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SKIN CANCER DETECTION USING IMAGE PROCESSING

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ABSTRACT

Skin cancer poses a significant health concern globally, demanding prompt identification and treatment for favorable patient prognosis. This study introduces an automated system for skin cancer detection through advanced image processing methodologies. Employing algorithms for image analysis and classification, the system distinguishes skin lesions into distinct categories: melanoma, basal cell carcinoma, or normal skin. The implementation of this technology aims to augment diagnostic precision, particularly in regions with limited access to specialized dermatological services. Through the integration of image processing techniques and transfer learning models, this project contributes to early detection strategies, facilitating timely interventions and improved clinical outcomes in skin cancer management.

Keywords: Skin Cancer Detection, Automated System, Image Processing, Image Classification.

I. INTRODUCTION

Detecting skin cancer in its early stages is crucial for successful treatment outcomes. This task presents difficulties due to multiple factors. Firstly, the limited availability of dermatologists creates barriers to accessing examinations and diagnoses for patients. Secondly, relying solely on manual examinations can introduce errors, leading to delayed detection and treatment initiation. This delay not only impacts patient health but also adds to costs and consumes valuable time. To overcome these challenges, leveraging advancements in image processing and classification models presents a promising solution. These technologies enable accurate analysis and classification of skin lesions based on predefined criteria, facilitating early detection and timely intervention. Such an approach holds significant potential for improving patient outcomes by expediting diagnosis and treatment initiation, thereby alleviating strain on healthcare systems and mitigating the impact on individuals' health, finances, and overall well-being.

OBJECTIVE OF SYSTEM

- The main goal is to provide fast and accurate diagnoses, reducing analysis time and ensuring precise results.
- This methodology proves especially in regions lacking dermatological services, thereby improving healthcare accessibility for marginalized communities.
- Through the utilization of advanced image processing techniques, the system proficiently assesses skin images and identifies potential cancerous abnormalities.

II. LITERATURE SURVEY

Arifin, S., Kibria, G., Firoze, A., Amini, A., & Yan, H. “Dermatological Disease Diagnosis Using Color-Skin Images” [1] 2012 - The system presented by this paper is a machine intervention in contrast to human arbitration into the conventional medical personnel based ideology of dermatological diagnosis. The process consists of two interconnected stages: the initial detection of skin irregularities & the subsequent identification of associated diseases. The system operates on visual input i.e. high resolution color images and patient history. The system employs color image processing methodologies, including k-means clustering and color gradient techniques, to discern diseased skin areas. Disease classification is accomplished through the utilization of feedforward backpropagation artificial neural networks.

Mohamed Hammad, Pawel Plawiak, Mohammed ElAffendi, Ahmed A. Abd El-Latif & Asmaa A. Abdel Latif “Enhanced Deep Learning Approach for Accurate Eczema & Psoriasis Skin Detection” [2] 2023 - This paper presents an enhanced deep learning approach for the accurate detection of eczema and psoriasis skin conditions. They have proposed a system named as “Derma Care” which has achieved the accuracy of 96.20% while performing the detection of eczema & psoriasis skin diseases.

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Naval Soliman ALKolifi ALEnezi "Skin disease detection using Machine Learning" [3] 2019 – This paper proposes a system created by using pre-trained convolutional neural network called as AlexNet to detect skin disease and implemented using MATLAB 2018b. This system is able to detect 3 types of skin diseases.

T.K. Jagtap, H.P. Shinde, O.V. Gaware, S.R. Maurya "Skin Disease Prediction" [4] 2021 - This paper proposes an mobile based method by using deep learning to detect skin diseases. This system is able to detect 6 different types of skin diseases with the highest accuracy of 75%.

III. METHODOLOGY

- **Image Pre-Processing:**

Image preprocessing plays a crucial role in optimizing the efficiency and accuracy of the system. We implemented image resizing to convert the images into the unified size of 224x224 pixels which will help to reduce the processing time & enhance the system performance as well as accuracy. After resizing, the image is getting converted into RGB color space for further processing.

- **Feature Extraction:**

After the initial preprocessing, the system employs a model that has been trained explicitly for detecting skin cancer. Then the model utilizes transfer learning techniques to extract pertinent features from the resized image. These extracted features are essential in capturing crucial patterns and traits that signify various types of skin cancer, such as melanoma, basal cell carcinoma, and normal skin conditions.

- **Image Classification:**

After feature extraction, the system advances to image classification to ascertain the specific type of skin cancer depicted in the uploaded image. Utilizing the model, the system calculates the likelihood of each skin cancer category based on the extracted features. Subsequently, the class with the highest probability is identified as the classification outcome, providing insight into the type of skin cancer identified in the lesion.

IV. PROPOSED SYSTEM

Our innovative system is a user-oriented web application designed to empower individuals in the early detection of possible skin cancer lesions or moles. Utilizing advanced image processing methodologies, the application conducts a thorough analysis of uploaded images, focusing on critical indicators of skin cancer such as asymmetry, irregular borders, and variations in color. Upon completion of the analysis, the system promptly delivers clear and actionable results to users, indicating the specific type of skin cancer lesion detected.

Through its accessible interface and dependable functionality, our tool aims to encourage proactive health management and enhance outcomes by facilitating timely intervention. With its user-friendly design and comprehensive analytical capabilities, the platform serves as a valuable resource for individuals looking to prioritize their skin health and make well-informed decisions regarding potential medical care or consultation.

SYSTEM ARCHITECTURE

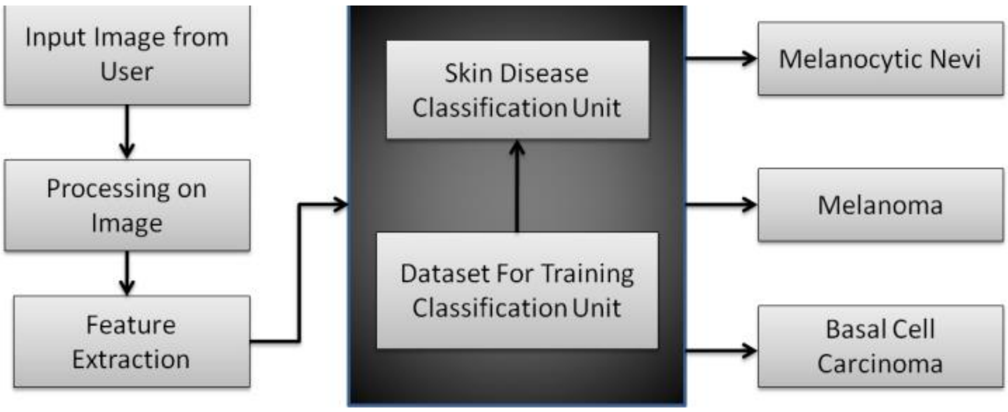

Fig 1: System Architecture Diagram

V. RESULT

In this study, we have evaluated the accuracy of our system. The model was trained for 70 epoch on the dataset of 3600 images, where 2880 images where used for training purpose while remaining 720 images where used for testing purpose. In the Fig -2, we can see the different detection rates for 3 types of skin cancer lesions.

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CLASS	ACCURACY
Melanoma	0.87
Melanocytic Nevi	0.84
Basal Cell Carcino...	0.94
Normal Skin	1.00

Fig 2: Disease Detection Rate

Figure-3 shows the training accuracy graph of the model trained on 70 epochs which shows that training accuracy has been increased from 10 epochs and remained constant up to 70 epochs.

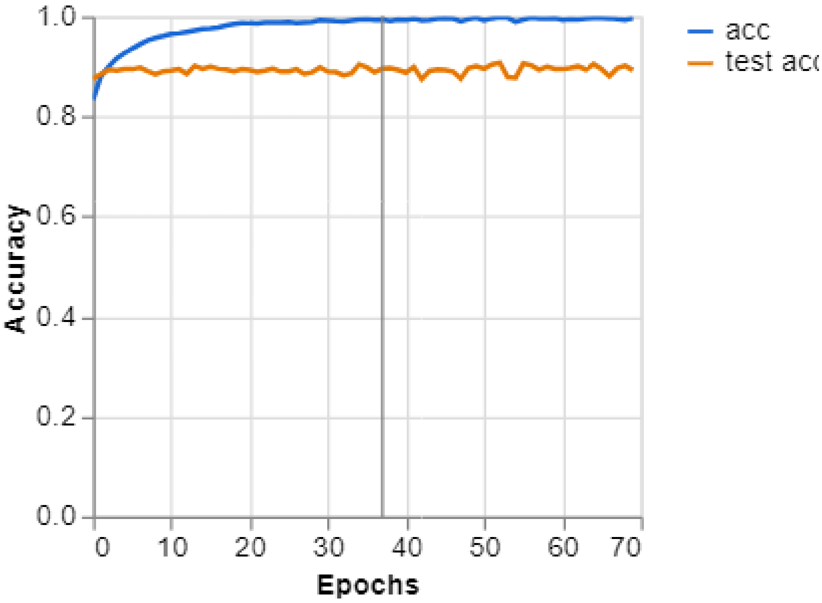

Fig 3: Training & Testing Accuracy Graph

While figure-4 shows the loss graph which tells that the model was experiencing high loss and then the rate of loss started decreasing after 10 epochs.

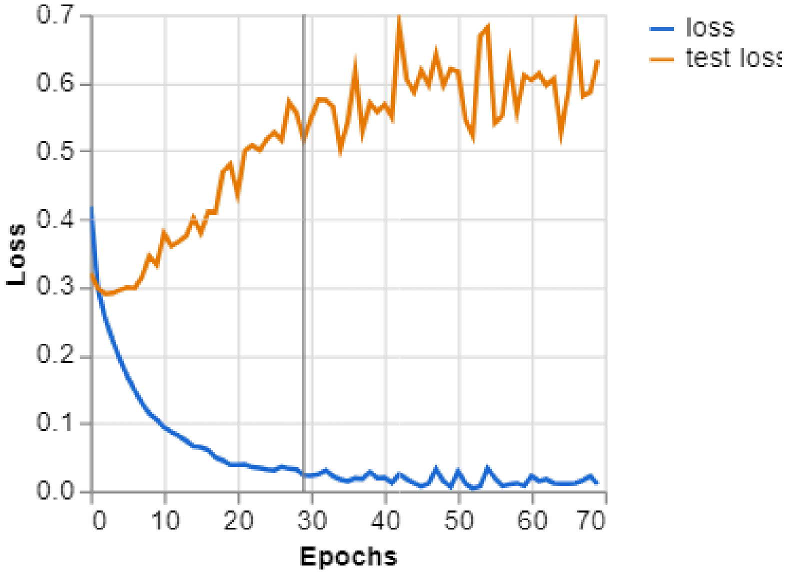

Fig 4: Training & Testing Loss Graph

OUTPUT

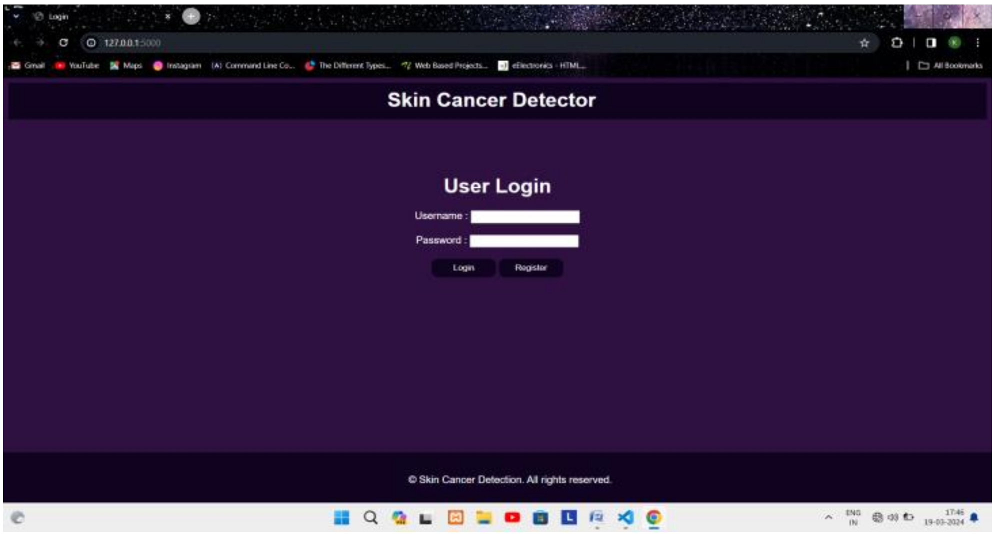

Fig 5: Home Page

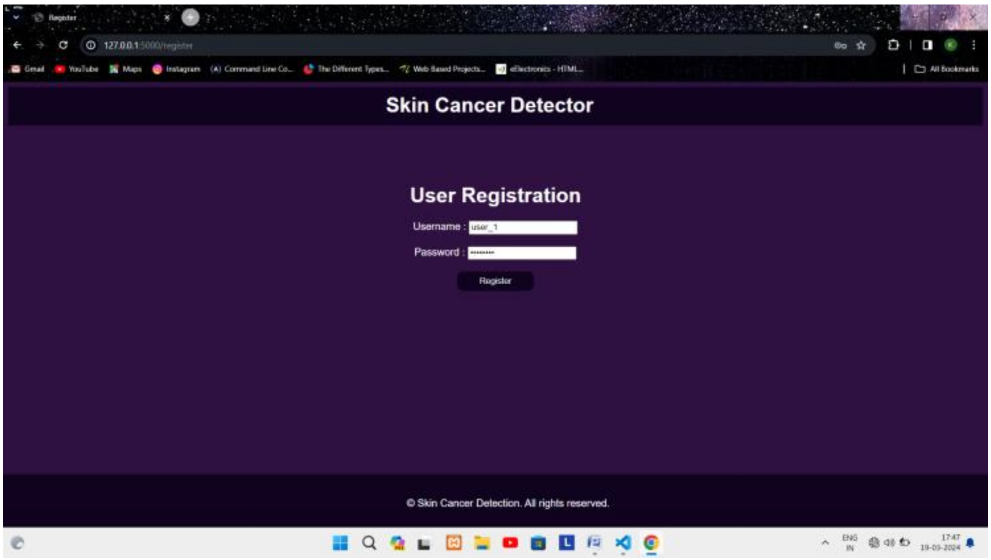

Fig 6: Registration Page

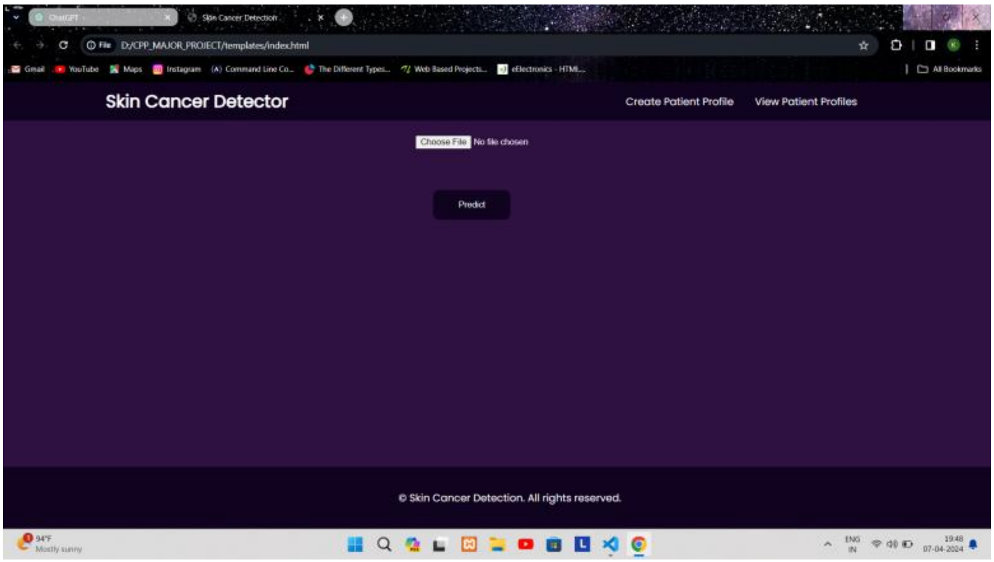

Fig 7: Prediction Page

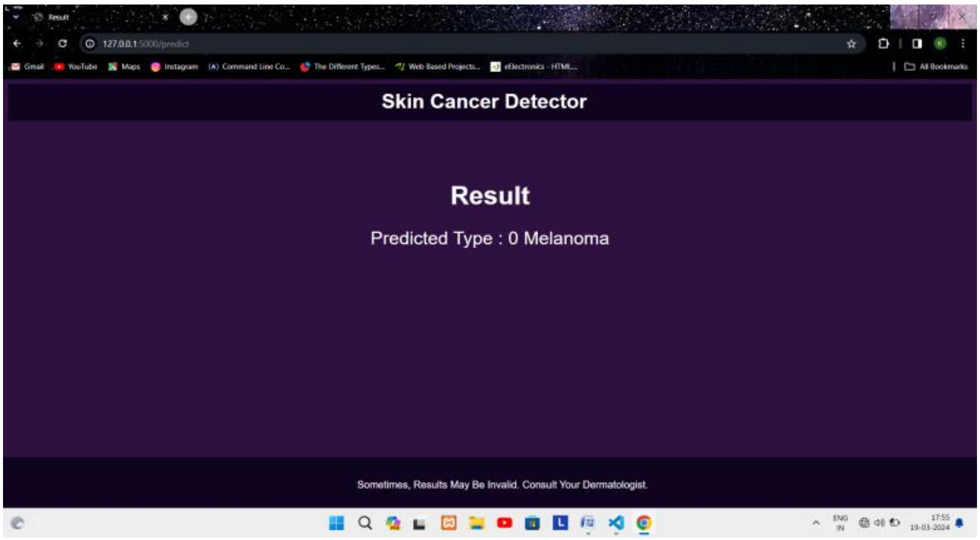

Fig 8: Result Page

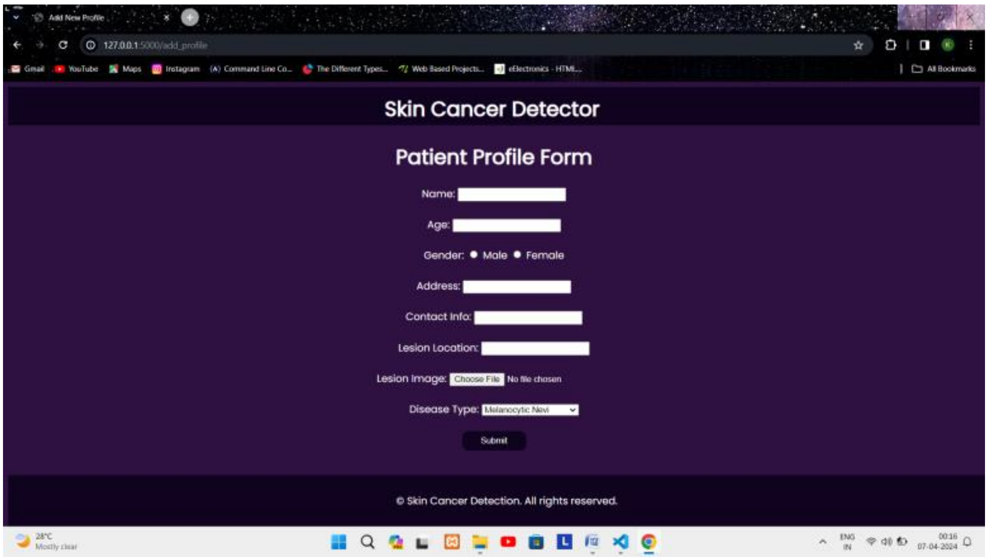

Fig 9: Adding Patient Profiles

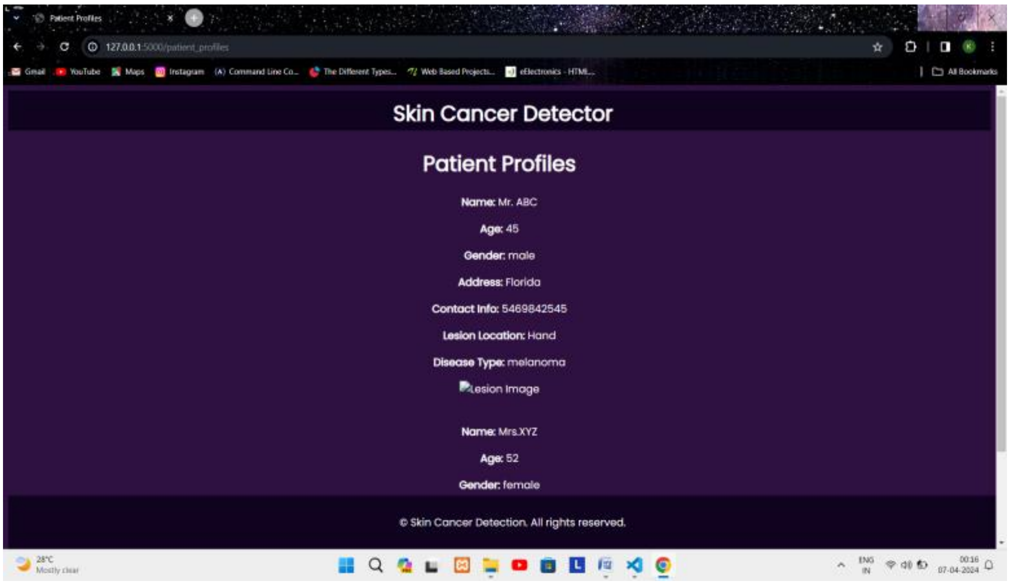

Fig 10: Patient Profiles

ADVANTAGES

- Early Detection
- Non-Invasive Approach
- Time-Efficient Diagnosis
- Scalable and Cost-Effective
- Accessible Tool

SYSTEM REQUIREMENTS

- **Hardware Requirements:**
- Operating System: Windows 11
- RAM: 8 GB or Above
- Storage: 128GB SSD or Above
- Processor: Intel i5-11th Gen. or Above
- **Software Requirements:**
- IDE: VS Code
- Frontend: HTML & CSS
- Backend: Python & Flask
- Database: SQLite

VI. CONCLUSION

The "Skin Cancer Detection using Image Processing" project represents a significant advancement in healthcare technology, specifically targeting the early detection and classification of skin cancer. Through the integration of image processing techniques and transfer learning, the system efficiently identifies and categorizes skin cancer lesions, including melanoma, basal cell carcinoma, and normal skin conditions. This capability is instrumental in facilitating prompt and accurate decision-making by healthcare professionals, leading to improved patient care and treatment outcomes. Moreover, the system's architecture is dynamic, allowing for continuous growth and enhancement. It possesses the potential to perform real-time image analysis, expand its classification capabilities to encompass various types of cancer, and evolve into a mobile application for widespread accessibility. These ongoing developments promise to elevate the system's effectiveness, reach, and impact, ultimately benefiting a broader spectrum of users and advancing the field of skin cancer detection and treatment.

VII. REFERENCES

[1] Arifin, S., Kibria, G., Firoze, A., Amini, A., & Yan, H. (2012) “Dermatological Disease Diagnosis Using Color-Skin Images.” Xian: International Conference on Machine Learning and Cybernetics.

[2] Mohamed Hammad, Pawel Plawiak, Mohammed ElAffendi, Ahmed A. Abd El-Latif & Asmaa A. Abdel Latif (2023) “Enhanced Deep Learning Approach for Accurate Eczema & Psoriasis Skin Detection”.

[3] Naval Soliman ALKolifi ALEnezi.(2019) “Skin disease detection using Machine Learning.”

[4] T.K. Jagtap, H.P. Shinde, O.V. Gaware, S.R. Maurya (2021) “Skin Disease Prediction.”