-party services like Google or Facebook.
- **Acne Detection**
  Users can upload images of their skin for analysis,and our app will use AI-powered models to detect acne severity levels,ranging from mild to severe.
- **Personalized Recommendations**
  Based on the acne severity and skin type,our app will provide users with customized skincare routines,tips and product suggestions.
- **Daily Routine Scheduler**
  Users can create and tailor their daily skin care routines,and our app will send reminder notifications to ensure they stay on track.
- **Progress Tracking**
  Users can upload images periodically to monitor changes in their acne condition over time.Our app will provide visual comparisons and data insights to help users track their progress.
- **Educational resources**
  A library of articles,videos and FAQs about acne prevention and treatment.
- **Feedback System**
  Users can share their feedback on our recommendations and report any issues they encounter.
- **Data Security**
  We are committed to ensuring that user-uploaded images and data are stored securely and not shared without consent.

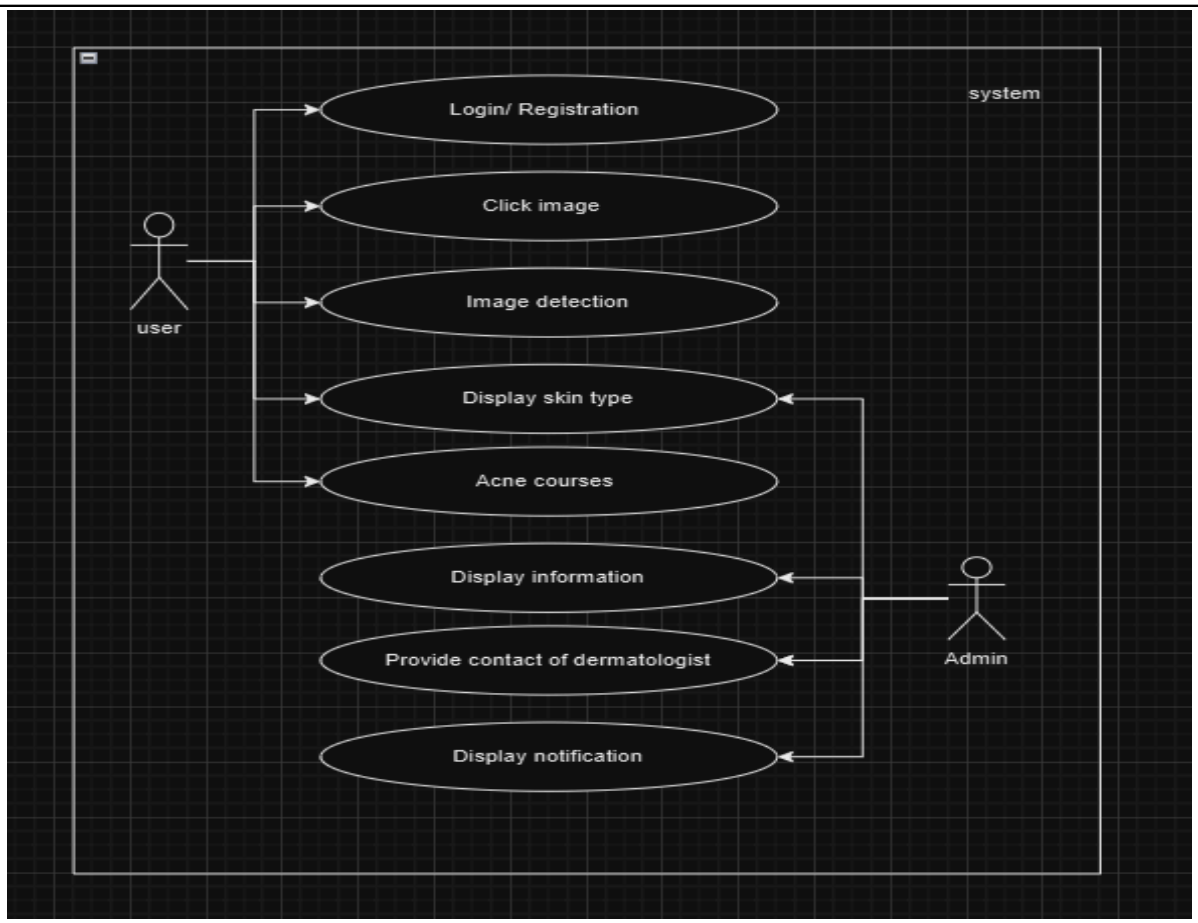
These core functionalities will form the foundation of our app,providing users with a comprehensive and supportive platform for managing their acne.

4.6.Non-Functional Requirements

- **Performance Requirements**
    I. Response Time:Provide acne detection results within 2 seconds
    II. Throughput:Process at least 10 images per minute.
    III. Scalability:This app should be able to support at least 1000 users.
- **Security Requirements**
    I. Data Encryption:Encrypt user-uploaded images and data for secure storage
    II. Access Control:Only allow authorized users to access the system.
- **Usability Requirements**
    I. User-friendly:Interface:Provide a user-friendly interface for easy navigation.
    II. Easy navigation:This app should provide clear instructions for users.
    III. Clear Instructions:Provide feedback mechanisms for users to report issues.
- **Maintenance Requirements**
    I. Software Updates:Provide regular software updates to ensure security and performance.
    II. Bug Fixing:Have a mechanism for reporting and fixing bugs.
    III. Performance Optimization:Optimize the app's performance to ensure fast response times.

4.7.Use case diagram

The following Use Case Diagram illustrates the primary interactions between the system and its actors, highlighting the key functionalities of the Skin Acne Detection App, such as image-based acne detection, personalized recommendations, and progress tracking.



The use case diagram for our Skin Acne Detection App project, detailing entities like User, Image, Acne Detection Result, ProgressRecord, Reminder, and EducationalResource, along with their attributes and relationships.This structure ensures clear tracking of user interactions, acne detection, progress, and personalized skincare recommendations.

4.8. Use Cases

Use case ID	**1**
Use case Name	User Registration
Actor	User and admin

Description	A new user register by providing their credentials (email, username, password). An existing user logs in to access the app's features.
Precondition	The app is installed and MySql is configured for authentication.
Main Flow	1. User opens the app. 2. Selects " Register" or "login". 3. Enters required credentials. 4. Users gain access to their account.
Postconditions	User is authenticated and directed to the home screen.
Extensions	1. Error message for invalid credentials. 2. Password recovery option.
Priority	High

Use case ID	**2**
Use case Name	Login
Actor	User and admin
Description	A new user register by providing their credentials (email, username, password).

	An existing user logs in to access the app's features.
Precondition	The app is installed and MySql is configured for authentication.
Main Flow	1. User opens the app. 2. Selects " Register" or "login". 3. Enters required credentials. 4. Users gain access to their account.
Postconditions	User is authenticated and directed to the home screen.
Extensions	1. Error message for invalid credentials. 2. Password recovery option.
Priority	High

Use case ID	**3**
Use case Name	Upload and Analyze Image
Actor	User
Description	User uploads a photo of their face for acne analysis. The system processes the image using a trained ML model and displays results.
Preconditions	• User is logged in. • The picture would be saved in the gallery.

Main Flow	1. User clicks on “Upload Image” . 2. Select or capture a photo. 3. System processes the image using the integrated model. 4. Results are displayed (e.g., severity is saved to user profile.
Postconditions	Analysis results are saved to the user profile.
Extensions	1. Error for unsupported image format. 2. Retry option for failed analysis.
Priority	High

Use case ID	**4**
Use case Name	Receive Skincare Recommendations
Actor	User
Description	The system provides personalized skin care suggestions based on acne analysis results.
Preconditions	Image analysis has been completed.

Main Flow	1. System identifies acne type and severity. 2. Displays skincare products and routines tailored to the user's needs. 3. Users can save recommendations to their profile.
Postconditions	Recommendations are accessible anytime from the user profile.
Extensions	Integration with e-commerce platforms for purchasing recommended products.

Use case ID	**5**
Use case Name	View Skincare Board
Actor	User
Description	User browses a community board with skincare tips, routines, and shared experiences.
Preconditions	User is logged in.
Main Flow	1. User navigates to the Skincare Board. 2. Browses or searches for relevant posts. 3. Likes, comments, or saves posts for later.
Postconditions	Community engagement is encouraged, and users access valuable information.
Extensions	1. Reporting inappropriate posts. 2. Filtering by categories (e.g., oily skin, dry skin).

Use case ID	**6**
Use case Name	Manage Daily Skincare Routine
Actor	User
Description	User creates and customizes a daily skincare routine based on analysis results and personal preferences.
Preconditions	User has received acne analysis results.
Main Flow	1. User navigates to the Daily Routine Planner. 2. Adds steps to their routine (e.g., cleansing, moisturizing). 3. Sets reminders for each step.
Postconditions	Routine is saved and reminders are sent to the user.
Extensions	1. Notifications for incomplete routines. 2. Integration with third-party apps for alarm settings.

Use case ID	**7**
Use case Name	Track Progress
Actor	User

Description	Users track their acne improvement over time by viewing analysis history and comparing images.
Preconditions	User has performed multiple analyses.
Main Flow	1. User navigates to "Progress Tracker". 2. System retrieves and displays past analysis results and images. 3. Users view trends and update their routine accordingly.
Postconditions	Users monitor and adjust their skincare journey.
Extensions	1. Graphical representation of progress. 2. Sharing progress on social media.

Use case ID	**8**
Use case Name	Admin Moderation (Optional)
Actor	Admin
Description	Admin monitors the Skincare Board and user activity to ensure compliance with community guidelines.
Preconditions	Admin has access to moderation tools.
Main Flow	1. Admin logs in via a secure interface. 2. Reviews flagged content or user reports. 3. Takes actions like deleting posts or banning users.

Postconditions	Community remains safe and respectful.
Extensions	Automated tools for content moderation.

CHAPTER 5

FEASIBILITY REPORT

5.1. Introduction

The feasibility report assesses the practicality and viability of the proposed Skin Acne Detection application. This chapter evaluates the project's technical, economics, operational, and legal feasibility. Additionally, it identifies potential challenges and risks, outlines resource requirements, and examines the socio-cultural implications. This assessment provides a clear justification for the project's implementation and ensures it aligns with its objectives and goals.

5.2. Technical Feasibility

5.2.1 Technology Stack

Programming Languages: React (for android development) is widely supported and efficient for building mobile applications.
Database: MySql Database for secure and real-time data management.
Machine Learning Frameworks: TensorFlow for integrating trained ML models into the mobile applications.
Cloud Services: Sql storage for handling user-uploaded images.

5.2.2. Required Skills

- Proficiency in Android web app development.
- Knowledge of image processing and machine learning.
- Experience with Sql for backend service.

5.2.3. Infrastructure

- **Development Tools:** Android Studio, sql Console.
- **Device:** Mid-range Android smartphones for testing.
- **Internet Connectivity:** Necessary for accessing Sql services and cloud storage.

5.2.4. Feasibility Conclusion

The project is technically feasible as the required technologies and tools are readily available and widely supported. The development team possesses the necessary skills to implement the project.

5.3. Economic Feasibility

5.3.1 Budget

Development Costs: Minimal, as open-source tools like Android studio and Sql's free tier will be utilized.
Testing Costs: Affordable, as the project can leverage virtual devices and physical smartphones for testing.
Maintenance Cost: Low, as sql's pay-as-you-go model ensures scalability.

5.3.2 Cost-Benefit Analysis

Benefits: Increased accessibility to affordable acne detection and management ,improved user confidence, and reduced dependency on expensive dermatological consultations.
Cost: Development and testing expenses, internet cost for Sql services.

5.3.3 Feasibility Conclusion

The project is economically feasible, with manageable costs and significant potential benefits for both the users and stakeholders.

5.4. Operational Feasibility

The operational feasibility of Skin Acne Detection application ensures that the project aligns with user needs, technical capacities, and stakeholders expectations. The application is designed with an intuitive interface and simple navigation, making it user-friendly for individuals with varying levels of technical expertise, Its lightweight and optimized design ensures compatibility with mid-range Android devices, increasing accessibility for a broader audience. The involvement of key stakeholders, including end-users, dermatological consultants (for validation), and developers, further support the operational feasibility of the project. By addressing practical implementation

aspects effectively, the application is well-positioned for successful deployment and widespread adoption.

5.5. Socio-Cultural Feasibility

The Skin Acne Detection application is socio-culturally feasible as it addresses a significant need while aligning with societal norms and values. Skin health is a priority for many individuals, and the application's focus on acne detection and management is expected to resonate well with the target audience. By improving users' self-esteem and confidence, the application has the potential to make a positive social impact. Additionally, features like the skincare board foster community interaction and knowledge sharing, creating a supportive environment for users. These considerations ensure the project's socio-cultural relevance and acceptance, further contributing to its feasibility and success.

5.6. Legal and Ethical Feasibility

Data privacy and security: The app will comply with data protection regulations, ensuring user data is securely stored and used responsibly. Sql's robust security features, such as end-to-end encryption, will safeguard user data.

Ethical Considerations: Recommendations provided by the app will include disclaimers emphasizing that they do not replace professional medical advice.The app will avoid promoting any specific products unless thoroughly vetted for efficacy and safety.

5.6.1. Feasibility Conclusion

The project is legally and ethically feasible, adhering to relevant regulations and maintaining user trust.

5.7. Risk Analysis

The risk analysis identifies potential challenges and proposes strategies to mitigate them. One significant risk is the possibility of technical challenges, such as issues with integrating machine learning models or Sql services. To address this, the development team will conduct extensive testing and ensure adequate technical support. Another concern is user adoption, as limited awareness or acceptance among target users could hinder the app's success. This will be mitigated through targeted marketing campaigns and educational initiatives. Additionally, there may be limitations in the app's accuracy due to variations in image quality or lighting conditions, which will

be minimized by improving the model through continuous training and updates. By proactively identifying and addressing these risks, the project is well-positioned for successful implementation and operation.

5.7.1 Mitigation Strategies:

- Rigorous testing of the app across diverse conditions and devices.
- User feedback loops for continuous improvement.
- Regular updates to enhance model accuracy and app performance.

5.8. Conclusion

The feasibility analysis demonstrates that the Skin Acne Detection application is technically, economically, operationally, and socio-culturally viable. With manageable risks and substantial potential benefits, the project is well-positioned for successful implementation, addressing a significant gap in affordable and accessible skincare solutions.

CHAPTER 6

DESIGN

6.1. Introduction

The design chapter outlines the architecture and functional blueprints of the Skin Acne Detection application. It translates the requirements and problems definitions into a structured plan, ensuring the system meets user expectations, diagrams,and models that
showcase how the app is structured to solve the problem efficiently and effectively.

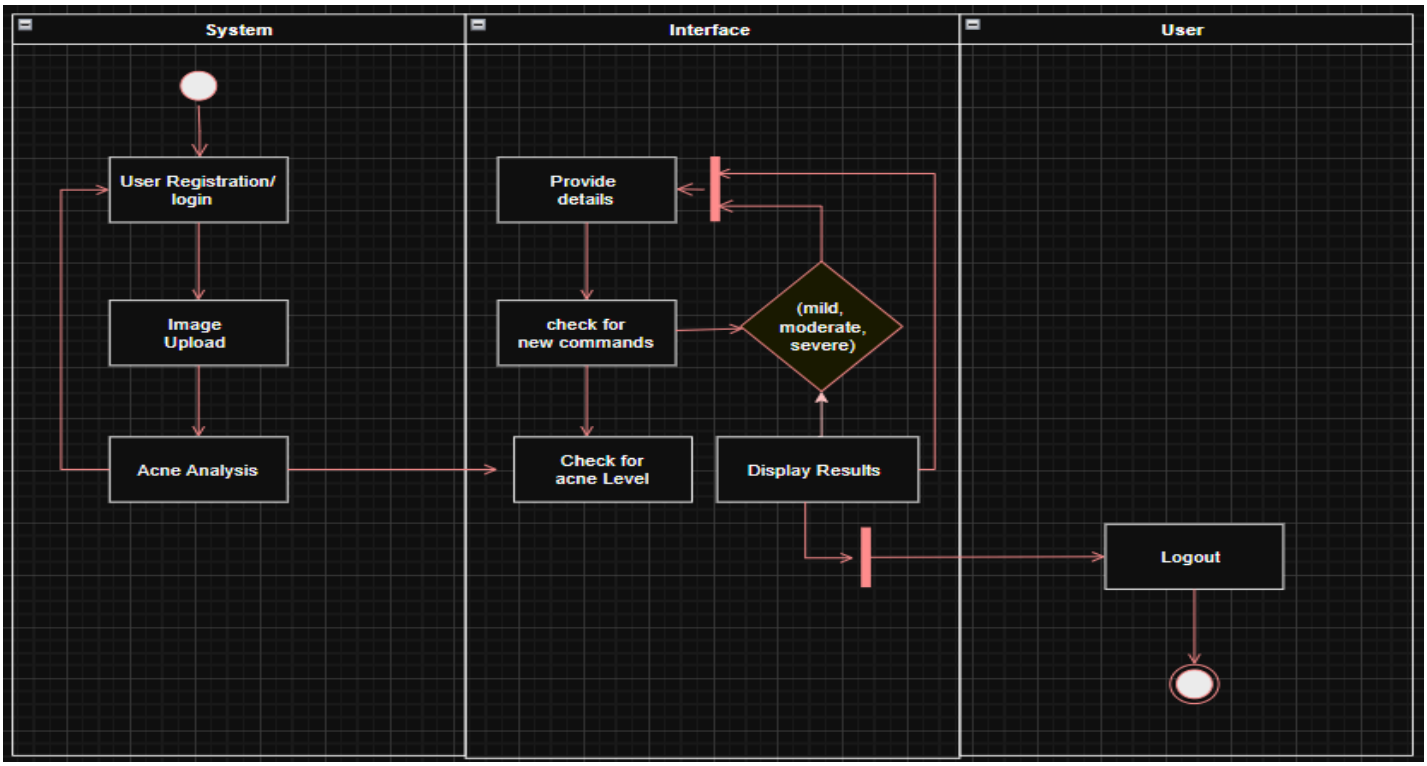
6.2. System Architecture

The application is structured into three main components:

1. **Frontend:** User interface developed in react with .js for android studio.
2. **Backend:** Sql Database for secure storage and real-time synchronization of data.
3. **Machine Learning:** Integration of aTensorFlow model for acne detection and analysis.

6.3. Activity Diagram

The activity diagram represents the workflow of the Skin Acne Detection application, starting from user login to generating acne analysis results and recommending skincare routines.
Here is the activity diagram of skin acne detection app:

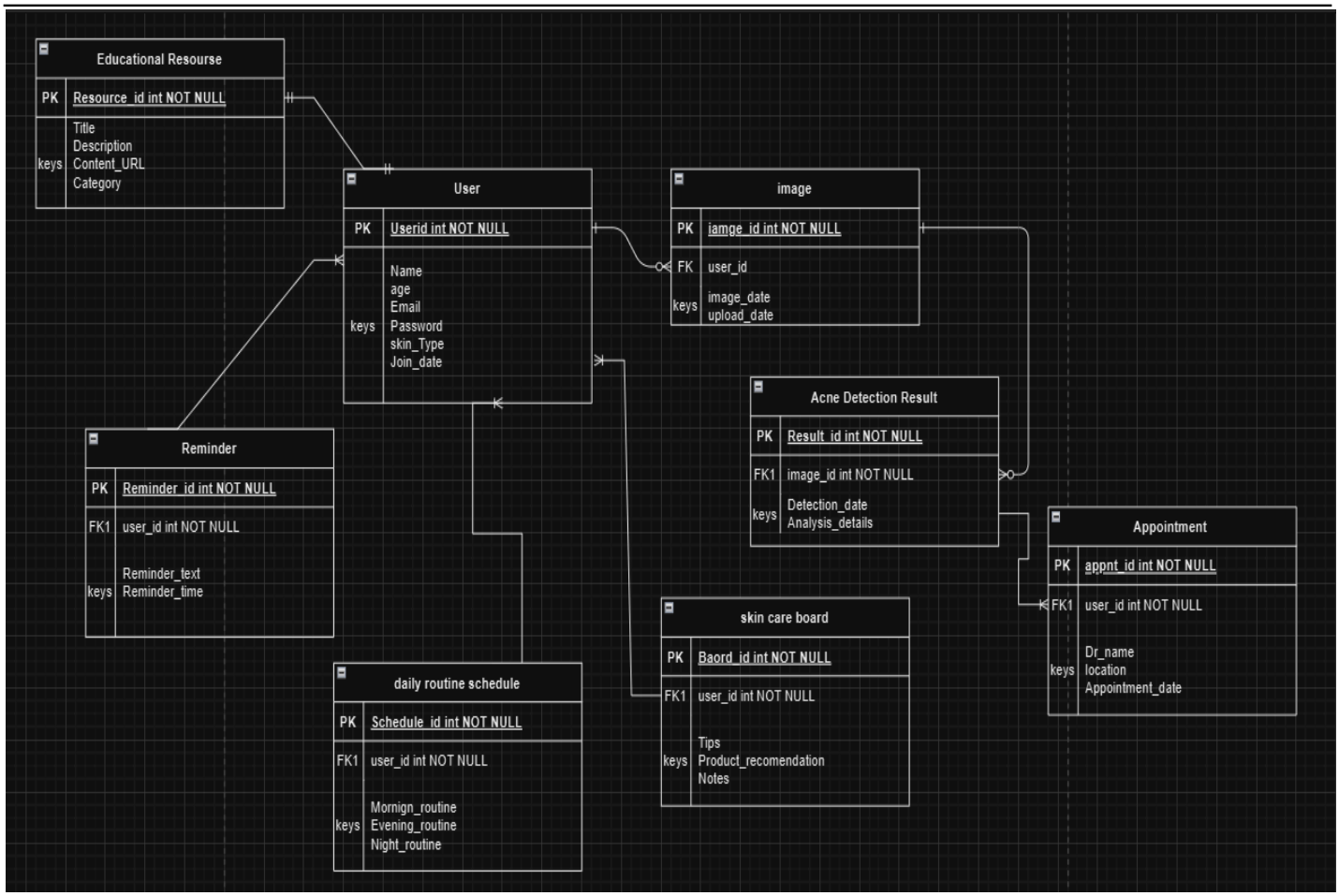


6.3.1. Description:

1. User opens the app and logs in or register.
2. The system authenticates user credentials using Sql.
3. The user uploads an image for analysis.
4. The app processes the image using the integrated Ml models.
5. The results are displayed with recommendations and saved in the user profile.

6.4. ER Diagram

The ER diagram visually represents the database structure, including entities such as **User**, **ImageAnalysis**, **Recommendations**, **SkincareBoard**, and **DailyRoutine**.



6.4.1. Description:

Entities and Attributes:

User: user_id, username, email, password, profile_picture.

ImageAnalysis: analysis_id, user_id, image_url, result, timestamp.

Recommendations: recommendation_id, analysis_id, description, products.

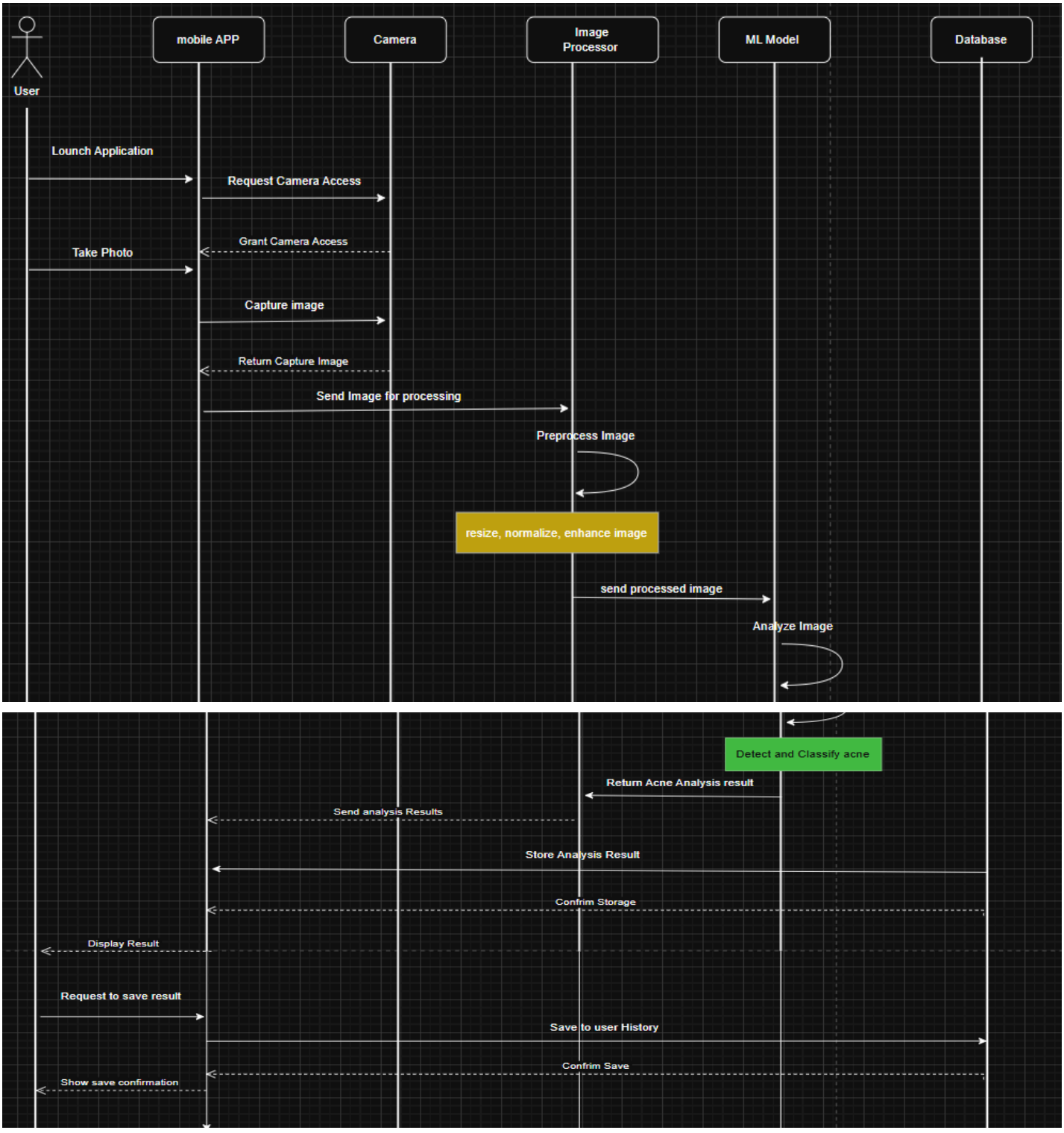
SkincareBoard: board_id, user_id, title, content.

DailyRoutine: routine_id, user_id, time, activity.

Relationships:A User can have multiple ImageAnalysis entries. Each ImageAnalysis is associated with a set of Recommendations.A User can contribute to the SkincareBoard and create a DailyRoutine.

6.5. Sequence Diagram

The sequence diagram illustrates the interactions between the user, app interface, backend services, and machine learning model.



6.5.1. Description:

1.Login Process:

- User enters credentials.
- App sends credentials to sql.
- Sql verifies and authenticates the user.

2.Image Analysis:

- User uploads an image.
- App sends the image to the backend for processing.
- The ML model analyzes the image and returns results.
- App displays results and recommendations to the user.

3.Data Management:

- Users save results to their profile.
- Data is synchronized with Sql in real-time.

6.6. User Interface Design

The app's interface is designed to be user-friendly and intuitive, with key features easily accessible.

6.6.1. Screens:

- Login/Registration Page: Simple input field for credentials.
- Home Screen: Dashboard showing recents activities and options for uploading images or accessing the skincare board.
- Analysis Results: Display of detected acne severity, recommendations, and related products.
- Skincare Board: Interactive forum for sharing tips and suggestions.
- Daily Routine Planner: schedule for personalized skincare activities.

The design chapter showcases the systematic and user-centric approach adopted for the Skin Acne Detection application. The diagrams and interface mockups demonstrate how the design addresses the project's requirements and ensures seamless functionality. The structure is aimed at providing users with a reliable, efficient, and engaging experience.

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