Mobile application with artificial intelligence for object recognition and visualization of haircut styles

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Abstract

This article was based on research and development of a multiclass machine learning model in the design of a mobile application. The aforementioned application aims to improve user satisfaction, streamline decision-making, reduce errors, and foster confidence in students' ability to practice haircutting. At the methodological level, the procedural option was based on the use of the Mobile D methodology to offer haircut suggestions for men. Additionally, it included a bibliographic investigation, field coverage, and the use of inductive and deductive methods. This application was tested at the Majirel Academy of Hairdressing and Cosmetology in Quito to evaluate men's haircuts using artificial intelligence. The application analyzes facial features to provide personalized options, addressing the growing demand for cosmetology and styling professionals. This design included a user interface, AI-generated recommendations, and a user profile focused on enhancing the customer experience and optimizing the time and resources of stylists, which have been crucial in establishing improvements in the training and professional skills of students. It also promotes sustainable practices, reduces waste of products and materials, and equips students with technological skills for the job market.

Keywords: mobile application, machine learning, artificial intelligence, haircuts, Mobile D.

1.Introduction

Currently, current trends in haircuts and male styles must be considered when designing an interface and display options for a mobile application. In this context, a mobile application for male haircuts using artificial intelligence has been developed for the Majirel Academy of Hairdressing and Cosmetology (Maulana et al., 2023). The application will analyze facial features to provide personalized options to students. With the reopening of hair salons after quarantine, there is a growing demand for professionals in cosmetology and styling (Fahmi et al., 2022). The project aims to preview different male haircut models, considering individual needs and preferences. The app will differentiate Majirel Academy from similar services by allowing users to view and make decisions based on their facial features. The Majirel Academy of Hairdressing and Cosmetology is implementing a mobile application to preview haircut models, aiming to enhance the experience and quality of its services. The academy is addressing dissatisfaction with the lack of empathy and professionalism in the industry, which has led to the opening of multiple hair salons. The use of artificial intelligence to preview male haircut models is considered an innovation that promotes a practical and functional approach to interaction and collaboration (Gupta et al., 2024). This technology can prepare students for the ever-changing job market and enhance the client experience in beauty salons.

The Majirel Academy of Hairdressing and Cosmetology in Quito aims to improve user satisfaction in the cosmetology

and hairdressing industry by implementing a mobile application. Therefore, the relevance of using an app allows hairdressing students to preview haircut models for practical classes, generating personalized experiences for clients or models to follow (Changjo S. and Seongah C., 2023). By properly using the app, the decision-making process is streamlined, errors are reduced, and the efficiency and quality of hairdressing students' learning are improved. It also fosters confidence in students' ability to perform hair cutting practices based on artificial intelligence models (Castanyer et al., 2021). The app aims to strengthen the connection between the academy and both theoretical and practical learning, increasing the academy's competitiveness and enhancing the connection between the academy and students' theoretical and practical learning.

In this context, this study focuses on the design and management of an intuitive mobile app that allows users to generate personalized previews of male haircuts based on their facial features. This is done through an artificial intelligence model that analyzes users' facial characteristics ("face shape") to generate accurate, individualized visualizations. The study also considers user satisfaction perception assessments and acceptance testing of the mobile app.

2.Methodology

In this study, the research methodology involves bibliographic research, field research, and inductive and deductive methods. Bibliographic research focuses on existing information about men's haircuts, artificial intelligence techniques, and their application in personalizing services. Field research involves participant observation, interviews, and analysis, with beneficiaries from Majirel Academy conducting surveys and interviews to understand their needs and expectations. The inductive method identifies patterns and relationships from data collected from field observations and images of different face types and haircuts. The deductive method applies general principles of artificial intelligence and machine learning to develop a mobile app for the Majirel Academy. The artificial intelligence model analyzes facial features and user preferences to generate accurate, tailored recommendations (De Sario et al., 2023). This research aims to build a solid knowledge base for the development of the mobile app for Majirel Beauty Academy.

The Mobile D methodology (Alnanih et al., 2019) is being used to develop a mobile application for Majirel Beauty Academy, with the goal of providing male haircut suggestions. The project involves several stages, including exploration, initiation, production, stabilization, and system testing. The first stage involves analyzing current trends and popular styles in men's haircuts, as well as researching machine learning in the context of haircut suggestions (Daniels et al., 2021; Weerasinghe, H. & Vidanagama, D., 2020). The project scope is defined, and a small, agile team is formed to carry out development.

The production stage of the mobile application involves creating a functional prototype using known design patterns and adapting it based on user feedback. Stabilization involves iterative improvements, focusing on quick delivery and thorough testing to ensure the app works correctly. The system testing stage is the final stage, where the app is validated in a real environment, with academy students as beta users and 66 clients, who undergo an evaluation of their perceptions regarding design, visualization, decision-making, response speed, and app functionality.

3. Results

3.1 Mobile App Graphical Interface

The "Majirel" beauty academy has developed an initial functional prototype for a mobile application. This prototype will validate basic ideas before advancing to more complex versions. The main navigation will feature basic screens to select haircut styles and display recommendations. The app will implement basic interactivity, integrating an artificial intelligence model to provide haircut recommendations (Kamble, Y. & Kulkarni, R., 2024). Preliminary feedback will be collected from selected users through surveys and interviews to gather detailed comments.

The results are embedded according to the agile Mobile-D methodology, which helps meet specific requirements, such as login, catalog, control panel, student management, catalog management, role management, photo uploads, image generation, image sharing, and profile editing (Amajuoyi et al., 2024). The system's authors are specified, with ACT-001 as the administrator and ACT-002 as the student. Thus, the login/registration screen allows users to create a new account or log into an existing one, with options to recover passwords and register for a new account (Figure 1).
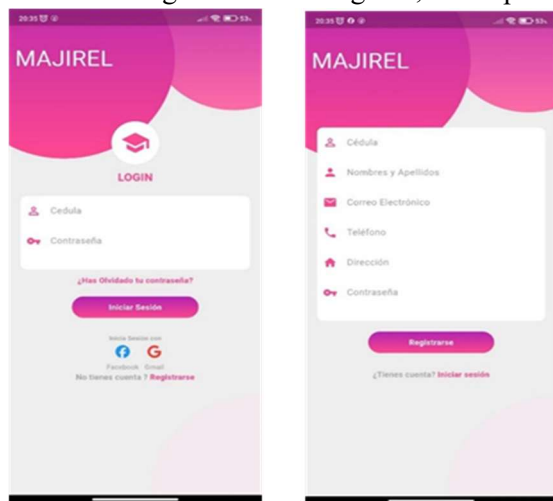

Figure 1. Registration/Login Graphical Interface

3.2. Artificial Intelligence that Analyzes Users' Facial Features "Face Type" to Generate Accurate and Tailored Visualizations for Each Individual

The approach using artificial intelligence has been carried out through GAN, or Generative Adversarial Networks, which represent an image recognition algorithm (Zhong et al., 2024). The key metrics to evaluate its performance include accuracy at a level of 95%, which measures the percentage of correct predictions, and recall, which measures the model's ability to identify all positive instances of a class without generating false positives. Generative models, such as those that create new images, use metrics like FID and IS to compare generated images with real images of hairstyle styles. Other considerations include false positive and false negative rates, as well as the ROC curve, which shows the relationship between true positive and false positive rates for different classification thresholds.

In this context, the results of the application's interface show on the user profile screen the corresponding updates on the required personal information, including name, address, email, and photo. The recommendations screen displays hairstyle recommendations generated by AI, with an image gallery and a button to save the history (Figure 2).
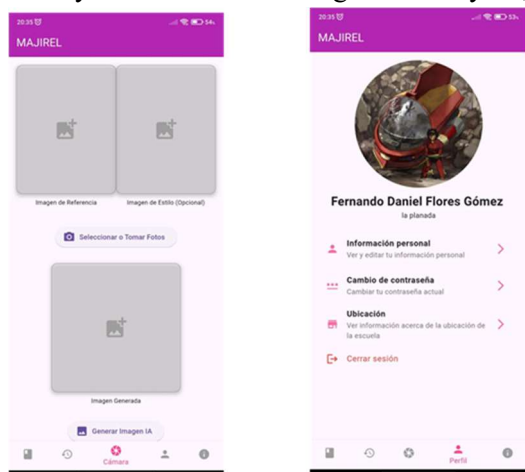

Figure 2. User Profile Graphic Interface.

The haircut details screen provides a detailed view of a hairstyle, while the Admin Panel allows Majirel Academy staff to manage users, make recommendations, and perform data analysis (Figure 3).
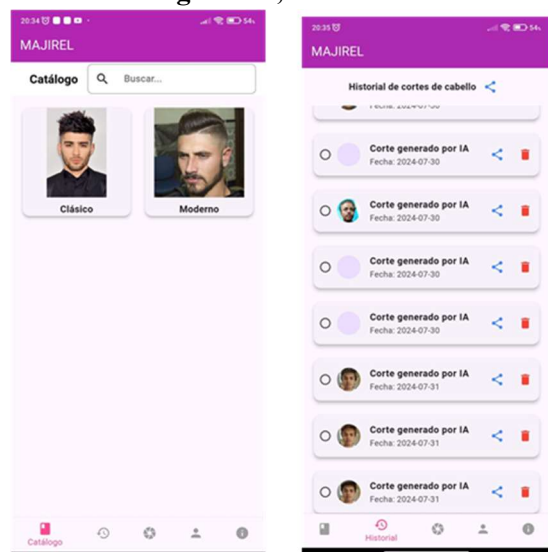

Figure 3. Graphical interface for recommendations and haircut details.

3.2.   Customer   Satisfaction   Evaluation

A satisfaction survey was conducted with a significant sample of 66 clients at the Majirel Hairdressing and Cosmetology Academy in Quito. The aim was to evaluate men's haircuts using artificial intelligence. The overall perception was positive according to most of the respondents. The survey revealed that the user interface design of the app was mainly seen as positive, with 75.60% of the respondents describing it as attractive but improvable (Figure 4). This indicates that the app meets the expectations of most users and is functional, allowing for intuitive and efficient interaction. The visualization of haircut styles was mostly considered realistic by the respondents, with 78.28% finding the images generated by the app realistic. However, 21.3% considered the visual fidelity to be neutral and slightly unrealistic (Figure 5).
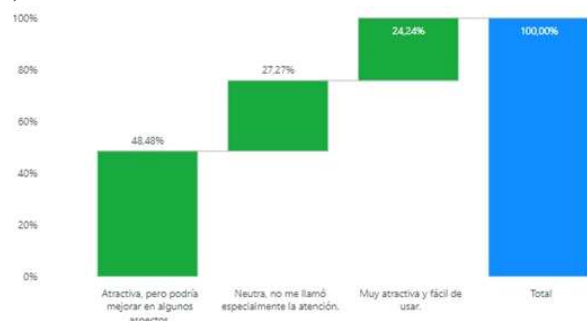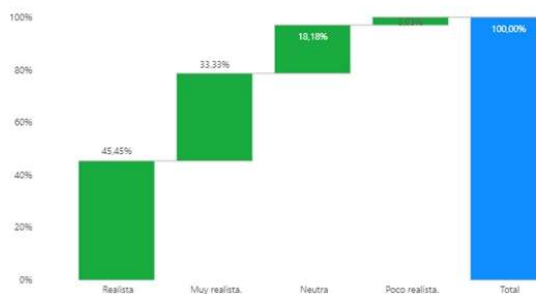

Figure 4. User interface design

Figure 5. Visualization of hair styles

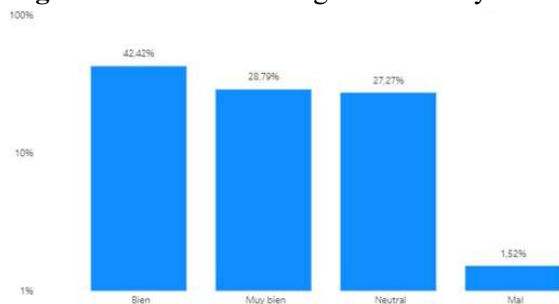**Figure 6.** Decision making in haircut style   **Figure 7.** Application response speed

Figure 8. Application functionality

The influence of the app on the choice of a haircut was well received, as 69.7% indicated that it had a strong influence, while 30.3% felt it had little or some influence (Figure 6). The speed of response to image analysis was also positively received, with 71.21% of respondents finding it fast or very fast (Figure 7). The functionality of the application was well-received, with 71.21% of respondents stating it was good or very good (Figure 8).

The accuracy of the haircut recommendations based on the face and hair type was also highly accepted, with 77.27% of respondents stating that the recommendations were quite accurate (Figure 8). However, 22.73% of respondents felt neutral or found the recommendations somewhat inaccurate, suggesting that the algorithm is being improved to provide better results, or that the users did not find the recommendations to their liking. Overall, the functionality of the app was well-received and understood by the majority of respondents, and it met their expectations.

4.   **Discussion**

The Majirel Beauty Academy, through the implementation of a mobile app for personalized haircuts based on artificial intelligence, is improving customer self-esteem, promoting learning of effective techniques, and providing innovative services that are more accessible (Shakeel, S. & Khan, S., 2024). While the technology also increases competitiveness, revenue generation, and resource optimization, it helps reduce waste and promotes environmental awareness. The use of AI in the beauty industry will enhance the use of advanced technology and develop new skills for the current and future job market (Shakeel CS & Khan SJ., 2024). Therefore, the academy's curriculum will be modernized and interactive, preparing students for market demands. The app will also improve the culture of personalization in beauty services, valuing individuality and promoting innovation (Paranjape et al., 2021).

5.   **Conclusions**

The mobile app based on artificial intelligence for the 'Majirel' beauty academy has significantly improved the recommendations for men's haircuts, enhancing the customer experience and optimizing the time and resources of stylists. The app has also improved the training and professional skills of students, leading to greater customer satisfaction and higher income. The mobile app promotes sustainable practices, reducing waste of products and materials, and equips students with technological skills for the job market. To further improve the effectiveness of the mobile app, it is recommended to continue innovating and updating its interface, expand the project to other academies and beauty salons, implement continuous training programs, analyze user data, promote sustainable practices, and improve the user interface of the app. Regular user feedback is also crucial for identifying and making the necessary improvements.

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