

Estilo: A Mobile-Based Fashion Recommendation App Tailored to Users' Needs

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ABSTRACT

Artificial Intelligence (AI) and Machine Learning (ML) have been increasingly affecting the fashion industry with real-time capabilities for personalized clothing. Despite fashion ultimately being just self-expression, identity & culture, many considerations, like differences in body shapes, tastes, requirements for the occasion, and continuously evolving trends, complicate the decision-making on what to wear. While personalization systems are more beneficial than one-size-fits-all, many systems still limit their capability for personalization through apps that do not focus on user preference and that are less accurate. This study shows the rapid evolution of a cross-platform mobile application for fashion recommendations, that fused content-based and Collaborative filtering with machine learning techniques to deliver personalized fashion recommendations. The app simplifies the choices about outfitting, reduces the time browsing for clothing, builds user confidence, and provides several options suitable to various user preferences. Firebase and Supabase offer database management and authentication security, while Machine Learning is leveraged to analyze the strong relationships between user and product data in order to provide a recommendation based on user preferences. The development utilized Agile methodologies, incorporating iterative tasks and adjustments guided by user feedback to improve functionality, usability, and precision. Result demonstrates that the application reduces time and browsing in finding outfits and increase user confidence through reliable, and timely suggestions suited to the situation. Moreover, the system showcased inclusivity by putting various styles and real-time trends, thus enabling merchants to connect with a wider audience. In summary, the findings shows that an AI-mobile based fashion recommendation system provides a more user-friendly, personalized, and various clothing selection method. The suggested solution promotes digital fashion technologies by focusing on individuality, diversity, and usability, thereby improving the role of AI in daily self-expression.

Keywords: Fashion, Recommendation System, Content-based Filtering, User Preference, Personalized Fashion

INTRODUCTION

Information technology influences the personal and professional lives of each individual in modern society. Information technology forms the baseline for all technology advances and inventions, affecting the present and future. It is known as artificial intelligence (AI) when an information technology application can perform repetitive activities requiring human intelligence. A division of AI, machine learning (ML) is typically defined as an application of algorithms to develop, improve, and predict applications such as recommendation systems.

With the help of Artificial Intelligence (AI) and Machine Learning (ML), the system provides users with personalized outfit by removing the uncertainty associated with what to wear to a specific preference of a user. Instead of relying solely on user preferences, it makes recommendations based on the characteristics of the items. The recommendations are coordinated based on the attributes to meet the needs of the end user. It can also increase convenience and save time by giving the end-user precise clothing options. Additionally, the system adapts to the current trends and allow the end-user to stay updated with the evolution of fashion, offering coordinated style that enhance confidence in their appearance.

Choosing the appropriate outfit and making sure it suits the style and personality of a person are some of the most difficult fashion challenges. According to Dabare and Caldera (2024), by examining the end-user

preferences and wardrobe items, AI-driven recommendation systems can assist end-users in making better fashion choices. By utilizing machine learning algorithms to provide personalized outfit suggestions.

Therefore, this study seeks to develop Estilo: A Mobile-based Fashion Recommendation App Tailored To User's Need. The goal of this system is to make a list of suggestions for the end-user without making them take the guesswork and anxiety out of choosing what to wear. It is designed for making it easier to look for outfits that is most suitable based on the choices of the user. Feeling confident while being fashionable with minimal effort, enhancing their daily- decision without worrying about stress.

REVIEW RELATED STUDIES

Sivaranjani, L., et al. (2023) express that AI-based applications can help to personalize outfit suggestions based on user preferences. This reinforces that both machine learning and content-based filtering can be beneficial technologies in recommender systems based on the prior behavior of the user. In turn, this increases the personalization aspects and efficiency in the selection of wearables in mobile applications.

A study by Varma et al. (2024) they developed a system STYLESYNC, a fashion recommendation system that uses AI-Based to assist an individual to decide what to wear. The interface of the STYLESYNC is user friendly allowing the individual to conveniently coordinate their clothing items in their wardrobe and affords the use of the feedback supplied by users to continue improving the accuracy of the recommendations and user experience. This study reflects the capabilities of AI for fashion recommendations.

Khubchandani et al. (2024) develop a Smart Outfit Recommendation System that provides clothing options based on the user's body type, gender, skin tone, and special occasions. With an intuitive interface, the system provides similes about the user's wardrobe for outfit assembling and includes real-time interactive fashion recommendations. This study highlights the importance of fashion recommendations based on user behavior and has expanded this idea further by providing handy content-based filtering in outfit suggestions that shows the users' own wardrobe.

According to Blancaflor and Villasor (2025), they developed a fashion e-commerce with a recommendation system and augmented with virtual reality (VR) for a more enjoyable buying experience. The utilization of AI recommendation system and emerging technologies leads to personalization in shopping experiences. The results of this study contribute to the development of a mobile system for recommending outfits by showing that recommendation algorithms and virtual try-on increase user engagement and facilitate better outfits selections suited to individual preferences.

Mire (2021), developed an e-commerce application with a recommender system. Its job is to provide users with personalized product recommendations based on their ratings, which indicate their likes and dislikes or what they preferred. It emphasizes a recommendation system for user action through AI-driven personalized recommendations.

According to Yaswanthraj et al. (2024), they developed a comprehensive clothing recommendation system that can highlights the important role in enhancing deep levels of user satisfaction and efficiency within the online shopping experience. The study study focused on creating that the addition of user attributes to outfit recommendations, example of that is body shape, skin tone, height, and style preference, allows the system to deliver more precise and personalized recommendations through user characteristics and preferences.

According to Sarojadevi et al. (2023), product recommendation engines are effective tools in improving the quality of customer experience through the use of machine learning, various product selection forms, and a specialized recommendation system algorithm. The researchers in the study titled Fashion Recommender System (FRS): Image-Based Engine for Personalized Outfit note that fashion recommendation systems dynamically integrate into various platforms, including websites, applications, and digital platforms. They stated that current engines can also process large product catalogues and autonomously determine which algorithm(s) and filters to use for each individual user. Due to this, businesses can enhance personalization, improve conversion rates, and increase customer satisfaction overall.

According to Challa et al. (2023) An intelligent system called a fashion recommendation system provides customers personalized fashion recommendations based on different factors including their own preferences, style, body type, and other criteria. The system processes the user's data and recommends the most suitable fashion products for them using data analytics, machine learning, and artificial intelligence approaches. Intelligent fashion recommendation is urgently needed due to the tremendous growth of fashion-oriented trends. We developed algorithms that automatically recommend the users' clothing choices based on their fashion preferences.

Becattini et al. (2023) suggest that improving fashion recommendations looks at a new interpretation of "layer," which expresses and incorporates not only style but also social context. In the study, Fashion Recommendation Based on Style and Social Events, they represented style as a hybrid of mood and emotional attributes of color combinations, while using social context as a measure of suitability for an outfit via analysis of actual social context or events of clothing worn in images. By incorporating this representation of style and context into their recommendation framework, they first implemented a style classifier and then a context classifier to make contextual fashion recommendations.

According to Guillermo et al. (2021), recommender systems are becoming increasingly important as most software applications are aggregated, giving a one-stop shop for clients, particularly in the fashion industry. Based on the data and findings of the study presented in the preceding section, it is possible to conclude that the demonstration of unsupervised picture learning was successful. Aside from practicality, aggregated systems will be more efficient and user pleasant in the sense that a user will not have to walk through the complete categories of an online shop or even search from multiple applications in order to find the item that is being searched for.

CONCEPTUAL FRAMEWORK

The conceptual framework of the study "Estilo, A Mobile-Based Fashion Recommendation App Tailored to User's Need" is made including the input, output, and processes, to obtain the overall picture of the study. The goal of this study is to find what the end-user wants for their apparel on a certain occasion. The following figure is shown as the conceptual framework:

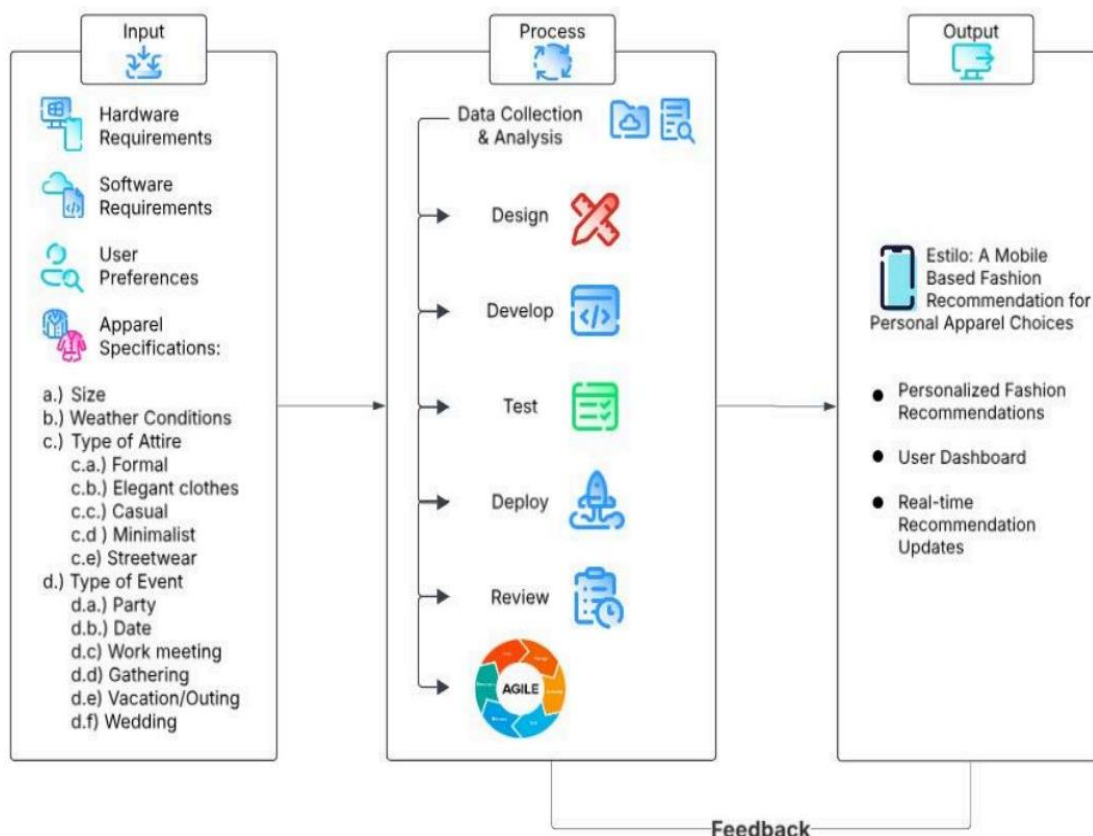


Figure 2.1: input-process-output model (IPO)

The figure 2.1 shows the stages that the study needs to take in order for the proponents achieve its desired output, and that will be the mobile fashion recommender with a smart filtering algorithm in order to sort what the user likes.

Input stage are consists of hardware, software requirements, user preferences, and apparel specifications. Hardware requirements include the laptop, computer, and a mobile phone used for designing, developing, testing of the mobile application. For the software requirements, it includes React Native (JSX) as the framework for mobile development and Python for handling the database, with an IDE such as Visual Studio Code or Android Studio used for coding and development. For the user requirements, it includes the what the user like when picking an outfit. Lastly for the apparel specifications, this includes the size, type of attire, and the type of event that the end-user will filter out in the application.

Process stage it includes the planning, designing, developing, testing, deploying, and the review. In the first phase of the Agile methodology will be the data collection, it is the phase wherein the different data or information will be gathered for the study. Afterwards, the data analysis will be the next phase wherein this will be the phase that we filter out the necessary data that is needed for the study. Following that, will be the designing phase which will be the UI/UX of the mobile application. Next, will be the developing phase, this is the phase that will focus on coding, where the source code will be made so that the application will be functional. Next will be the testing phase, this phase will focus on debugging and testing in order for the application to have minimal errors. Next is the deployment phase where the application will be available for use on Android. Lastly, the review, where feedback from users will be gathered to evaluate the performance of the application and in order for the proponents to identify the areas for improvement.

Output stage will include what will be the end product or the mobile application itself, while including the user feedback that comes from the application. The mobile application “Estilo” that has been built, will be ready for deployment and functional with all its core features, ensuring a seamless user experience. In the user feedback, it will be used for improvements for the application in order for it to be more efficient and is aligned to meet the preference of the user.

METHODOLOGY

The process of developing Estilo" A Mobile-Based Fashion Recommendation App Tailored to User's Need. It uses the Agile Model Development that makes sure that the mobile application develops continuously for every stage and requires user feedback for further improvements. The Agile methodology was broken down into iterative cycles of planning, design, development, testing, release, and feedback. Each sprint ended with user evaluations to identify issues and measure usability and accuracy for ongoing improvement. Agile methodology is flexible that helps Estilo grow and evolve. The experimentation we can conduct, the data we collect, and the recommendations we are able to refine create a more intelligent and engaging experience for the user. Whether it is a small change in the look and feel or the larger changes to the machine learning models designed to deliver on the outfit recommendations, being agile allows for the building of a product that meets the expectations of the end-users while reducing the exponential rate of change within the fashion space.

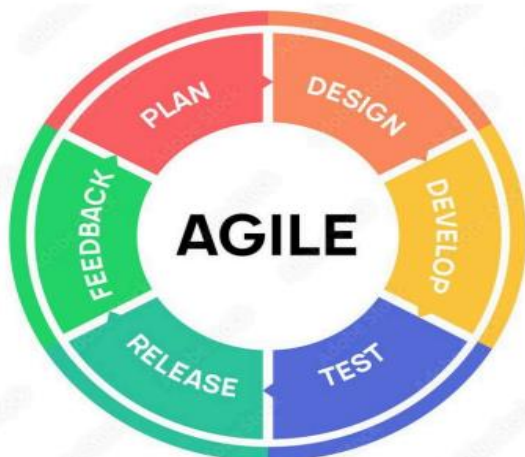


Figure 3.1: Agile Model

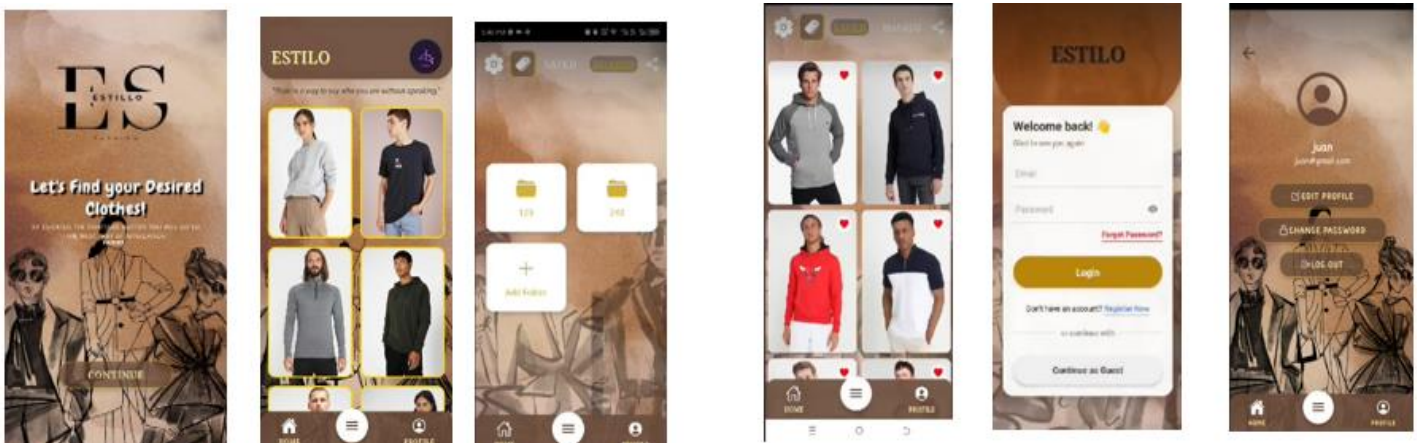
Planning

This stage will involve gathering the essential data that will be needed for the fashion recommendation system. The proponents will conduct surveys, interviews, and gather data sets. The proponents will be using these data gathering techniques to identify all user preferences, challenges, and inspirations for our project. The necessary data will be analyzed for the proponents to determine the key factors influencing apparel recommendations, such as fashion trends, personal style preferences, clothing suitability for different weather conditions.

Design

The proponents will design the user interface (UI) and user experience (UX) using Figma. Wireframes and prototypes will be created for users for the proponents to visualize how users interact with the application. In order to align the content for

In order to fit the design with the user's preferences. The proponents conduct an interview with a specific individual to gain information into how they felt after using the app, the content, the design, the color, and the outfit recommendations. Proponents ensure that it aligns with the user's preferences.



Develop

The proponents will use react native as Integrated Development Environment (IDE) for the availability in Android, using JavaScript to build the Frontend and python for the Backend, will also be using Firebase and Supabase for the database management.

To improve the recommendation system, the algorithms were tested on a sample collection of outfit photographs organized by size, event, weather, and style. The models were created in Python and linked to frontend processing via React Native using Firebase and Supabase databases. Precision and recall metrics were used to assess the correctness and relevance of recommendations.



The proponents begin by identifying the necessary datasets, in this case, the outfit for the user needs to be find.

Furthermore, the proponents create the basis and fundamental frameworks, such as Content-Based Algorithm and Collaborative Filtering to work them together to be able understand the user preference, because these are required for the recommender system to function. Using the essential frameworks, the system will be able to understand user actions, making outfit suggestions more relevant and assisting users in discovering new outfit ideas.

Test

Testing will be carried out to locate and fix bugs. Unit, integration, and user acceptance testing (UAT) is conducted so that it will assess system performance, accuracy, and usability. The testers will check the accuracy of recommendations and speed across various devices and screen sizes.

The proponents have gathered local apparel businesses that will serve as the study's respondents, including Street Underground in Paco, Tondo Manila, Yifu in Binondo Manila, and Plain Street in Tondo Manila. The proponents create a Likert-Scale interview questionnaire for the intended target user's to review and test the application. The questionnaire was created using the ISO/IEC 25010 criterion to ensure the applications fit the user's wants and needs and also to assess the quality standard, functionality, efficiency, and reliability.



Release

The application will be deployed in a live setting. The deployment includes provisioning cloud infrastructure, considerations of data security and operational availability through app distribution services. The team will provide feedback channels for early adopters and stakeholders to help with refinement based on feedback.

Feedback

The proponents will use the ongoing review and feedback process to further develop the system. The proponents will release regular updates to provide improvements to prompt features, updates of recommendation accuracy, and apply any lessons learned. Review of consumer updates are analyzed for priority of features in future releases, and to ensure the app remains with fashion trends and preferences of the users.

The proponents will gather and document performance evaluation data, such as accuracy, precision rate, and response time, after each development sprint to ensure transparency and reproducibility. User feedback guided the changes to the UI and algorithm of the system, allowing for more flexible and user-centered fashion recommendations.

With this, the proponents will assess system performance based on user feedback and make any necessary changes and upgrades to preserve the quality of outfit recommendations.

SAMPLING METHODS

The study is conducted with fashion enthusiasts, fashion designers, and fashion retailers, they considered to be the primary users of the system. The purposive sampling technique is designed to select individuals with relevant expertise and knowledge in the fashion industry.

The purposive sample was chosen to guarantee that the participants in the study had the ability to provide useful

data and information. The goal was to collect in-depth information from users in order to support and contribute to the early stages of study development and analysis.



ETHICAL CONSIDERATION

The proponents followed to ensure the integrity, safety, and fairness of the study. It addresses the protection and privacy of the information that obtained to the study. In conducting this study, proponents ensure the integrity and fairness of the AI-based outfit recommendation system without bias, making sure that AI-based outfit recommender systems are fair and inclusive to anyone and protect the privacy of users and make sure it is encrypted while ensuring that the data collected and recommendation that the user personalized are conducted transparently and securely. Additionally, sensitive information was protected against unauthorized access, and academic integrity was upheld by properly citing all sources used in the study.

RESULT AND DISCUSSION

The survey results obtained from the total 60 respondents regarding the evaluation of the mobile-based fashion recommendation application, Estilo. The data collected pertained to six quality criteria, namely functional suitability, performance efficiency, usability, reliability, security, and portability. The results are presented in tables accompanied by mean scores and were interpreted based on a Likert scale (1=Strongly Disagree to 5=Strongly Agree) and a graphical scale for a better result perception. The subsequent discussion draws attention to how these results align with the aims of the research study.

RESULT

Functionality

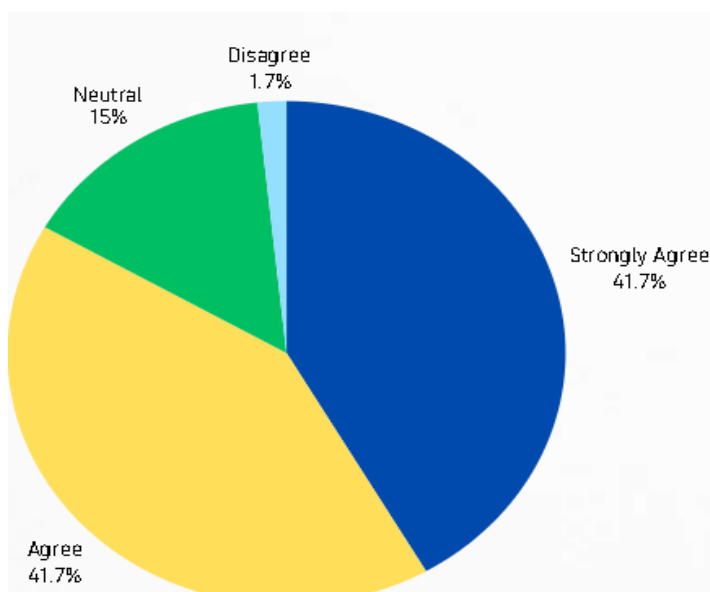


Figure 4.1: Pie Graph for Functionality

The system received an average mean score of 4.24 (Very Good) regarding functional suitability. The majority of respondents agreed the application has the appropriate functions and is providing adequate and accurate outfit suggestions according to stated preferences.

This shows how well the functions of the system respond to the user's needs. Additionally, it provides further evidence that ESTILO, as a mobile-based fashion recommendation application, provides sufficient and accurate clothing recommendations that are compatible with the preferences of the user's intended audience.

PERFORMANCE

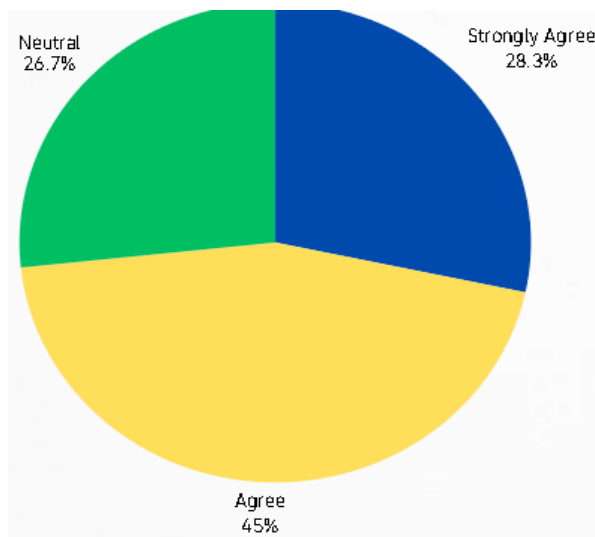


Figure 4.2: Pie Graph for Performance

The system achieved an average mean score of 4.03 (Good) for performance efficiency. Users generally agreed that the application loads quickly, responds promptly, and handles image-heavy content efficiently with smooth interactions.

The measurement of performance efficiency shows that the system was able to provide sufficiently fluid and resonant interactions. Additionally, the results also demonstrates that ESTILO, as a mobile-based fashion recommendation application, has great loading times, as well as being able to successfully render content that is image heavy, which allows for an affectively positive user experience.

Usability

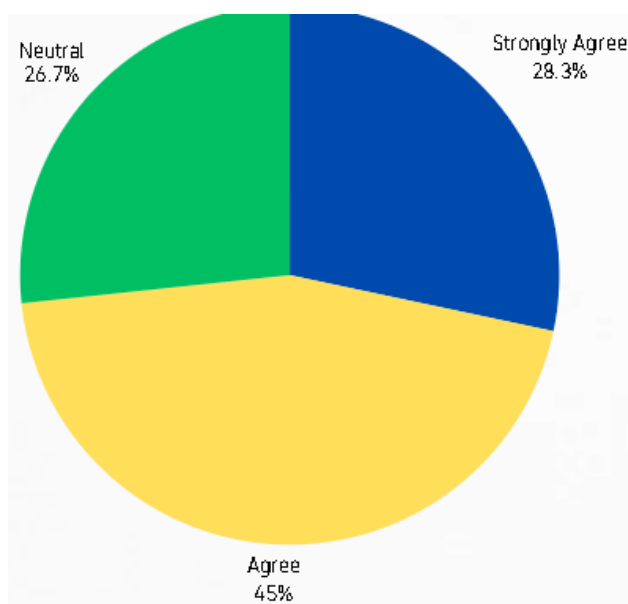


Figure 4.3: Pie Graph for Usability

The system received a mean score of 4.33 (Very Good) for usability. Most of the respondents strongly agreed that the application is easy to navigate utilizing clear icons and instructions, requiring very little effort to learn.

The usability results indicate that the system is straightforward and intuitive for users to control. Furthermore, it is further evidence that ESTILO provides clear icons as well as clear instructions about the process, making navigation simple and requiring very little cognitive effort, as shown by its mean score of 4.33 (Very Good).

Reliability

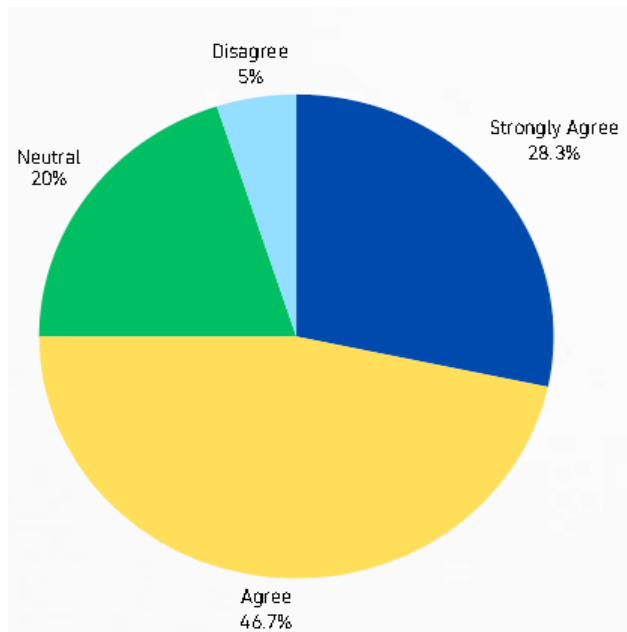


Figure 4.4: Bar Graph for Reliability

The system was able to gain a mean average score of 3.98 (Good) in survey. The users concurred that the application rarely crash, works in different conditions of internet and maintains data persistence effectively.

The results show that the system works reliably under various usage conditions. ESTILO operates reliably and stably, rarely crashing, and can operate with changes in the internet service. It also allows users to be dependent on it to use it in consistently and safer way because of data persistence.

Security

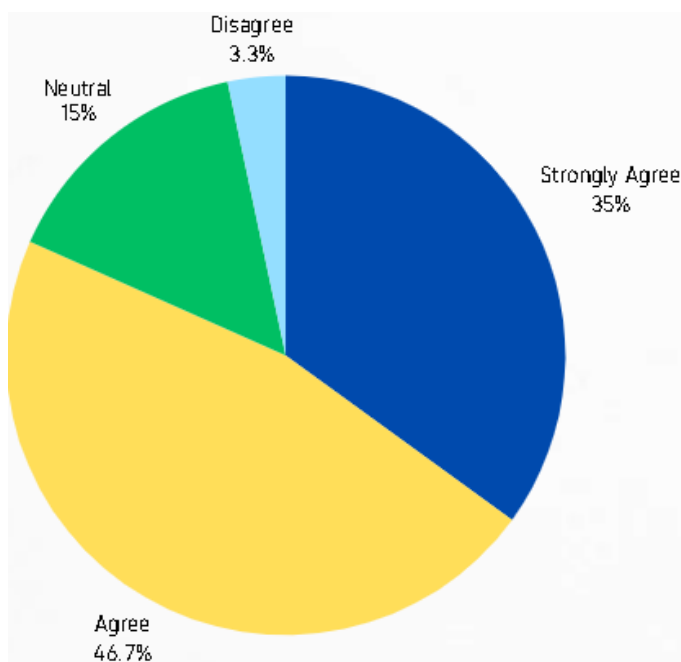


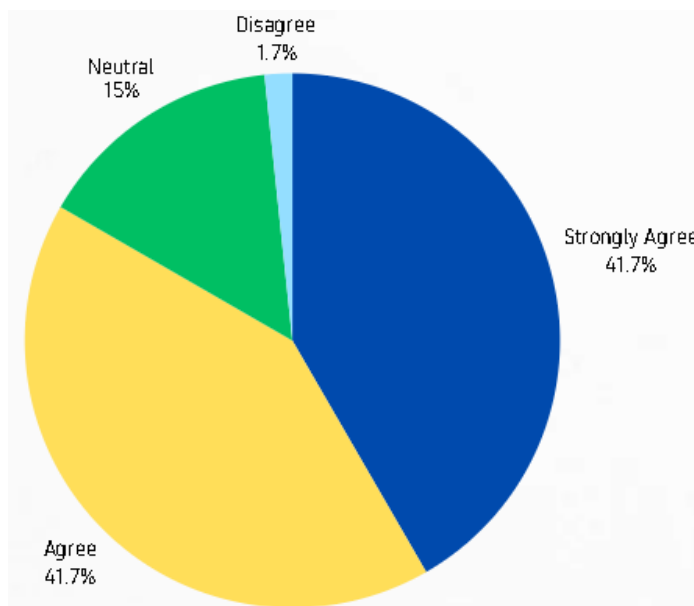
Figure 4.5: Bar Graph for Security

The system achieved an average mean score of 4.13 (Good) regarding security. Respondents agreed that the application adequately protects personal data, provides privacy control, and ensures account safety.

The investigation reveals that the system provided adequate protections for users' information. ESTILO accounts are safe, personal data is secured and privacy controls allow the user to easily be aware of how safe the application and their security is.

Portability

The system received an average mean score of 4.23 (Very Good) for portability. Users agreed that the application offers easy installation, works across different devices, and adapts well to varying screen sizes.



Security	4.13	Agree
Protects personal data	4.20	Agree
Provides privacy control	4.15	Agree
Ensures account safety	4.10	Agree
Prevents unauthorized access	4.05	Agree
Uses secure authentication and encryption methods	4.15	Agree
Portability	4.23	Agree
Easy installation	4.30	Strongly Agree
Works across different devices	4.15	Agree
Adapts to varying screen sizes	4.20	Agree
Comparable to similar apps	4.25	Agree
Perform Consistently	4.25	Agree

Figure 4.6: Bar Graph for Portability

The results indicate that the system is adaptable and easy for users to access across platforms. The ESTILO system installed easily, worked on devices and adjusted nicely for different screen sizes, and made access to system and usage easy and user-friendly in a variety of using conditions.

User Evaluation Survey Summary

Overall, the system received positive reviews across all six rating scales, with usability and functional suitability receiving the highest scores. These findings indicate that the application achieves user expectations by offering accurate and individualized recommendation sets (outfits) while also providing a simple, appealing, and user-friendly interface. The neutral to favorable evaluations for performance and reliability indicate that there are still areas for us to improve optimization, particularly in terms of reliability.

Criteria	Average Mean	Interpretation
Functionality	4.24	Strongly Agree
Provides necessary features	4.35	Agree
Delivers accurate and relevant outfit suggestions	4.20	Agree
Recommendations align with personal preferences	4.15	Agree
Enables efficient discovery of outfit ideas	4.25	Agree
Supports diverse fashion needs across different body types and occasions	4.25	Agree
Performance	4.24	Agree
Loads quickly and responds promptly.	4.10	Agree
Smooth interaction.	4.05	Agree
Efficient battery and data usage.	3.95	Agree
Handles image-heavy content well.	4.00	Agree
Maintains consistent performance during extended use.	4.05	Agree
Usability	4.33	Strongly Agree
Easy to navigate	4.40	Strongly Agree
Clear icons and instructions	4.30	Strongly Agree
Visually appealing interface	4.25	Agree
Minimal learning curve	4.35	Strongly Agree
Provides intuitive and enjoyable user experience	4.35	Strongly Agree
Reliability	3.98	Agree
Rarely crashes	4.05	Agree
Works under varying internet conditions	3.95	Agree
Maintains data persistence	4.00	Agree
Recovers smoothly from errors	3.90	Agree
Provides consistent results across multiple sessions	4.00	Agree

Table 1: User Evaluation Survey Summary

CONCLUSION

In summary, this study is designed to developed a successful mobile application that integrated with AI-powered outfit recommendation system. The structured development of the system will go to the process of agile methodology that breaks the project down into several and manageable phases that would help to the development of the project and can also adapt for a continuous improvement by utilizing artificial intelligence and machine learning models, the proponents can achieve the project goals of this study to provide system that can personalized outfit suggestion based on user preferences by integrating Content-based filtering, and Random Forest with this the system can analyze various outfit attributes to recommend a outfit based on the user selected and to enhance the accuracy and the performance of the system to recommend. Through the process, the proponents gathered data, such as surveys and questionnaire to a certain individual that can help and give their insight to the development of the project and also the proponents collect a literatures data that have connection to the study for a support. The development process of the project will cover the model training, gathering data, system design, testing and evaluation to ensure the accuracy of the recommendation and the responsiveness of it in mobile application that align to the project goal of the proponents to develop a mobile-based outfit recommendation for personalized choices.

RECOMMENDATIONS

Base on the result of the study, the researcher recommends the following for the better improvement in the future of Estilo: A Mobile-based Fashion Recommendation App Tailored to User's Need”

Integration of Camera for Outfit Suggestion- clothes suggestion through built-in camera using CNN algorithm.

Incorporation of lightning in Outfit Suggestion –Recommends outfit choices suited to specific lighting situations. Users are to capture or photograph the lighting conditions of the wearer's environment.

Messaging System - This feature allow users to communicate without the need of external application, enhancing user convenience, streamline interaction, and engagement within the application.

Real-time Weather Integration – Incorporating real-time weather data would enhance the accuracy of outfit recommendation.

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