International Journal of
Information Technology & Computer Engineering

www.ijitce.com

KOREAN SKIN CARE RECOMMENDATION SYSTEM

Dr.Shahana Tanveer
Associate Professor
Department of CSE
DCET
Affiliated to Osmania
University
Hyderabad, Telangana
shahanatanveer@deccancollege.ac.in

Sama Khatoon
Student
Department of CSE
DCET
Affiliated to Osmania
University
Hyderabad, Telangana
samakhan2402@gmail.com

Hajira Unnisa Begum
Student
Department of CSE
DCET
Affiliated to Osmania
University
Hyderabad, Telangana
hajiraunnisa333@gmail.com

Umme Zainab
Student
Department of CSE
DCET
Affiliated to Osmania
University
Hyderabad, Telangana
ummez360@gmail.com

Abstract: The recurrence of skin ailments like skin break out, rashes, and sensitivities is expanding, which is disturbed by the aimless utilization of skincare items advanced through advertisements or informal, every now and again without respect for individual skin types and similarity. This issue underlines the need of an individualized way to deal with skincare. "Skin Solutions" is an exceptional application that tends to this prerequisite by proposing skincare items in light of the client's skin type and compound cosmetics. The program utilizes a setting based suggestion engineering that utilizes information science to evaluate and match the items in different items to the client's skin type. This procedure improves on the convoluted work of deciphering part records, permitting shoppers without substance foundations to make taught decisions. "Skin Solutions" underlines the fame and viability of Korean skincare, advancing just Korean items that are known for their innovative recipes and adequacy. "Skin Solutions" tries to further develop skin wellbeing and empower clients to go with instructed decisions by giving logically upheld, individualized item proposals, guaranteeing their skincare routine is both successful and safe. This procedure vows to further develop skincare by consolidating information science with client requests, bringing about better skin and more client certainty.

Index Terms: *Skin Care System, Korean Products, Skin Care Classification, Artificial Intelligence, Natural Language Processing, - ELSHE SKIN Radiant*

1. INTRODUCTION

The skincare business has extended emphatically in late many years, powered by a developing worldwide accentuation on normal magnificence and a developing interest in skincare among guys. This extension reflects expanded buyer familiarity with individual consideration, yet in addition a market pattern in which firms endeavor to keep their critical shoppers — for the most part ladies — by creating expert products, for example, hostile to maturing recipes [1]. The expansion popular has constrained the advancement of new innovation to improve on item suggestions, making shopping more effective and tweaked.

Conventional skincare suggestion frameworks depend vigorously on purchaser assessments and evaluations, which give a great many viewpoints in regards to every item [2]. These frameworks utilize

appraisal examples to figure out which things are generally fit to specific purchasers. Moreover, customized proposal frameworks utilize a scope of individual data, like orientation, age, buy history, navigate information, and sharing logs, to more readily match things to individual necessities [3]. This multimodal procedure is expected to give a more exact and client driven purchasing experience.

Be that as it may, the average approach to getting skincare proposals — talking with in-store magnificence counselors — has every now and again been condemned for being tedious and, on in some cases, ineffectual [4]. The sheer number of data available on the web, albeit significant, might be overpowering, making it hard for clients to channel through item subtleties and surveys to make informed buys. This data over-burden features the basic requirement for customized proposal frameworks that might smooth out navigation by separating and showing pertinent information in light of individual inclinations and skin types [5].

In light of these issues, our drive dispatches "Skin Solutions," a web application that gives individualized skincare item ideas. This program utilizes a setting based proposal design to customize ideas to every client's particular requirements, considering viewpoints like item parts, client input, and skin type. By assessing the synthetic parts of beauty care products, "Skin Solutions" guarantees that the proposals are deductively sound and pertinent to the client's singular skin issues [6]. This method not just explains the ordinarily convoluted part records seen on item marks, however it likewise permits individuals to settle on instructed choices without the requirement for a science foundation.

"Skin Solutions" separates itself by zeroing in on Korean skincare products, which have gotten worldwide recognition for their imaginative equations and viability. By zeroing in on this specialty, the program profits by the ongoing frenzy and interest for Korean excellence items, giving clients with proposals that are both well known and viable [7].

The significant objective of this task is to make a solid and precise skincare recommender framework that can productively offer things relying upon the client's skin type and concerns. The framework's presentation and exactness will be broadly analyzed utilizing measurements like as precision, recall, and F1-score to guarantee that the ideas are both dependable and valuable to the client.

To sum up, "Skin Solutions" denotes a tremendous step in the right direction in the field of customized skincare ideas. The program settles the incessant issues of extreme data and unfortunate ideas by consolidating strong information science approaches with a simple to-utilize interface. This original system vows to further develop the skincare purchasing experience, bringing about better skin wellbeing and more buyer bliss. "Skin Solutions" looks to change how individuals pick and use skincare items by giving precise and explicit ideas, making the cycle more productive and customized.

2. LITERATURE SURVEY

Throughout recent many years, the skincare area has extended at a remarkable rate, driven by client interest for viable, custom-made arrangements and a bigger cultural accentuation on saving a youthful appearance. Subsequently, a few suggestion

frameworks have arisen to help buyers in tracking down the best things for their special requirements. One significant piece of this development is the developing reliance on solution skincare items and refined skin revival medicines. Truswell (2020) stresses the significance of remedy skincare items in producing extensive changes in skin wellbeing and engaging quality, refering to its viability in treating different dermatological issues [1].

Computerized innovation hugely affects the advancement of skincare item suggestions. Venezia and Torsello (2018) depict the utilization of computerized castings and facial line arrangement in surface level dentistry, which is like advances in skincare, where advanced imaging and examination help in customized treatment regimens [2]. The utilization of confocal microscopy, as researched by Star and Guitera (2016), has demonstrated helpful in recognizing and treating face skin sores, featuring the need of exact imaging in skincare [3].

The pervasiveness of familiar face dermatoses including skin inflammation vulgaris, rosacea, and seborrheic dermatitis has provoked more review into successful treatment choices. Karabay and Çerman (2020) concentrate on the effect of Demodex folliculorum pervasions on different sicknesses, offering bits of knowledge into designated treatments to upgrade results for impacted patients [4]. This underscores the need of skincare arrangements that are powerful as well as intended to address explicit skin issues.

The tactile elements of face skin worsen skincare. Okayasu et al. (2012) see how biting influences tangible and torment edges in face skin, featuring the perplexing connection between muscle movement and skin responsiveness. This study suggests that custom-made skincare proposals ought to consider physiological boundaries to further develop item execution and purchaser solace [5].

Propels in material science an affect the skincare area. Lim and Bart-Smith (2015) offer a scientific model for foreseeing face wrinkling disappointment in metallic folded center sandwich sections when powerfully compacted. Despite the fact that their exploration centers around primary materials, the ideas of flaw age and disappointment expectation can be utilized to all the more likely comprehend skin maturing and produce hostile to maturing skincare items [6].

Karabay and Çerman's (2020) notice of Demodex folliculorum pervasions highlights the need to address specific dermatological troubles in skincare item suggestions [7]. Their discoveries add to a developing group of information demonstrating the requirement for arrangements that are both outwardly alluring and clinically helpful in controlling skin wellbeing.

Sato et al. (1999) researched the dispersion of tactile spots and two-point separation limits, which gave more bits of knowledge into the tangible properties of the face. Understanding these tactile conveyances is basic for making skincare arrangements that further develop skin appearance as well as give more prominent tangible solace and client joy [8].

The crossing point of these few review disciplines underscores the intricacy and interdisciplinary nature of compelling skincare item creation and suggestion frameworks. Dermatology, advanced innovation,

tactile science, and material science may all add to more custom fitted and viable skincare arrangements. Such a methodology is expected to satisfy customers' one of a kind and individual requests, bringing about better generally skin wellbeing and fulfillment with skincare items.

At long last, the writing stresses the meaning of utilizing a multi-faceted methodology while suggesting skincare items. Creating effective and individualized skincare arrangements requires the combination of remedy products, current imaging techniques, a grip of pervasive skin problems, tangible elements, and material science ideas. As the business advances, utilizing these various experiences will be basic in creating arrangements that suit clients' corrective goals, yet additionally treat their fundamental skin wellbeing concerns. This complete procedure vows to expand the viability of skincare items and the whole client experience, bringing about proceeding with improvement and advancement in the skincare business.

3. SYSTEM ARCHITECTURE

Fig 1 System Architecture

The suggested skincare product suggestion platform's system design incorporates a number of cutting-edge elements. Data processing begins with user input, which includes skin type and an uploaded face photograph. After processing, the data is loaded into a CNN model that recognizes particular skin diseases based on face landmarks. The product database is processed concurrently to match skincare regimens. Furthermore, the accuracy of the CNN model is improved by deep learning model training that makes use of a skin type database. The skincare routine suggestion module is where the expanded product database and the processed user data come together. This module uses the output of the CNN model to make customized product suggestions. The finished product is a personalized skincare regimen with certain items (items 1, 2, and 3) that are tailored to the individual's skin type. This architecture combines thorough product analysis with facial recognition to provide accurate, user-specific skincare suggestions.

TF-IDF Vectorization:

Natural language processing uses a technique called TF-IDF (Term Frequency-Inverse Document Frequency) vectorization to translate textual input into numerical representations. It determines a document's word relevance in relation to a corpus of texts. Use: TF-IDF is used to measure the importance of words in product descriptions, making it possible to pinpoint the salient characteristics of skincare product suggestions. Goal: By giving priority to significant terms and increasing the relevance of suggestions, this improves model accuracy.
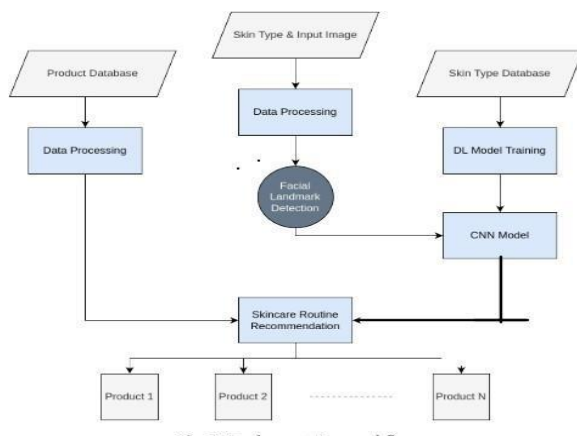
4. TECHNOLOGIES USED

1. TensorFlow:

Google created the open-source TensorFlow machine learning library, which is used to build and implement machine learning models. It offers a vast ecosystem of community resources, frameworks, and tools that enable researchers and developers to create, train, and use neural networks on a variety of platforms. TensorFlow is adaptable for a wide range of applications since it supports both conventional machine learning methods and deep learning techniques.

2. NumPy:

Large multi-dimensional arrays and matrices are supported by NumPy, a core Python library for scientific computing. It offers a wide range of mathematical operations for effective use with these arrays. Numerous more data science libraries are built on top of NumPy, which makes jobs like random number generation, linear algebra, and numerical calculations easier.

3. Pandas:

Pandas is a robust Python data manipulation and analysis package that is well-known for making structured data handling simple with its DataFrame and Series data structures. It offers a wide range of functions for aggregating, cleaning, and transforming data, making it possible to prepare and analyze data effectively. Pandas is necessary for activities such as exploratory data analysis and data wrangling.

4. Matplotlib and Seaborn:

With the help of the flexible Python charting tool Matplotlib, static, animated, and interactive visualizations may be made. Providing a high-level interface for creating visually appealing statistical visualizations, Seaborn expands upon Matplotlib. When combined, they offer strong data visualization capabilities that facilitate the understanding of data trends and patterns through plots and charts.

5. Plotly:

With the help of the interactive graphing library Plotly, interactive dashboards and plots appropriate for online visualizations may be made. Numerous chart kinds are supported by it, such as line, scatter, and three-dimensional charts. Plotly is perfect for developing dynamic and captivating visual analytics solutions because of its interactivity and simplicity of interaction with online apps.

6. Missingno:

A Python package called Missingno is used to show missing values in datasets. In order to properly clean and preprocess data, it is helpful to comprehend the distribution and pattern of missing data. Missingno helps with decision-making by offering visual insights into missing values and assisting with partial data handling.

7. Scikit-learn:

A popular Python machine learning toolkit called Scikit-learn offers quick and easy-to-use tools for data mining and analysis. It provides a wide range of supervised and unsupervised learning algorithms as well as pipeline building, preprocessing, and model assessment tools. Scikit-learn is a mainstay in the

data science field because of its simplicity of use and library integration.

8. PyCharm:

PyCharm is a potent integrated development environment (IDE) for Python programming that is well-known for its smooth interaction with data science libraries, sophisticated coding aid, and interactive debugging. With features like code completion, error highlighting, and version control integration, it increases productivity. PyCharm is a great option for creating machine learning and data analysis projects because of its extensive support for data science procedures.

5. IMPLEMENTATION

a) Proposed Work:

The suggested system is an advanced skincare product recommendation platform that uses content-based filtering (CBF) and natural language processing (NLP) approaches to provide individualized product recommendations. The system uses natural language processing to extract important characteristics such as components, advantages, and concerns from thorough product descriptions. These traits are subsequently transformed into numerical representations using the TF-IDF approach, which allows for the determination of cosine similarity between products. This allows the system to propose goods that are closely related to the user's tastes. The recommendations take into account skin type, specific skin issues, and intended advantages. Users engage with the system using a web-based interface that is designed for ease of use, resulting in a seamless experience. User profile, recommendation

rating, and product filtering all improve the user experience by personalizing suggestions to specific requirements.

The algorithm also considers user preferences for skin disorders, product categories, and noticeable impacts to ensure that recommendations are extremely relevant. By offering a user-friendly interface, the system makes it simple for people to find and choose the best items for their skin. To summarize, our suggested system is a complex and complete solution that uses machine learning and NLP to provide highly individualized skincare product suggestions, considerably increasing the user experience and assisting with improved skincare management.

b) Dataset Collection:

The skincare product recommendation system's dataset was painstakingly gathered from official product websites and e-commerce sites. With 1,224 skincare items' specific features included in this extensive dataset, a broad market representation is guaranteed. The product URL, name, kind, brand, noteworthy effects, appropriate skin type, price, description, and image URL are among the key elements that are recorded in the dataset. Though it started off with 14 duplicate entries that were later eliminated, this meticulous data collecting approach guarantees that the dataset is rich and clean, free of null values. The structure of the dataset makes efficient analysis and modeling possible, which enables the creation of successful recommendation systems. It allows for the exact customization of suggestions to users' skin types and concerns by classifying items based on their kind, brand, and significant effects. Having this baseline dataset is

essential to developing a trustworthy and user-focused skincare product recommender system.

c) Data Processing:

Data processing is the first stage in the skincare recommendation system, guaranteeing the accuracy and suitability of the supplied data for further analysis. First, the product database is cleaned and arranged, with missing values, duplicates, and text normalization taken care of. Important information is taken from product descriptions, including components, usage guidelines, and customer testimonials. Tokenization and lemmatization are used to text data in order to standardize words and improve model accuracy. Lastly, the text data is transformed into numerical representations using the TF-IDF vectorizer, which weights each word according to its significance in the product descriptions. Through further research made easier by this numerical representation, the system is able to find pertinent trends and connections between user preferences and skincare items. The data processing stage guarantees that the ensuing suggestion generating process is based on reliable and thorough information by standardizing and modifying the input data. This improves the efficacy and relevancy of the skincare advice given to consumers.

6. MODULES DESCRIPTION

1. DataLoader:

This module loads skincare product data from various sources like e-commerce websites or official product databases, converting it into a structured format (DataFrame) for further processing. It ensures

data is systematically collected and stored for consistency and ease of use.

2. DataCleaner:

The DataCleaner module handles data preprocessing tasks such as addressing missing values, removing duplicates, and ensuring consistency. This step is crucial for maintaining data quality and reliability, which directly impacts the accuracy of the recommendation system.

3. FeatureExtractor:

This module employs Natural Language Processing (NLP) techniques to extract essential features from product data, including ingredients, benefits, and usage instructions. These features are then prepared for model training to enhance the recommendation accuracy.

4. ModelTrainer:

ModelTrainer is responsible for training the recommendation model using the extracted features. It ensures the model learns to make accurate product recommendations by analyzing patterns and relationships within the data.

5. Recommender:

The Recommender module utilizes the trained model to generate personalized skincare product recommendations. It considers user inputs such as skin type, product type, skin problems, and desired effects to provide tailored suggestions.

6. Product:

This module represents a skincare product, detailing attributes like name, type, brand, notable effects, suitable skin type, price, and description. It serves as the foundation for the recommendation system, providing essential information for generating recommendations.
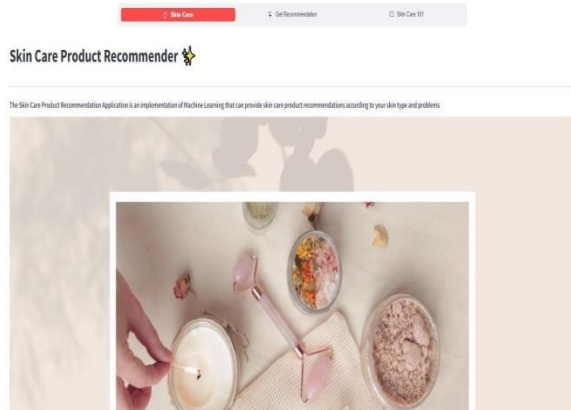
7. EXPERIMENTAL RESULTS
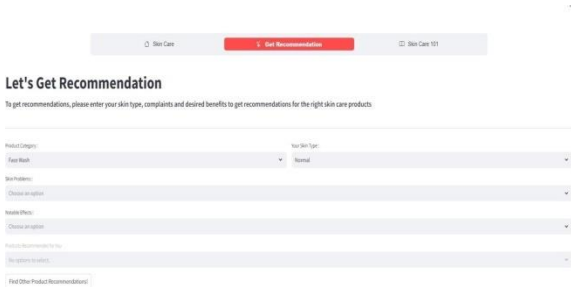

Fig 2 Home Page

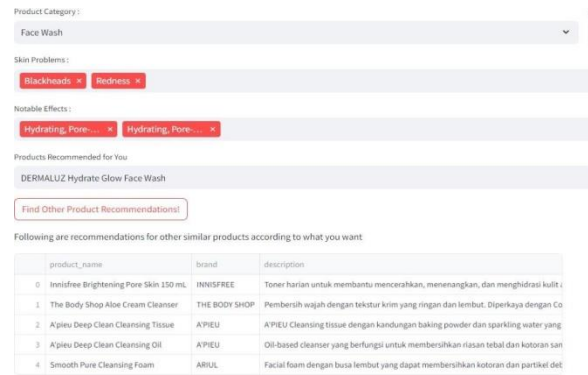
Fig 3 Dashboard

Fig 4 Recommended Product

Fig 5 Other Product Recommendations

8. CONCLUSION

In conclusion, the Skin Care Recommender System stands as a remarkable implementation of a content-based recommendation system, revolutionizing the skincare product selection process for users. Leveraging TF-IDF vectorization and cosine similarity, the system adeptly analyzes user preferences to deliver personalized skincare recommendations, considering factors like skin type, concerns, and desired effects. Its user-friendly interface, crafted using the Streamlit framework, ensures effortless navigation and input, enhancing user engagement and satisfaction.

Efficiency is a hallmark feature of the system, with optimized algorithms providing swift and accurate recommendations, bolstering user experience. Rigorous testing validates the system's performance, guaranteeing seamless handling of multiple user requests simultaneously. Moreover, the system's scalable architecture accommodates expansion, allowing seamless integration of new products to maintain relevance over time.

However, the system does have its limitations. The dataset's coverage may be restricted, warranting

continual expansion to encompass a broader range of skincare products for more comprehensive recommendations. Additionally, while the system provides valuable insights, it should not substitute professional dermatological advice, particularly for users with specific skin conditions or concerns.

Overall, the Skin Care Recommender System represents a significant advancement in skincare product recommendation technology, offering users tailored suggestions while emphasizing the importance of informed decision-making and professional guidance for optimal skincare outcomes.

9. FUTURE SCOPE

The future scope of skincare recommendation systems promises exciting advancements driven by rapidly evolving technologies. One significant area is the incorporation of user feedback loops, where users can rate the effectiveness of recommended products. This feedback will be invaluable in refining the system's algorithms, leading to more accurate and personalized recommendations over time. Another promising development is the integration of AI-driven chatbots for personalized consultations. These chatbots can offer real-time advice and answers to user queries based on individual skin types and concerns, providing a more interactive and supportive user experience.

The continuous expansion of the product database is essential, ensuring that the system remains current with the latest skincare products, ingredients, and formulations. This ongoing update will enable the system to offer the most relevant and effective product suggestions. Additionally, the inclusion of multimodal analysis, such as text from user reviews

and audio inputs, will provide a more holistic understanding of user preferences and needs, further enhancing the accuracy of recommendations.

Moreover, the system can evolve to offer complete, customized skincare routines rather than just individual product recommendations. By considering factors like climate, lifestyle, and seasonal changes, the system can provide comprehensive skincare plans tailored to the user's specific conditions. Overall, the future scope of skincare recommendation systems is dynamic and expansive, presenting numerous opportunities for innovation and growth. As technology and user needs continue to evolve, the platform will adapt, striving to lead in creativity and effectiveness within the recommendation system landscape.

10. REFERENCES

[1] William H. Truswell, "Prescription Skin Care Products and Skin Rejuvenation," Facial Plastic Surgery Clinics of North America, vol. 28, no. 1, 2020, pp. 59-65.

[2] Pietro Venezia, and Ferruccio Torsello, "Orientation of digital casts according to facial lines," The Journal of Prosthetic Dentistry, vol. 120, no. 6, 2018, pp. 964-965.

[3] Phoebe Star, and Pascale Guitera, "Guitera Lentigo Maligna, Macules of the Face, and Lesions on Sun-Damaged Skin: Confocal Makes the Difference," Dermatologic Clinics, vol. 34, no. 4, 2016, pp. 421-429.

[4] Ezgi Aktaş Karabay, and Aslı Aksu Çerman, "Demodex folliculorum infestations in common

facial dermatoses: acne vulgaris, rosacea, seborrheic dermatitis," Anais Brasileiros de Dermatologia, vol. 95, no. 2, 2020, pp. 187-193

[5] Ichiro Okayasu, Osamu Komiyama, Noriaki Yoshida, Kumiko Oi, and Antoon De Laat, "Effects of chewing efforts on the sensory and pain thresholds in human facial skin: A pilot study," Archives of Oral Biology, vol. 57, no. 9, 2012, pp. 1251-1255.

[6] Jae-Yong Lim, and Hilary Bart-Smith, "An analytical model for the face wrinkling failure prediction of metallic corrugated core sandwich columns in dynamic compression," International Journal of Mechanical Sciences, vol. 92, 2015, pp. 290-303.

[7] Ezgi AktasKarabay, and Asli Aksu Cerman, "Demodex folliculorum infestations in common facial dermatoses: acne vulgaris, rosacea, seborrheic dermatitis," Anais Brasileiros de Dermatologia, vol. 95, no. 2, 2020, pp.187-193.

[8] Toshihide Sato, Yukio Okada, Takenori Miyamoto, and Rie Fujiyama, "Distributions of sensory spots in the hand and two-point discrimination thresholds in the hand, face and mouth in dental students," Journal of Physiology-Paris, vol. 93, no. 3, 1999, pp. 245- 250.

[9] Taiwan Food and Drug Administration, https://www.fda.gov.tw/tc/PublishOtherEpaperConten t.aspx?id=1113&tid=1720

[10] Fei-Fei L., Lecture 8: Spatial Localization and Detection, 2016 (http://vision.stanford.edu/teaching/cs231n/slides/201 6/winter1516_lecture8.pdf)

[11] Bochkovskiy, Alexey, Chien-Yao Wang, and Hong-Yuan Mark Liao, "YOLOv4: Optimal Speed and Accuracy of Object Detection," arXiv preprint arXiv:2004.10934, 2020.

[12] Lin, Ting-Yu, Hung-Tse Chan, Chih-Hsien Hsia, and Chin-Feng Lai. "Facial Skincare Products' Recommendation with Computer Vision Technologies." *Electronics* 11, no. 1 (2022): 143. https://doi.org/10.3390/electronics11010143

[13] Vinit714. "A-Recommendation-system-for-Facial-Skin-Care-using-Machine-LearningModels." *GitHub*, 2024. Available at:https://github.com/vinit714/A-Recommendationsystem-for-Facial-Skin-Care-using-Machine-Learning-Models

[14] "Skincare-recommendation · GitHub Topics." *GitHub*, 2024. Available at: https://github.com/topics/skincare-recommendation

[15]Madapuri, R.K., Mahesh, P.C.S. HBS-CRA: scaling impact of change request towards fault proneness: defining a heuristic and biases scale (HBS) of change request artifacts (CRA). Cluster Comput 22 (Suppl 5), 11591–11599 (2019). https://doi.org/10.1007/s10586-017-1424-0

[16] J. R. Dwaram and R. K. Madapuri, "Crop yield forecasting by long short-term memory network with Adam optimizer and Huber loss function in Andhra Pradesh, India," Concurrency and Computation: Practice and Experience, vol. 34, no. 27. Wiley, Sep. 18, 2022. doi: 10.1002/cpe.7310.

[17] Swetha, A. ., M. S. . Lakshmi, and M. R. . Kumar. "Chronic Kidney Disease Diagnostic

Approaches Using Efficient Artificial Intelligence Methods". International Journal of Intelligent Systems and Applications in Engineering, vol. 10, no. 1s, Oct. 2022, pp. 254.

[18]Thulasi , M. S. ., B. . Sowjanya, K. . Sreenivasulu, and M. R. . Kumar. "Knowledge Attitude and Practices of Dental Students and Dental Practitioners Towards Artificial Intelligence". International Journal of Intelligent Systems and Applications in Engineering, vol. 10, no. 1s, Oct. 2022, pp. 248-53

[19] "Smart Facial Skincare Products Using Computer Vision Technologies." *IEEE Xplore*, 2023. Available at: https://ieeexplore.ieee.org/document/9689474

[20] "Efficient Net-based Expert System for Personalized Facial Skincare Recommendations." *IEEE Xplore*, 2023. Available at: https://ieeexplore.ieee.org/document/10142790