

AURA: AI Self Make over App – An AI-Driven Frame work for Personalized Beauty, Fashion and Virtual Try-On Systems

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Abstract: Artificial Intelligence (AI) and Augmented Reality (AR) continue to transform beauty, fashion, and personal
styling. AURA is an AI-powered self-makeover application designed to provide personalized makeup, hairstyle, and outfit
recommendations by analyzing facial attributes, skin tone and user preferences. This paper describes the system
architecture, methodology, implementation, and evaluation plan for AURA, and discusses its applicability to beauty-tech
and retail.

Keywords: AI makeover, augmented reality, facial analysis, virtual try-on, personalization, deep learning.

I. INTRODUCTION

AURA: AI Self Makeover App is designed to address the growing need for personalized grooming in a digitally driven and
image-conscious society. Unlike generalized beauty standards promoted through social media, AURA emphasizes AI-
driven personalization by analyzing individual facial features such as skin tone and face shape. Using computer vision and
deep learning techniques, the application provides customized makeup and grooming recommendations tailored to each
user's appearance and preferences. The inclusion of virtual try-on functionality enables users to preview makeup styles
realistically before real-world application. Developed as a lightweight Flutter-based mobile application with a FastAPI
backend, AURA serves as an accessible and intelligent digital assistant for enhancing personal grooming and self-
presentation. The primary objective of AURA is to simplify and enhance personal grooming decisions through AI-
powered facial analysis and personalized recommendations. By processing user images and additional inputs such as body
type and event type, the system generates tailored makeover suggestions that promote confidence and informed decision-
making. AURA aims to provide a safe, user-friendly, and non-invasive digital platform where users can visualize makeup
styles through realistic virtual previews. Leveraging computer vision, deep learning models, and AI-based recommendation
logic, the application delivers an efficient and scalable solution for personalized self-care and appearance enhancement.

II. LITERATURE REVIEW

Arun et al. proposed [1] an AI-based Android application designed to enhance lifestyle management using machine
learning, natural language processing (NLP), decision trees, and KNN algorithms. Developed using Android Studio and
Firebase, the system provides personalized recommendations with a focus on accuracy and usability. However, its strong
dependence on continuous internet connectivity limits its effectiveness in offline environments.

Perera et al. [2] introduced a virtual makeover and makeup recommendation system based on personal trait analysis. The
system employs YOLO, CNNs, and hybrid deep learning models to generate real-time AR-based simulations through a
web interface. While achieving high accuracy (approximately 87%), the system faces challenges related to scalability and
deployment in resource-constrained environments. Daram, et al. proposed [3] Virtual Glamour: Recommendations and
Trials. AI- Enhanced Makeup. Daram et al. explored GAN-based and CNN-based architectures for producing highly
realistic virtual makeup effects. Their AI-enhanced system, deployed on web and AR platforms, demonstrated strong
visual performance with PSNR values of 36.66 dB and SSIM scores of 0.918.

Despite superior realism, the approach demands high computational resources, making real-time execution difficult on low-end devices.

Jabraeili, M. [4] The application of artificial intelligence in the beauty industry. Jabraeili examined the application of AI in the beauty industry, focusing on advanced skin diagnostics using computer vision and AR technologies such as OpenCV and ARKit. The study highlighted improved accuracy and higher conversion rates but emphasized the need for high-resolution images to maintain consistent output quality.

Hegde, S. [5] AI in the beauty industry in India. Hegde et al. analyzed the impact of AI in the Indian beauty industry, particularly through chatbots and recommendation engines deployed on cloud platforms such as AWS, Google Cloud, and Azure. While these solutions enhance user engagement and offer 24/7 assistance, the associated infrastructure costs pose challenges for small-scale enterprises.

Debnath et al. [6] Impact of AI on workforce dynamics. Debnath et al. investigated the role of AI-driven chatbots and virtual assistants in workforce and organizational dynamics. Their study applied CNN and ML models for sentiment-driven product recommendations and personalized skincare guidance. However, limitations related to biased datasets and insufficient training data were observed.

Shukla, P. [7] Title: Development of Apps Industry using Flutter. Shukla et al. presented a comprehensive review of Flutter as a cross-platform application development framework. The study emphasized Flutter's advantages, including faster development cycles, code reusability, and support for Android, iOS, web, and desktop platforms. Nevertheless, challenges such as increased application size and restricted access to native APIs were noted.

He, T., Hu, Y. [8] FashionNet: Personalized outfit recommendation with deep neural network. He and Hu proposed FashionNet, a deep neural network-based outfit recommendation system that personalizes clothing suggestions using NDCG as a performance metric. Although effective in recommendation accuracy, the system's high computational complexity limits its deployment on devices with constrained resources.

S. Lingala. [9] Title: Fashion Recommendation System Using Machine Learning. Lingala et al. developed a fashion recommendation system using ResNet-50 for visual feature extraction and KNN for similarity-based recommendations. While the model captures detailed visual attributes such as color, texture, and style, it lacks personalization depth and real-world user validation and is computationally intensive.

Perret and Schwientek. [10] BeautyTech: Customer Experience and Loyalty of Augmented Reality- and Artificial Intelligence-Driven Cosmetics. Perret and Schwientek [10] examined BeautyTech applications using the S-O-R model and PLS-SEM analysis. Their study highlighted the influence of utilitarian and hedonic values on customer experience and loyalty in AR- and AI-driven cosmetic platforms. However, limitations included a relatively small and skewed sample size and restricted exposure to physical devices.

The comparative analysis of existing AI-based self-makeover and beauty recommendation systems reveals a diverse range of algorithmic approaches, platforms, and evaluation metrics. While machine learning and NLP-based systems [1] offer accessibility and personalization, they often depend on constant connectivity. AR- and deep learning-based systems [2], [3],[4] provide highly realistic virtual try-ons but face challenges in scalability and computational efficiency. Cloud-based solutions [5] enhance engagement but incur high costs, whereas virtual assistants [6] suffer from dataset bias. Cross-platform development frameworks like Flutter [7] offer flexibility but have native limitations, while deep learning-based fashion systems [8], [9] achieve accuracy at the expense of resource efficiency. Overall, existing literature highlights a trade-off between personalization, realism, performance, and resource requirements. These insights form the foundation for the proposed AURA system, which aims to balance AI accuracy, real-time performance, inclusivity, and scalability within a unified beauty and fashion platform.

III. METHODOLOGY

The AURA: AI Self Makeover App is a mobile-based, AI-driven grooming and styling application designed to deliver personalized makeover recommendations through automated image analysis and virtual try-on techniques. The system emphasizes simplicity, real-time performance, and accessibility, enabling users to interact with the application without mandatory login or account creation. The proposed system employs a combination of computer vision, deep learning, and mobile application development methodologies to deliver an AI-based self-makeover solution. Facial image processing is performed using Media Pipe Face Mesh to extract precise facial landmarks, which form the basis for face shape analysis and virtual makeup placement. Deep learning techniques, specifically a Convolutional Neural Network based on the Efficient Net architecture, are used for accurate face shape classification, while skin tone estimation is achieved through color analysis using the STONE skin tone classification approach. Virtual makeup effects such as foundation, blush, eyeliner, and lipstick are generated using image segmentation, masking, and alpha blending techniques to ensure realistic visualization. A hybrid recommendation methodology combining AI outputs and rule-based logic is implemented to provide personalized makeup and fashion suggestions. The system follows a client-server architecture where a Flutter-based mobile application communicates with a FastAPI backend using RESTful APIs, enabling efficient data transfer, scalability, and real-time performance. The operational workflow begins when a user uploads an image from the device gallery or captures a selfie using the mobile camera. The input image is transmitted to the backend AI system, where preprocessing and facial analysis are performed. Key facial attributes, including face shape and skin tone, are detected using deep learning and computer vision techniques. In addition, users provide optional inputs such as event type, gender, and body type, which are utilized to refine the recommendation process. Based on the detected facial attributes and user-provided preferences, the system generates personalized grooming and makeup recommendations.

Virtual try-on functionality is enabled through image overlay and GAN-based transformation techniques, allowing users to preview makeup effects realistically before real-world application. The methodology follows a client-server model, consisting of a Flutter-based mobile frontend and a Python-based backend implemented using FastAPI. The backend handles image preprocessing, AI inference, and recommendation logic using YOLO for face detection, OpenCV for image processing, Convolutional Neural Networks (CNNs) for classification, and Generative Adversarial Networks (GANs) for virtual makeup simulation. The design ensures secure image handling, fast response time, and reliable system performance. The methodology successfully combines deep learning, computer vision, and mobile application development to deliver a complete AI-based self-makeover solution. The modular design improves accuracy, flexibility, and real-time performance, making the system suitable for real-world applications.

IV. DESIGN

The design of the AURA: AI Self Makeover App focuses on delivering a simple, intuitive, and AI-driven mobile makeover experience through automated facial analysis and virtual try-on visualization. The system is designed as a lightweight client-server application that enables users to analyze their appearance and preview grooming recommendations using a mobile device without requiring complex configuration or mandatory authentication. The application follows a layered architectural approach, consisting of a Flutter-based user interface, a service and communication layer, a REST-based backend interface, and a Python-based AI processing module. This modular design ensures clear separation of concerns, scalability, and ease of maintenance. Users interact with the system through the mobile interface by uploading an image from the gallery or capturing a selfie using the device camera. The application also provides options for makeup selection and tutorial guidance. User inputs are passed to the service layer, which handles image preprocessing and API communication before forwarding the request to the backend AI system. The backend performs facial analysis and generates personalized grooming recommendations. The processed results are returned to the frontend, where they are rendered as visual overlays and preview images. This design enables real-time interaction while maintaining efficient AI inference and secure image handling.

A. Data Flow Diagram

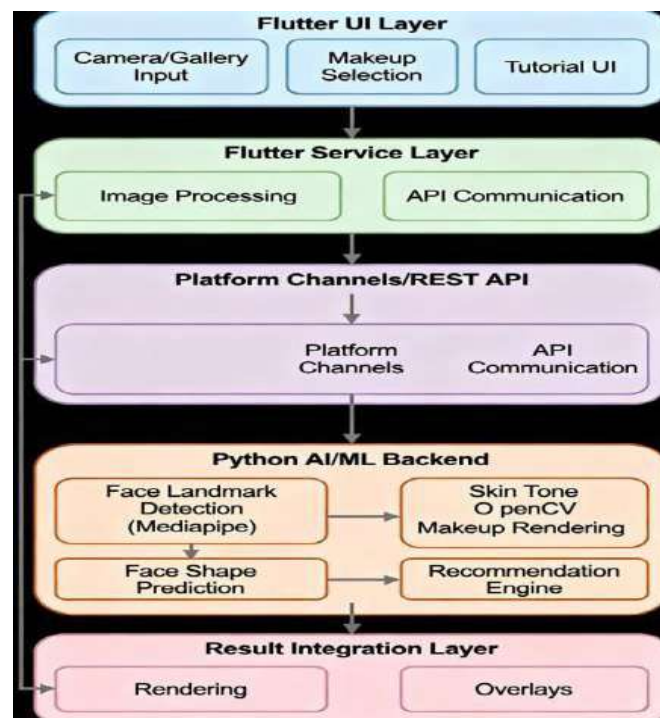


Fig.1. Data Flow Diagram

Fig.1 illustrates the data flow of the AURA system, showing the end-to-end processing from user input to result visualization. The data flow begins with the user providing an image through the camera or gallery. The Flutter UI captures the image and forwards it to the Flutter Service Layer, where basic preprocessing and request packaging are performed. The image data is then transmitted to the backend through Platform Channels / REST APIs using JSON and multipart image requests. The Python AI/ML Backend processes the received image. Face landmark detection is performed using computer vision techniques, followed by skin tone classification and face shape prediction using CNN-based models. Based on the extracted facial attributes and user-selected preferences, the recommendation engine generates suitable makeup suggestions. If facial attributes are not detected correctly, the system requests re-input from the user. Once successful processing is completed, the backend returns the recommendation data and processed images to the frontend. The Result Integration Layer renders the output by displaying visual overlays, virtual makeup previews, and step-by-step guidance. The data flow concludes once the results are displayed to the user, completing a full analysis cycle. This data flow ensures a smooth and efficient transition from user input to AI-driven visualization, enabling repeatable analysis and real-time interaction.

B. System Architecture

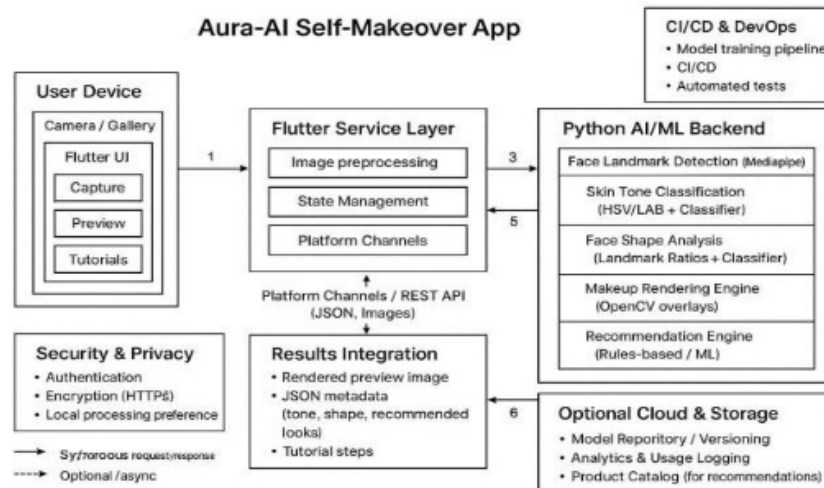


Fig.2. System Architecture

Fig.2 presents the system architecture of the AURA application, illustrating the interaction between frontend components, backend AI modules, and result rendering layers. At the client side, the User Device hosts the Flutter application, which includes modules for image capture, preview, makeup selection, and tutorial display. The Flutter Service Layer manages image preprocessing, state management, and communication with the backend through REST APIs. The communication between the frontend and backend is handled via Platform Channels and REST-based API calls, ensuring efficient transmission of image data and inference results.

The Python AI/ML Backend forms the core intelligence layer of the system. It includes modules for:

- Face landmark detection
- Skin tone classification using CNNs
- Face shape prediction
- Virtual makeup rendering using OpenCV-based overlays
- Rule-based recommendation engine

The backend processes the input image and generates recommendation metadata along with rendered preview images. These outputs are returned to the frontend through structured API responses. Finally, the Result Integration Layer on the Flutter side renders the received data as visual overlays and preview images. This layer ensures that makeup simulations appear natural and aligned with the user's facial features. The architecture is designed to be modular, scalable, and efficient, allowing future enhancements such as improved models or additional styling features without affecting the overall system flow.

V. IMPLEMENTATION PROGRESS

This section presents the implementation details of AURA: AI Self Makeover App, focusing on the backend architecture, AI-driven facial analysis modules, recommendation engines, and API integrations that enable personalized styling, makeup guidance, and virtual makeover experiences. The system is designed to be modular, scalable, and responsive, supporting real-time interaction with a Flutter-based mobile frontend.

A. Face Detection and Landmark Extraction

Face detection and landmark extraction form the foundational step of the AURA pipeline. Uploaded facial images are first converted into an OpenCV-compatible format and processed using a YOLO-based face detection model to identify facial regions along with confidence scores. Each detected face is isolated and pre-processed to enhance robustness under varying lighting and pose conditions. For each detected face, a facial landmark extraction module is applied to identify 68 key facial points, representing regions such as the eyes, eyebrows, nose, lips, and jawline. These landmarks are critical for accurate face shape analysis, makeup alignment, and virtual try-on placement. The extracted bounding box coordinates, confidence values, and landmark points are structured and passed to downstream modules for further analysis.

B. Makeup Recommendation and Feedback Module

The makeup and fashion recommendation module generates personalized styling suggestions based on user-specific attributes such as skin tone, face shape, event type, and style preferences. The recommendation engine outputs structured results, including suitable outfits, makeup products, and accessories tailored to the user's profile. To support virtual makeover functionality, AURA incorporates a GAN-based makeup transfer model, which applies selected makeup styles directly onto the detected facial region.

This enables users to preview makeup looks in a realistic and visually coherent manner. In addition, a CNN-based feedback analysis model evaluates the generated or uploaded look and produces normalized aesthetic scores for attributes such as facial symmetry and makeup blending quality. Along with quantitative scores, the system provides qualitative suggestions to help users improve their overall appearance, enhancing both usability and user confidence.

C. Data Models for API Communication

Structured communication between the frontend and backend is ensured through Pydantic-based data models.

These models define standardized request and response formats for facial analysis, recommendation generation, and feedback reporting. By enforcing strict type validation and schema consistency, the system minimizes runtime errors, improves maintainability, and ensures reliable data exchange across all application modules.

D. Skin Tone Analysis

Skin tone classification is implemented using a CNN-based inference model trained on diverse facial image datasets. The uploaded image is preprocessed and transformed into a normalized input tensor before being passed through the trained model. During inference, gradient computation is disabled to optimize performance and reduce latency. The model predicts one of the predefined skin tone categories such as fair, medium, or dark which is subsequently used as a key input for makeup shade selection, outfit recommendation, and personalization logic. This module plays a crucial role in delivering inclusive and accurate styling suggestions.

E. Fast API Backend Endpoints

The backend of the AURA application is implemented using FastAPI, providing high-performance RESTful APIs that support facial analysis, personalized recommendations, and virtual makeover guidance. These endpoints enable seamless communication with the Flutter-based mobile frontend and ensure real-time responsiveness.

1) Facial Analysis Endpoint

The facial analysis endpoint performs combined skin tone classification and face shape prediction on user-uploaded images. The processing pipeline integrates Efficient Net-based face shape classification, CNN-driven skin tone analysis, and Media Pipe-assisted facial landmark alignment. The endpoint returns structured JSON output containing predicted skin tone, face shape, and extracted facial features, forming the basis for all subsequent recommendation and makeover operations.

2) Makeup and Fashion Recommendation Endpoint

This endpoint generates personalized makeup and fashion recommendations based on validated user inputs, including skin tone, face shape, event type, and style preferences. The recommendation engine applies rule-based logic combined with AI-driven inference to produce curated suggestions, which are returned in a structured and interpretable format.

3) Makeup Guide and Lipstick Modules

Additional makeover functionality is provided through modular API routes dedicated to step-by-step makeup guidance and lipstick shade application. These modules allow focused enhancement of individual makeup components and support extensibility for future features. The modular routing architecture improves code maintainability and enables independent evolution of each makeover component. The implementation of AURA integrates advanced computer vision techniques, deep learning models, and a scalable API-driven backend to deliver an interactive and personalized self-makeover experience. By combining real-time facial analysis, AI-powered recommendations, and virtual try-on capabilities, the system demonstrates the practical application of AI in personalized grooming and fashion assistance.

VI. RESULTS

This section presents the experimental results and user interface outputs obtained after the successful implementation of the AURA: AI Self Makeover App. The results demonstrate the effectiveness of the system in facial analysis, personalized recommendation generation, virtual try-on, and step-by-step makeup guidance.

A. Upload Screen

The Upload Screen serves as the entry point of the AURA application. It allows users to provide an image for analysis either by uploading a photo from the gallery or by capturing a selfie using the device camera.



Fig 3. Upload Screen

The interface is designed with large, clearly labeled buttons to ensure ease of use and accessibility. This screen initiates the AI-based processing pipeline for facial attribute detection and makeover analysis.

B. Profile Screen

After image upload, the Profile Screen displays the AI-extracted facial attributes, including face shape and skin tone. In addition to the automatically detected features, users can manually select preferences such as gender, body type, and event type. These inputs are combined with AI analysis to personalize recommendations. A "Get Recommendations" button allows users to proceed to the recommendation stage.

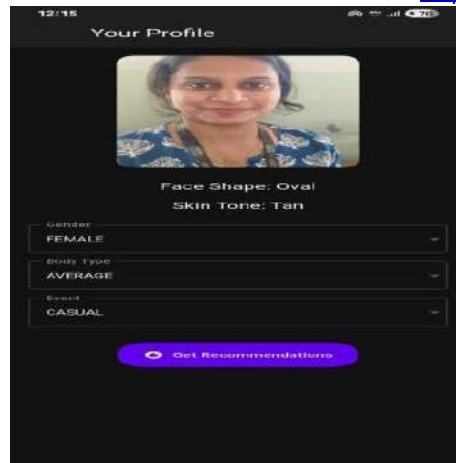


Fig 4 Profile Screen

C. Recommendation Screen

The Recommendation Screen presents AI-generated styling suggestions based on the user's profile. The results include:

- Suitable color palettes matching the detected skin tone.
- Outfit recommendations aligned with the selected event and body type.
- Makeup suggestions such as foundation shade, lipstick, and blush.

An AI-generated summary explains how the recommendations are tailored to the user's facial attributes and preferences, improving transparency and user confidence.

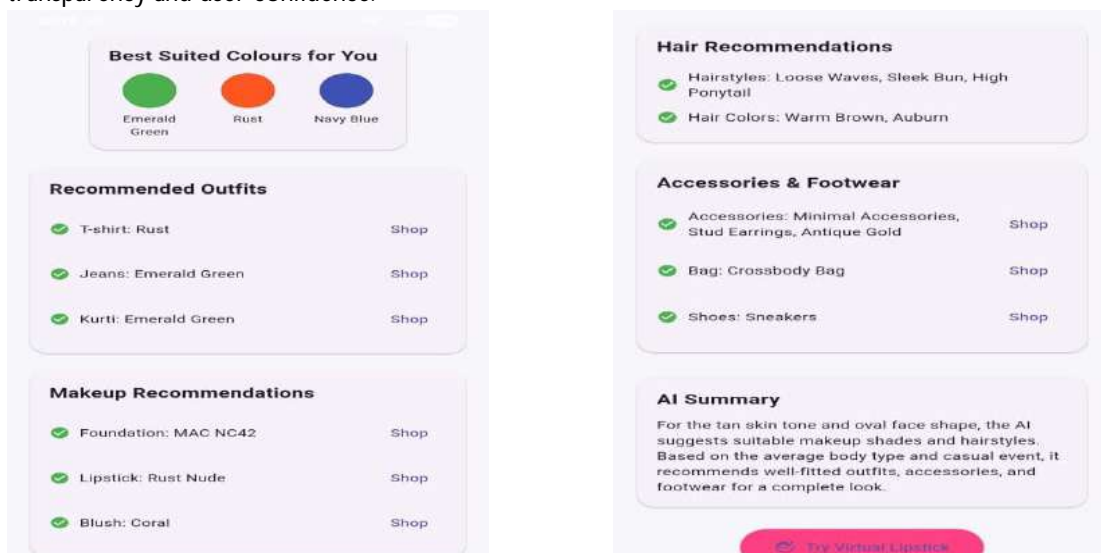


Fig 5 Recommendation Screen

A. Virtual Lipstick Try-On

The Virtual Lipstick Try-On feature enables users to preview multiple lipstick shades on their uploaded image in real time. Users can switch between different shades instantly, allowing easy comparison without physical application. This feature demonstrates effective use of image overlay techniques for realistic virtual makeup visualization.



Fig.6. Virtual Try-On

B. Step-by-Step Makeup Guide

The Step-by-Step Makeup Guide provides structured and personalized makeup instructions. Users upload a clear, front-facing photo to ensure accurate facial analysis. The interface offers a simple and minimal design that guides users toward generating a customized makeup routine.



Fig 7 Makeup Guide

F. Makeup Selection Screen

Once a face is successfully detected, users are presented with a selection screen where they can choose specific makeup categories such as foundation, blush, eyeshadow, eyeliner, lipstick, and highlighter. A "Generate Guide" button triggers the creation of step-by-step instructions, while a "Change Photo" option allows re-uploading images if required.

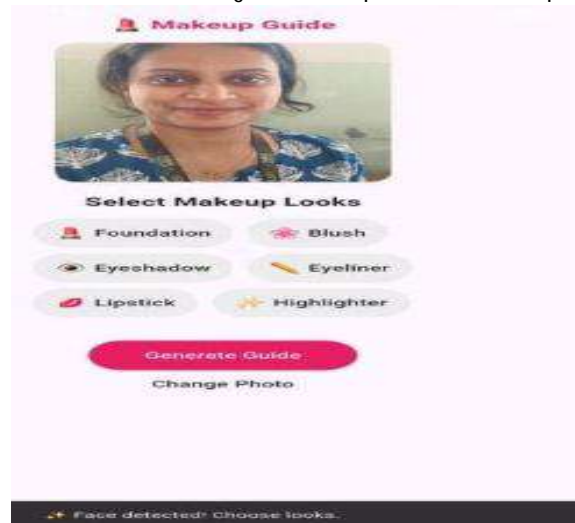


Fig 8 Makeup Guide Selection Screen

G. Makeup Application Steps

The generated makeup guide consists of multiple sequential steps:

Foundation Application



Fig 9 Foundation Application

This screen represents the first step in the step-by-step makeup guide, focusing on foundation application. A visual overlay highlights the facial regions where foundation should be applied to achieve even coverage. Clear textual instructions describe the objective of creating a smooth and uniform base, while navigation controls allow users to progress sequentially through the makeup steps. This design supports structured and beginner-friendly makeup guidance.

Blush Application

This screen represents the second step in the makeup guide, focusing on blush application. Highlighted cheek regions indicate correct placement, while concise instructions guide users to apply and blend blush upward for a natural appearance. Navigation controls enable smooth progression through the makeup steps, ensuring clarity and ease of use.



Fig10 Blush Application

Eyeshadow Blending

This screen illustrates the eyeshadow application stage, where users are instructed to blend eyeshadow smoothly across the eyelids. The guidance emphasizes even blending to enhance eye depth and definition while avoiding harsh lines.



Fig 11 Eyeshadow Application

Eyeliner Application

This image represents the eyeliner application stage. The guide advises applying eyeliner along the upper lash line. This step enhances eye shape and provides a bold, defined look, making the eyes appear sharper and more expressive.



Fig 12 Eyeliner Application

Lipstick Application

This screen focuses on lipstick application. A highlighted area is shown on the lips to guide the user. The instruction helps the user apply lipstick evenly within the lip boundaries, ensuring a neat and polished finish.



Fig 13 Lipstick Application

Highlighter Application



Fig 14. Highlighter Application

This screen represents the final makeup step, focusing on highlighter application. Key facial areas such as the cheekbones, nose bridge, and brow bone are highlighted to enhance facial features and add a natural radiance. Each step includes clear visual cues and concise instructions, making the guide beginner-friendly and easy to follow.

H. Final Look and Feedback

After completing all makeup steps, users are prompted to capture a selfie of their final look. The system analyzes the image and provides feedback scores along with improvement suggestions related to blending quality, symmetry, and lighting conditions. Users can retry the process or start over, enabling iterative learning and skill improvement.



Fig 15 (a) Final Look

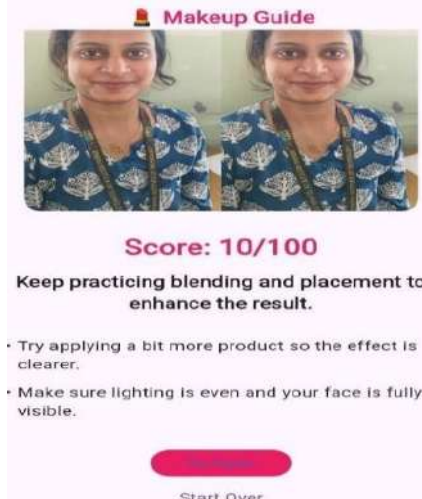


Fig 15 (b) Comparison & Feedback

The results demonstrate that the AURA application successfully performs facial analysis, generates personalized styling recommendations, enables realistic virtual try-on, and provides structured makeup guidance. The system achieves its goal of delivering an intuitive, AI-powered self-makeover experience with practical and visually guided outputs.

VII. CONCLUSION

The AURA: AI Self Makeover App successfully demonstrates the application of artificial intelligence and computer vision techniques to deliver a personalized and user-friendly grooming and styling experience. The system was designed to simplify fashion and makeup decision-making by analyzing facial attributes and user preferences, thereby providing relevant and practical recommendations for different occasions. Throughout the project, emphasis was placed on usability, accuracy, and personalization. The application integrates facial analysis, AI-based recommendation logic, and virtual makeup visualization to assist users in selecting suitable outfits, makeup styles, and accessories. The step-by-step makeup guidance further enhances user engagement by offering clear and structured instructions, making the system accessible even to beginners. The project highlights the potential of AI-driven solutions in the beauty and fashion domain by promoting individuality and confidence rather than rigid beauty standards. With further enhancements such as expanded datasets, improved model accuracy, and additional virtual try-on features, AURA can be extended into a scalable and intelligent personal styling assistant. Overall, the AURA application represents a meaningful step toward intelligent self-care systems, combining technology with personalization to support informed grooming and styling decisions in a practical and inclusive manner.

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