

Personalised Skin Care Recommendation Using Machine Learning

Prof. Supriya Jadhav^{*1}, Disha Memane^{#2}, Kadambaree Supekar^{*3}, Shraddha Shinde^{#4},
Trupti Jadhav^{*5},

^{2,3,4,5}Students & ¹Assit. Prof. of Department of Computer Engineering,
JSPM's Jayawantrao Sawant College of Engineering
Hadapsar, Pune-28
Savitribai Phule Pune University, Pune

Abstract— Acne is a common skin condition that can cause both physical and emotional distress for many individuals. Acne can be prevented and treated with skincare products, but choosing the right ones can be challenging. The use of inappropriate skincare products can even worsen the condition. To address this problem, we propose using machine learning to analyse various features of an individual's skin quality and acne status and then recommend the most appropriate facial skincare products for that person. This approach takes into account the specific needs of each individual's skin type and can help prevent the use of products that may exacerbate the condition. Several research papers regarding skin care product recommendation were reviewed and an appropriate solution to address this problem was concluded. You Only Look Once (YOLO) and Convolutional Neural Network (CNN) algorithms assist in determining the skin concern and recommending a skin care regimen. This system provides a precise idea of which product is best for our skin type. The suggestion for skincare products is based on different types of skin that people may have. By using this approach, the final result is expected to have an accuracy score of over 97%.

Keywords: Skincare product recommendation, acne, skin care, skin type classification, CNN, acne detection, Machine Learning, YOLO, Skin Care, Recommendation Engine

I. Introduction

A significant change in the mindset of people has occurred as a result of globalization and technological advancements, and women today no longer are confined to just household chores; there has also been a sharp increase in literacy levels in both rural and urban areas, enabling a tremendous amount of awareness to be created about beauty and skin care. A person's skin reveals their origin, lifestyle, age, health, and state of mind. Several characteristics of the skin's surface indicate our skin's health, including color, tone, and evenness. There is an enormous array of skin care products and procedures available to the cosmetic and pharmaceutical industries, which helps maintain the health of our skin by cleansing, soothing, restoring, enhancing, protecting, strengthening, and treating it. Health and nursing care plays an integral role in the daily care of patients who need skin care products, which are readily available at the point of care.

As the name implies, skin care products are those items we use in order to cleanse, tone, massage and moisturize our skin. The health and appearance of our skin are heavily influenced

by the way in which we care for our skin. With women and men now aware of the importance of skincare, it is time to make some changes in order to achieve optimal results. To begin with, it is important to consider what conditions need to be addressed as well as the lifestyle of the individual. It is important to ensure that you use skin care treatments that are safe and free of chemicals once you have a general idea of the types of products you require and want to use.

In addition to the importance of skincare, we suggest products tailored to the specific needs of our customers. Visual and tactile information is primarily used in the selection of skin care products, and products are designed with those channels in mind. With the advent of digital multimedia technology in recent years, there has been an abundance of information available to the public, but it needs to be verified as to its authenticity. Due to excessive marketing and packaging, consumers can have a hard time distinguishing between correct and incorrect information. Their uncertainty makes it difficult for them to decide which product would be suitable for them. Recommendation systems are now often employed in a variety of commercial platforms to provide useful suggestions. The performance of the algorithms employed for recommendations, however, is constrained by the sparsity of the data and the method's scalability, and it is challenging to further raise the quality of the recommendations' outcomes. Hence we propose a predictive system that provides a precise idea of which product is best for our skin type using the Machine Learning Technique. The recommendation is based on the possible normal skin types: combination, dry, oily, and sensitive. We have implemented the Convolutional Neural Network(CNN) model for cosmetic product composition. Finally, it is confirmed that our model can successfully improve the recommendation performance by contrasting it with other recommendation algorithms on the dataset we provided.

II. Literature Survey

Ting-Yu Lin implemented the system by combining multi-feature processing with ML classification technology and DL semantic segmentation technology [1]. Finger-vein identification, skincare product recommendations, and an electronic payment mechanism make up the basic architecture of this work.

For this study's labeling of 4700 selfies into five categories, a supervised approach was used and 11 internal dermatologists were recruited. This technology combines facial recognition with skin type analysis. When the original facial skin image is entered, the cheeks are recognized as the region of interest (ROI). The ROI image is used to determine the skin type and spot acne.[2]

Hsiao-hui Li suggested that image classification and placement are important features in this type of application. Positions of the four coordinate points in the regression prediction detection frame after extracting features by convolution and registering the classified images. YOLO's algorithm can be viewed as a regression problem.[3]

The creators of the paper [4] utilized Amazon Recognition to supply an API to recognize facial subtle elements in a given picture. A real-time picture of the client is captured by the camera, the picture is analyzed to identify the faces within the picture, and the facial details are extricated utilizing the Picture Recognition API. API responses are analyzed utilizing choice rationale to powerfully show focused advertisements on screen for the client to see further.

III. Methodology

Methodologies:-

Skin care Recommendation

Perform an analysis of a person's face

Identification of a person's skin type

Analyse the severity of facial acne

Recommend the Skincare Product

Algorithms and Techniques: -

YOLO:

Feature Extraction Technique: The Yolo algorithm works by splitting the image into N grids, each with an area of equal size of $S \times S$. Each such grid N is responsible for detecting and locating the object within. Each cell in the grid predicts several bounding boxes, which are used to enclose the objects present in that cell.

Convolutional neural network:

Classification Technique: It is a kind of network architecture for deep learning algorithms and is specifically used for image recognition and classification.

It is designed to process data with a grid-like topology, such as an image. The algorithm uses multiple layers of artificial neurons that “convolve” or filter the image, gradually extracting higher-level features from the input data. This allows the CNN to learn a classify images based on features it has extracted, rather than just the raw pixel data.

IV. Proposed System

The focus of this study is to create a customized skin care recommendation system. Fig.1 shows an overview of the architecture. This proposed system will be deployed as a Desktop application. The picture is recorded in real-time. A

suitable dataset can be formed which will help in giving an accurate output. Different preprocessing techniques can be applied to clean the dataset, removing unwanted features, and highlight the main features. The same dataset can further be used for training and testing the model. The Yolo algorithm is used to extract facial features from the user's photograph in order to detect skin problems and facial acne. The skin care products are suggested using CNN, a machine learning algorithm, depending on the type of acne present and the skin type (oily, dry, combination, etc). A disclaimer would be displayed for performing a patch test before applying any product which is given as the output by the model. According to the severity of the acne or scar, the product will be recommended which may include products like retinol, salicylic acid, benzoyl peroxide. Proposing customized skin care products for their skin problems, this method will benefit the consumers.

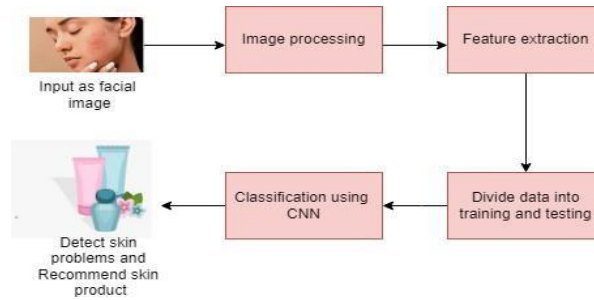


Fig.1: System Architecture

DB Browser for SQLite:

With DB Browser for SQLite (DB4S), you can create, design, and edit SQLite database files.

Tkinter:

Tkinter is the standard GUI library for Python.

The combination of Python and Tkinter provides a fast and easy way to create GUI applications.

Object-oriented interfaces are provided by Tkinter for the Tk GUI toolkit.

Expected Result:

The suggested approach evaluates the degree of acne and face skin problems before making care product recommendations to customers. With the use of computer vision technology, customers may quickly get a consistent, unbiased list of suggested facial care items. An picture is photographed using a camera, marked, and presented in a window so the user can confirm that the image is of the proper location. This allows novice users to locate a care product that is suited for them.Both cheeks have acne, which is diagnosed together with the skin type. The technology analyses the skin's oiliness, normalcy, or dryness before detecting the quantity of acne scars. To improve the system's accuracy, any errors brought on by the presence of numerous faces in the image may be eliminated by pushing a bottom on the screen. The findings for the skin's state and the finding of acne are used to propose skincare products, enabling customers to do so without assistance.

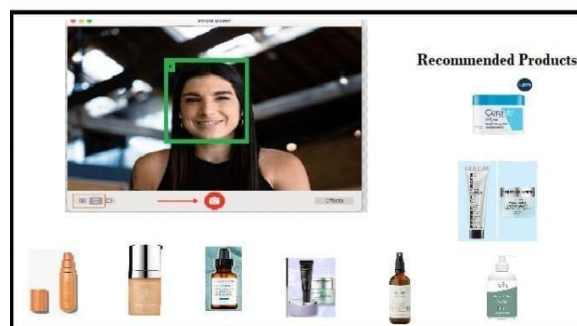


Fig.2:Expected Result

V. Conclusions

This research focuses on building a self-paced facial skin issues detection and related product recommendation. After going through the other papers, the models accuracy can be increased upto 97% by getting a suitable dataset and performing relative preprocessing techniques on the dataset. The machine learning algorithms (CNN and Yolo) can help in achieving the target output of the system. This system will recommend the product based on the skin type and condition of the specific user.

Acknowledgment

We would like to express our gratitude to the researchers and publishers for making their resources available. We also appreciate the guidance and feedback provided by the reviewers and thank the college authorities for providing the necessary infrastructure and support throughout the research process.

References

- [1] Ting-Yu Lin, Hung-Tse Chan, Chih-Hsien Hsia, and Chin-Feng Lai, “Facial Skincare Products’ Recommendation with Computer Vision Technologies”, *Electronics* 2022, 11, 143. <https://doi.org/10.3390/electronics11010143>
- [2] Chih-Hsien Hsia, Ting-Yu Lin, Jhe-Li Lin, Heri Prasetyo, Shih-Lun Chen, and Hsien-Wei Tseng, “System for Recommending Facial Skincare Products”, *Sensors and Materials*, Vol. 32, No. 10 (2020) 3235–3242
- [3] Hsiao-hui Li, Po-Jen Cheng, Yuan-Hsun Liao, Yen-nun Huang, “Based on machine learning for personalized skin care products recommendation engine”, 2020 IEEE 4) R. Suguna, M. Shyamala Devi, Puja Gupta, Akash Kushwaha, “An Efficient Real-time Product Recommendation using Facial Sentiment
- [4] <http://www.iosrjournals.org/iosrjce/papers/Vol10>
- [5] S. Sadhana Rao,” Sixth Sense Technology”, *Proceedings of the International Conference on Communication and Computational Intelligence– 2010*, pp.336-339.
- [6] Game P. M., Mahajan A.R,” A gestural user interface to Interact with computer system ”, *International Journal on Science and Technology (IJSAT) Volume II, Issue I, (Jan.- Mar.) 2011*, pp.018 – 027.
- [7] *International Journal of Latest Trends in Engineering and Technology Vol. (7) Issue(4)*, pp.055-062.
- [8] Kumar, S. A. S., Naveen, R., Dhabliya, D., Shankar, B. M., & Rajesh, B. N. (2020). Electronic currency note sterilizer machine. *Materials Today: Proceedings*, 37(Part 2), 1442-1444. doi:10.1016/j.matpr.2020.07.064
- [9] *Imperial Journal of Interdisciplinary Research (IJIR) Vol3, Issue-4, 2017.*
- [10] Christy, A., Vaithyasubramanian, S., Mary, V.A., Naveen Renold, J. (2019),” Artificial intelligence based automatic decelerating vehicle control system to avoid misfortunes “, *International Journal of Advanced Trends in Computer Science and Engineering, Vol. 8, Issue. 6, Pp. 3129-3134. 11)*

- [11] G. M. Gandhi and Salvi, "Artificial Intelligence Integrated Blockchain For Training Autonomous Cars," 2019 Fifth International Conference on Science Technology Engineering and Mathematics (ICONSTEM), Chennai, India, 2019, pp. 157-161. Jesudoss A., and Subramaniam, N.P., "EAM: Architecting Efficient
- [12] Authentication Model for Internet Security using Image-Based One Time Password Technique" Indian Journal of Science and Technology, Vol. 9 Issue 7, Feb. 2016, pp. 1-6.
- [13] Praveena, M.D.A., Eriki, M.K., Enjam, D.T., "Implementation of smart attendance monitoring using open-CV and python", Journal of Computational and Theoretical Nanoscience, Vol. 16, Number 8 pp:32903295 · August 2019 .
- [14] Mandal, D., Shukla, A., Ghosh, A., Gupta, A., & Dhabliya, D. (2022). Molecular dynamics simulation for serial and parallel computation using leaf frog algorithm. Paper presented at the PDGC 2022 - 2022 7th International Conference on Parallel, Distributed and Grid Computing, 552-557. doi:10.1109/PDGC56933.2022.10053161
- [15] M.S.Roobini, DrM.Lakshmi,(2019),"Classification of Diabetes Mellitus using Soft Computing and Machine Learning Techniques", International Journal of Innovative Technology and Exploring Engineering, ISSN: 2278-3075, Volume-8, Issue-6S4