International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Review Driven Beauty Product Recommendation System

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ABSTRACT:

The beauty industry is always evolving and growing with time, and with plenty of products on the market. Skincare, haircare, cosmetics, and fragrance are just a few of the many products that fall under this umbrella. The selection of the ideal product might be difficult for consumers due to the enormous items available to them. A traditional recommendation system typically relies on user behaviour data, such as past purchase history, product views, and user ratings, to generate recommendations but our recommendation system takes into consideration user input preference and

customer reviews to recommend products. The main target of this project is to design a system for recommending the top products to users based on their preferences. A user-friendly web interface facilitates seamless interaction, allowing customers to input preferences such as skin type, skin tone, and product category preferences. The virtual try-on feature provides an immersive experience, enabling users to visualize the top recommended products before making a purchase.

This paper provides a comprehensive exploration of recommending beauty products with a discussion of the findings, limitations and suggestions for further research.

Keywords: Personalized, Recommendation system, User Input Preferences, Customer Reviews, Sentiment Analysis, Knowledge Based, Virtual Try On

1. Introduction :

Nowadays, the amount of data on online e-commerce websites is growing exponentially. For the products, a large number of reviews are being produced. Customers must spend a lot of time and effort analysing each review in order to pick the one that is right for them. As a result, a system must be created in order to overcome these difficulties. Such a system developed has to assist the customers in deciding the right product without having to look into all the reviews online.

A beauty product recommendation system is a system that provides personalized recommendations based on the input preferences provided by the user. Considering these preferences such as skin type, skin tone and many more. The system analyses customer reviews and product descriptions to identify the best products suitable. It also involves ranking the top one product which is best suited to the input preferences provided by the customer. There is also an additional feature which is provided where users can virtually try out the top recommended products and help them choose the most suitable product. Such a recommendation system is helpful for providing personalized recommendations to the customers which helps them save time and effort in finding the one suitable for them.

2.Literature Survey

In the realm of user-review based recommendation systems, significant strides have been made in the existing literature. Researchers have explored various techniques to enhance the understanding the user needs. Despite the progress in these areas, a notable research gap persists in the development of systems that adeptly handle user input preferences. The identified research gap emphasizes the need for systems that excel in deciphering similarities within the context of user input.

Gyeongeun Lee [1] elaborated on a recommendation system for skincare products based on the skin type of the purchaser and the composition of the ingredients. Similar ingredients are identified using content-based filtering. Used K means clustering for content based filtering. A document term matrix (DTM) is established between each product's constituents and related product.

Yvonne Lau [2] proposed a sentiment analysis based model which assesses the significance of a word in relation to a particular skincare product and a group of skincare products. Used cosine similarity to calculate the similarity between a product and query tag.

Yoko Nakajima et al [3] believed that level of compatibility between users and skin care products are strongly dependent on ingredients in those products. The recommender system employees a streamline process: defining user attributes, extracting user reviews and ingredient data for lotions, identifying a strong-effect product group for the desired cosmetic effect, applying the IF-IPF method to characteristic ingredients and finally, deriving personalized product recommendations.

Sunila soumya et al [4] considered only high quality reviews and discarding low quality reviews which is done by calculating helpfulness score for each review in their research. SVM, Naive bays have been used to classify the unseen reviews. Once the reviews have been classified they have used linear regression and gradient boost for ranking these reviews. System is only limited to amazon and snap deal websites.

Keng-pei Lin et al [5] have tackled the concept by using LDA topic modelling. And then Consumer preferences are drawn where Hellinger distance is used to find similarity scores between product and consumer to decide if we should recommend this product or not. Recall is used for evaluation i.e. recall@M Recall@M = number of interested items in top recommended M products divided by total number of interested products.

3.Dataset

Our dataset comprises reviews gathered through web scraping, primarily sourced from Amazon. However, due to limitations imposed by Amazon, we expanded our data collection to other reputable websites, including MAC, Ulta Beauty, and more. The dataset focuses on two beauty products: Foundation and Lipstick, each representing five prominent brands.
The dataset includes key attributes such as brand, customer name, review, short description of review. For both foundation and lipstick, the reviews provide valuable insights into user experiences. For foundation, considerations such as coverage and skin type are crucial factors influencing satisfaction. Users express preferences for a natural look while avoiding patchiness or a cakey appearance.
On the lipstick front, longevity, smudge-proof, transfer-proof, and moisturizing properties emerge as key determinants of user satisfaction. Long-lasting wear is highly sought after, and users appreciate lipsticks that stay intact without smudging or transferring. Moisturizing properties add an extra layer of appeal, ensuring comfort during wear.

FOUNDATION:

Brand	No. of reviews
MAC	9991
Born This Way	9918
Woke Up Like This	8108
CC+ Cream - IT Cosmetics	7745
Lancôme	5102

Table. 1. Foundation products with reviews count

Features Analysed:

- Long-Lasting: Duration of foundation wear
- Coverage: Extent of product concealing imperfections
- Look: Natural, Patchy, Cakey appearances
- Skin Type: Varieties including Oily, Dry, Combination, Acne-Prone, Sensitive.

LIPSTICK:

Brand	No. of reviews
Infinity	5814
Maybelline	5627
Lip Slip	4258
Dirty Talk	4180
NYX	4057

Table. 2. Lipstick products with reviews count

Features Analysed:

- Long-Lasting: Duration of lipstick wear
- Smudge-Proof: Resistance to smudging throughout the day

- Transfer-Proof: Ability to remain on lips without transferring
- Moisturizing: The extent to which the lipstick keeps lips hydrated.

This comprehensive analysis of foundation and lipstick reviews provides valuable insights into consumer preferences and satisfaction factors. The dataset not only showcases the popularity of specific brands but also allows for a nuanced understanding of user expectations regarding various product features. The table summarizing the number of reviews offers a quick reference for the volume of feedback received for each product and brand.

4.Methodology

The recommendation system utilizes Combination of Knowledge based and Collaborative Based Recommendation Filtering Approach. We believe that personalized recommendation for users is highly dependent on both previous customer reviews and current user preferences. On the backbone of this idea, we aimed to build a recommender system that can provide personalized recommendation considering various features of the products. After scrutinizing thousands of customer reviews, we meticulously identified prominent keywords associated with each product type. This insightful analysis enables us to grasp the essence of customer sentiments and preferences, facilitating a deeper understanding of our products and enhancing our commitment to delivering exceptional experiences.

Key features in Foundation: Long lasting, Skin type, Coverage, Natural look Key features in Lipstick: Long lasting, Moisturizing, Transfer-proof, Smudge-proof.

The proposed methodology is summarized in the flowchart below Fig .1.

Step 1: Pre-processing the data: Basic pre-processing techniques which help in transforming raw texts from reviews by performing emoji substitution, stop word elimination, punctuation removal and tokenizing the text into lower case.

Step 2: Keyword extraction: The Keyword Extraction Module uses trigram extraction and keyword recognition approaches to extract essential characteristics from pre-processed text input. This stage is critical for understanding every aspect of each beauty product Consider the key feature "long-lasting." In this context, trigram analysis would examine the relationship and co-occurrence of words within a three-word window. For instance, if we input the term "long-lasting" into the trigram analysis, it could reveal associated terms and illuminate the context in which the phrase is often used. It considers not only the word itself but also the two words that come before and after it. This means we're looking at three-word combinations in a sequence. So, if we're exploring the trigrams of "long-lasting," it examines groups of three words, helping us understand not just what "long-lasting" means on its own, but also the words connected to it. This way, we get a fuller picture of the context and associations related to the term, providing more insights into its use and significance.

Step 3: Sentiment analysis: Sentiment analysis comes into play with the Sentiment Analysis Module, evaluating the sentiment associated with specific product features such as coverage, long-lasting, skin type, natural look (for foundation), and long-lasting, moisturizing, smudge-proof, transfer-proof (for lipstick). This sentiment analysis provides a quantitative measure of user opinions.

Step 4: Calculating product score: Product Scoring Module aggregates the sentiment scores, generating an overall score for each beauty product based on its features. This scoring system forms the foundation for personalized recommendations.

Step 5: Knowledge based recommendation: The User Preference Module engages users by collecting their preferences for product features, allowing for a more tailored recommendation approach

Step 6: Weighted score calculation: The weighted score for a product is computed by multiplying the attribute score of the product by the corresponding weight designated by the user.

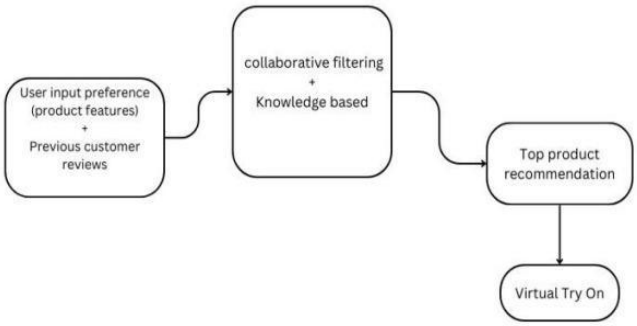

Fig.1. Flowchart for the proposed model

4.1 Recommendation of top product

Users are empowered to express their preferences through the utilization of sliders in our system. These sliders serve as a means for users to articulate their distinct priorities for each attribute. Specifically, users can manipulate the sliders associated with coverage and suitability for oily skin when seeking a foundation that offers high coverage while being suitable for oily skin. Upon submission of the form containing the adjusted slider values, the application captures and processes the user's preferences.

Calculation of Weighted Scores: To determine the suitability of beauty products for the user, the application employs a weighted scoring system. This process involves assigning a specific weight to each attribute based on the user's preferences. The weighted score for a product is computed by multiplying the attribute score of the product by the corresponding weight designated by the user. The formula for calculating the weighted score of a product is articulated as follows:
The result is a set of weighted scores, reflecting how well each product aligns with the user's specific preferences. The product with the highest calculated weight score is identified as the recommended product for the user.

4.2 Virtual Try On

The Virtual Try-On technology implemented in our system has redefined the cosmetic shopping experience, offering users the ability to virtually try on lipstick shades through uploaded images and dynamic real-time application. This transformative technology leverages advanced algorithms to apply various lipstick colors precisely to user-uploaded images, allowing them to visualize and experiment with different shades before making a purchase.

Features:
Image Upload Functionality: Users can upload their own images to the platform, providing a personalized canvas for virtual try-on.
Dynamic Real-Time Application: The real-time feature enhances the immediacy of the experience. Users can witness the transformation instantly as different lipstick shades are applied dynamically.
Diverse Color Palette: A comprehensive color palette is integrated, offering a wide array of lipstick shades. This not only caters to individual preferences but also encourages users to explore and experiment with various colors.

The implementation of Virtual Try-On technology is powered by the dlib library, a versatile and powerful open-source toolkit for machine learning and computer vision tasks. Specifically, we leverage dlib's facial landmark detection capabilities to precisely identify key points on the face, enabling accurate and seamless application of lipstick shades in the virtual try-on process. Dlib's facial landmark detection is instrumental in understanding the unique features of a user's face, allowing us to map and apply lipstick colors with high precision. This capability enhances the realism and effectiveness of our virtual try-on application.

Fig. 2. Comparison between original and modified

5. Conclusion

Upon articulating their preferences, users are presented with the pinnacle product that precisely aligns with their distinctive needs. This tailored recommendation is a culmination of the algorithm's meticulous analysis, taking into account user-provided preferences and the nuanced characteristics of each product.

For lipstick, the user experience is elevated to a virtual trial platform. Users have the unique capability to upload their own image, and in response, the system provides a simulated application of the selected lipstick product. This immersive virtual try-on feature empowers users to visualize the product on themselves, offering a realistic preview of how the chosen lipstick shade would complement their individual features. Additionally, users can exercise their freedom of choice by selecting their preferred lipstick color directly from a comprehensive color palette, further enhancing the customization and personalization of their virtual trial experience.

In the realm of foundation recommendations, the algorithm extends its commitment to user-certainty and flexibility. The top recommended foundation product is tailored to user's specific preferences, ensuring a seamless integration of their unique criteria. This approach not only acknowledges user preferences but also provides a level of flexibility that accommodates the diverse and evolving needs of individual users. The foundation recommendation process is designed to be dynamic, responding to the user's preferences and adapting to their evolving tastes, ultimately delivering a personalized and fitting recommendation.

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