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Abstract— Today, cosmetics have a big impact on how people look. Customers can access a range of products and conduct e-commerce on the website. Choosing the best product for our skin might be challenging. It offers a prediction approach so that individuals can select the goods that are suitable for their skin type. Configuration concepts perform better than conventional methods. It uses deep learning technology to streamline the complex procedures in the IT industry for cosmetics and beauty care. Along with its clients and product offerings, the beauty sector has grown over time. With the expansion of products and consumers, selecting the right cosmetics becomes more and more important. Due to the substantial influence that cosmetics have on a person's appearance, the client should choose the best cosmetics for themselves based on personal factors (skin type). Given that every person has a distinct type of skin, choosing cosmetics that suit the person may be difficult. The composition depends on whether the client has oily, dry, or neutral skin. Even the product the user is looking for can have an extremely difficult skin condition; AI algorithms are perfectly suited to address this problem since they can evaluate massive amounts of unstructured data and generate insightful results.

Keywords— Deep learning Technology, Consumers, Artificial Intelligence, Skin Type

I. INTRODUCTION

A skin care regimen is a method for taking care of your skin. To make sure that the skin is healthy and in good condition, this process is crucial. It should take different routines into consideration depending on the skin type. It must comprehend your skin's health and symptoms in order to establish the skin type. As a result, determining one's own skin type might be challenging for those who are unfamiliar with their own skin. Skin type can be established using a variety of factors, such as gender, age, amount of sleep, and skin condition. Four categories of skin exist: mixture skin, normal skin, oily skin, and dry skin. Dryness has an eerie resemblance to rough, scaly, or scaly skin.

Shiny, oily, or potentially big pores are signs of the oily condition. It possesses qualities that are in the middle. Combination skin, as opposed to normal skin, is skin that is oily in some places and dry in others. There are no resources available to assist non-experts in identifying their skin type. Visit a beauty salon to receive guidance on skincare

practices and supplies. As a result, it could be challenging for the general public to keep up a healthy routine and select the appropriate products for their skin type.

II. RELATED WORK

Numerous applications of deep learning exist, including speech recognition, computer vision, and natural language processing (NLP). I incorporate it into my recommendations as well. Recent applications for session-based suggestions, music recommendations, and news recommendations are noteworthy [1]. Tingting Li, Ruihe Qian, and colleagues suggested a Deep Generative Adversarial Network to transfer cosmetics from one image to another.

Rio Iwabuchi, Yoko Nakajima, and others suggested a system for making recommendations that is based on user feedback and cosmetic ingredients. Her research focuses on identifying cosmetics that include lots of ingredients that make people look beautiful using user feedback. In essence, they created a group of individuals with equivalent skin-extracted user characteristics (such as age and skin quality) selected by the individuals during registration. For every cosmetic product, we create lotions with a high percentage of beauty effect tags. To determine this threshold, they employed natural classification techniques. For component extraction, they applied the TF-IDF concept, which is intended to pinpoint the words that best capture the meaning of a text. Values from the IF-IPF calculation were sorted. The recommendations are based on the IF-IPF values' top components after sorting [5].

Yuki Matsunami et al. created a tag-recommendation approach for evaluating cosmetics in a recommendation system. This study aims to draw attention to the review text. An automatic scoring system was used to assign scores to the review text. To determine the review's score, the algorithm reads the text, rates the sentences, extracts k units from the review text, rates the sentences, and adds up all of the components. After that, the machine recommends high-scoring tags to assess the expression [6]. Asami Okuda et al. suggested a technique to discover comparable users based on preferences across cosmetic clusters

III. SKIN CARE ROUTINE

Skin care routine is a set of processes to take care of individual skin. Different types of skin have a different routine and procedure to be followed. In this section will discuss skin type determination, skin routine and chemicals that need to be avoided by the user.

3.1. Skin Type Determination

A person's skin care regimen entails numerous phases. There are different procedures and regimens that should be used for various skin types. This section will teach you how to identify your skin type, how to take care of it, and what products to stay away from determining one's skin type. This study takes into account four different skin types: normal skin, oily skin, dry skin, and combination skin. skilled cosmeticians 1, [14]–[16] frequently discuss choice. Sensitive skin is not taken into account because it is prone to allergies and skin problems [3], [17], as well as other medical factors such food, chemicals, dust, and family history. Skin type is determined by responses, illnesses, and symptoms [20]. However, other elements like exercise, the environment, and sleeping patterns might also have an impact on skin type.

It can treat a variety of skin problems for dry skin, including tightness, redness, roughness, and itching. The majority of skin care regimen websites concur that roughness and irritation are traits of dry skin. If adequate skin care practices are not followed, aging can result in dry skin. As a result of the sebaceous glands' excessive activity, oily skin is characterized by an increase in surface lipids. The skin typically appears glossy and thick, and pores are frequently enlarged. It mainly affects teenagers and young individuals and frequently produces blemishes like blackheads. Hormones, stress, and humidity all have an impact.

People with combination skin may experience dry patches on their bodies and oily patches. The cheeks and the area around the eyes (nose, forehead, chin) may become dry in addition to the T-sebum zone's production. Different skin care regimens are needed for oily and dry skin. This kind of skin is relatively typical.

IV. METHODOLOGY

The proposed method(Fig1) creates appropriate cosmetic setups using AI architecture (convolutional neural networks). In the suggested automatic characteristic learning approach, input attributes like skin type and product component compatibility are transmitted to the input layer and subsequently to the hidden layer. Finally, the cosmetics combination is displayed in the output layer. Alternative composition techniques are better than traditional ones.

4.1. Dataset

This helps in retaining the “spatial” properties of images. So here different types of skin datasets which consist of four categories are used. In this study, the primary method of data gathering is used. The information was collected from

the Kaggle website. There are 120000 records in the data collection overall (80% training records and 20% testing records). The epoch in this situation denotes how many times the loop has finished. An entire data collection cannot be given to a neural network at once. The training data set is then used to build a stack.

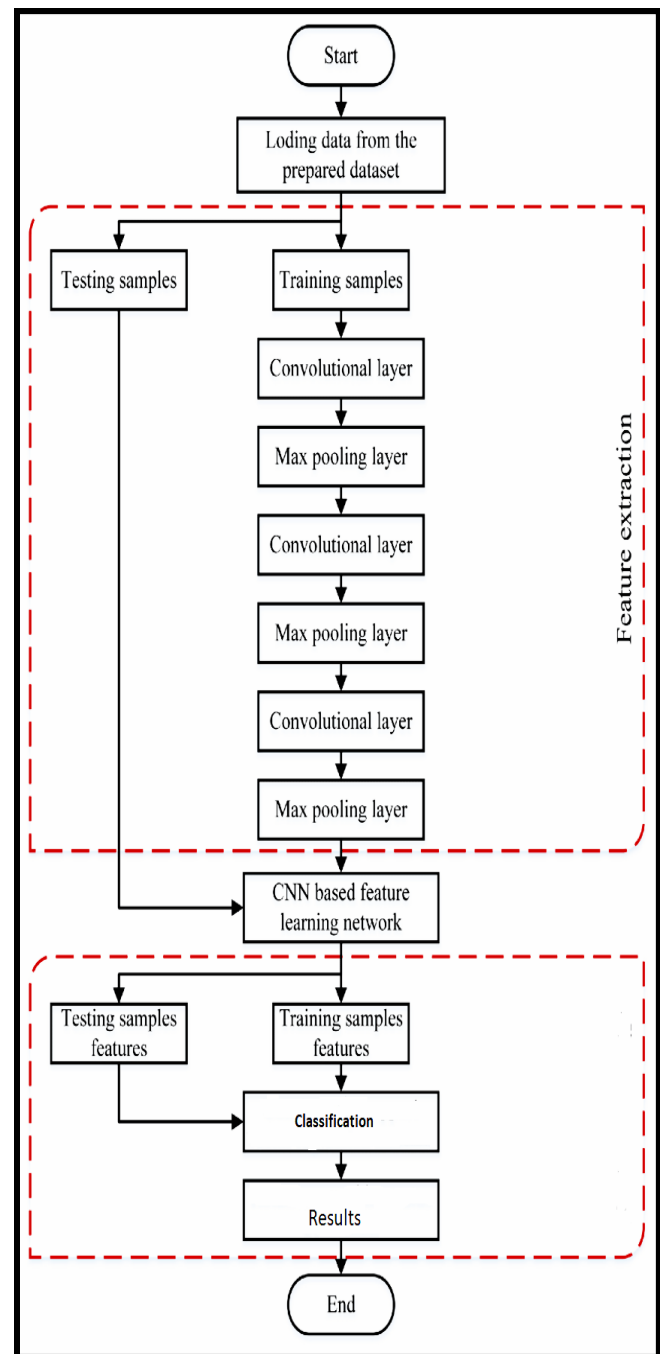


Fig. 1 Flow Diagram of Cosmetic Suggestion System

4.2 PreProcessing

A resizing, patching, and expanding procedure was used during the preprocessing stage. Normalizing the size of the input image is the first step in the preprocessing procedure. The majority of the images were rectangles with various heights (median matrix size: 1,800). As a result, it will maintain the aspect ratio while converting every image to a consistent 224x224 pixel square. The input photographs were

initially preprocessed with a second-stage processing patch since the input data is required to assess the effectiveness of deep learning (a cropped portion of each image). In order to verify that the patches had adequate segmentation for analysis, patches were obtained using bounding boxes. Then, using mirror images that had been rotated 30, 10, 10, and 30 degrees and had been turned from right to left, data augmentation was carried out exclusively on the training dataset is illustrated in Fig.2

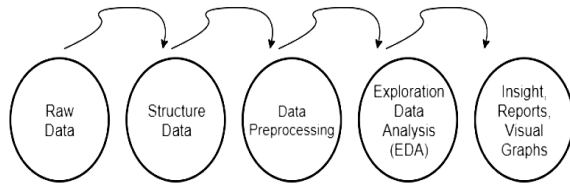


Fig. 2 Data Preprocessing

4.3. Feature Extraction

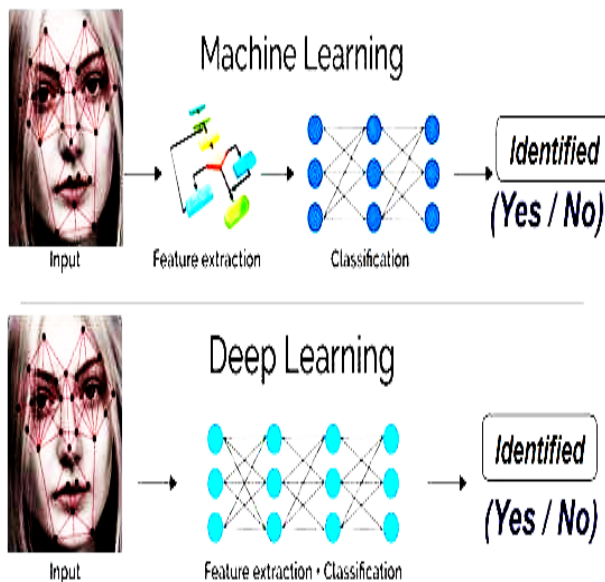


Fig 3. Feature Extraction [20]

When processing needs to be done quickly and efficiently without sacrificing crucial or pertinent information, feature extraction is a good strategy as shown in fig 3. Feature extraction can reduce the amount of duplicate data for a particular test. The learning and generalization stages of the machine learning process are also accelerated by data reduction and machine effort to construct combinations of variables (features).

4.3. CNN

Convolutional neural networks (CNNs) are a unique kind of deep neural network used in deep learning that analyze data sets and extract knowledge from them. CNN may use media, including images for data extraction. A CNN essentially comprises three elements. Priority is given to local receptive fields, then shared weightings and biases, and last activations and bundling. A neural network must

initially be trained on a lot of data in order for it to extract input features. After receiving input, an algorithm first does image preprocessing, then features are extracted using the saved dataset, followed by data classification, and lastly output.

Only inputs for which a CNN has been trained and data stored can be processed by a CNN. They are employed in image recognition, classification of images, medical image analysis, and recommendation systems.

4.4. Image Labeling and Dataset Distribution

Each subject was ranked separately using four sets of photos. In the Image Archive and Communication System (PACS), the annotations were first scored on the original images and then again on the shrunk-down images utilized for the actual training data. Internal and temporary data sets were used to score the tests. The internal dataset was separated into subgroups for training (70%), testing (15%), and validation (15%) as shown in Fig.4

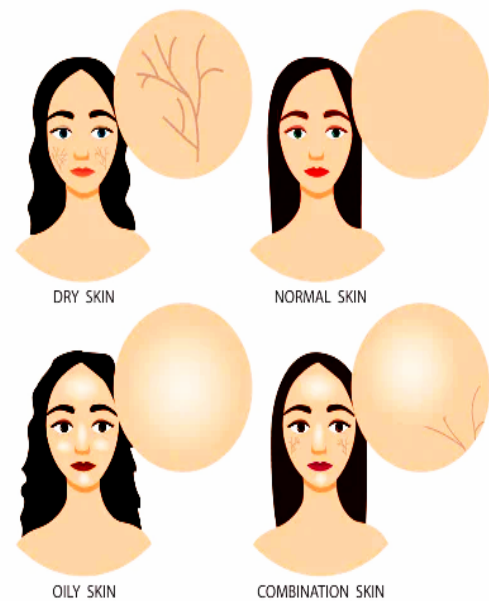


Fig 4. Image Labeling

V. RESULT AND IMPLEMENTATION

Utilizing the web application, the system has created the suggested solution effectively. Tests are still being conducted, though. Public and expert testing are conducted in each of his two types of contexts. In preparation for open testing, user knowledge will be evaluated both before and after system use. But models and laws are put to the test for professionals. Inputs, outputs, and data from the suggested solution are displayed in this test of the system. The step by step process of web application and cosmetic suggestion system is displayed as shown Figure 5-Figure 9.

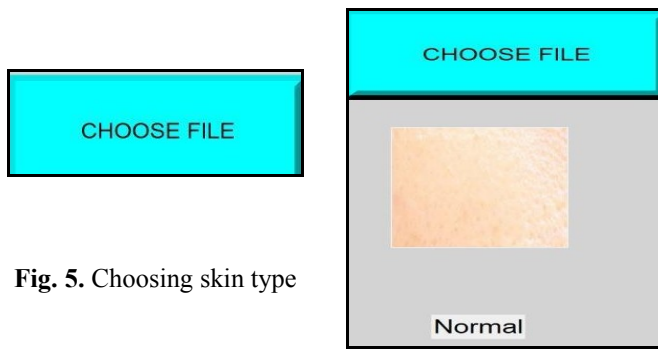


Fig. 5. Choosing skin type



Fig 6. Skin type identification with one product

In Figure 4 and Figure 5, a trained data set identifies the customer's skin type such as normal, oil, dry or combination skin. Based on the skin type of the customer the product such as cleanser (Fig.6), Sun Protect(Fig.7) and Eye cream (Fig.8) is recommended.

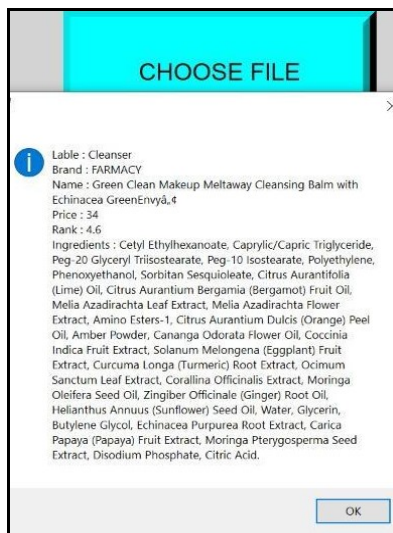


Fig. 7. Recommended Cleanser

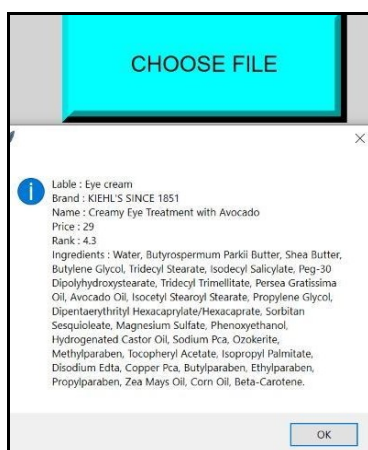


Fig. 8 Recommended Eye cream

The graph of training & validation of accuracy and training & validation of accuracy is shown below Figure 9.

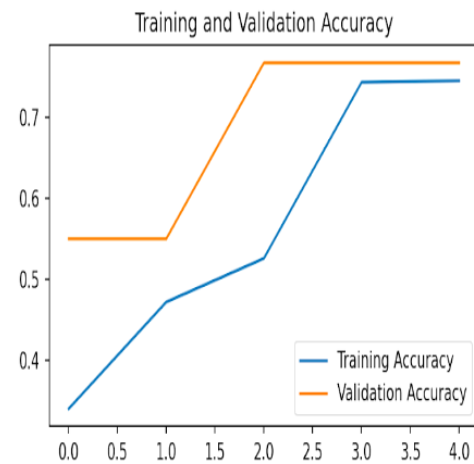


Fig. 9. Training and Validation Accuracy

Figures 10 illustrate the training loss after the model was trained using the dataset. Loss is plotted along the Y axis, while epoch is plotted along the X axis.

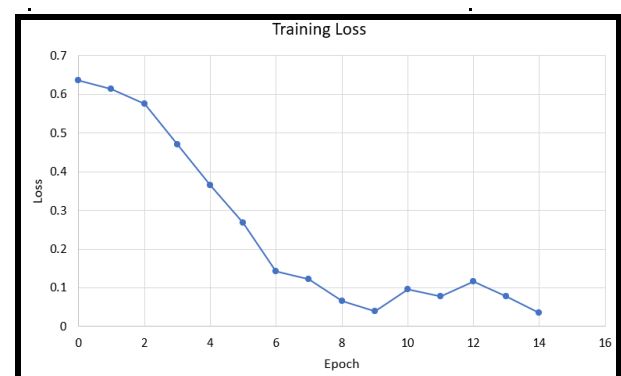


Fig. 10. Training Loss

VI. CONCLUSION

Making decisions in the modern world is more difficult than it was in the past, particularly for customers who are now faced with a wide range of options for numerous brands and product categories. Based on different skin types, this method provides the composition (i.e. dry, oily or natural). The improvement of cosmetic product composition is our

primary goal. A better composition of cosmetic items will undoubtedly result from using the proposed system.

A few areas that can be improved upon by this system and are being considered for future work include expanding the dataset, expanding the system to recommend for both men and women, learning the knowledge base rules directly from the labeled data, and adding more templates and colors to the makeup synthesis library to recommend more styles.

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