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AI BASED TOOL FOR PRELIMINARY DIAGNOSIS OF DERMATOLOGICAL MANIFESTATIONS

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ABSTRACT:

AIDerm is a state-of-the-art tool that uses artificial intelligence (AI) technology to help with the first diagnosis of skin disorders.AIDerm analyzes patient-reported skin patterns and symptoms using deep learning algorithms to find patterns and traits suggestive of different skin disorders. With this knowledge, medical professionals can quickly identify patients, obtain patient data, and start helping with triage and treatment planning. Confirmatory research has proven AIDerm's effectiveness and dependability, establishing it as a valuable instrument that can enhance precision and enhance patient outcomes in dermatological therapy

KEYWORDS: Dermatology, Diagnosis, Artificial Intelligence, PrePreparation, Skin condition, Machine Learning, Image Recognition, Symptom Analysis, Medical Imaging, Dermatology Assistant.

INTRODUCTION:

In recent years, advances in artificial intelligence (AI) have revolutionized every aspect of medicine, and dermatology is no exception. The integration of artificial intelligence into healthcare paves the way for new tools that will increase diagnostic accuracy and efficiency. Among these advances, AIbased diagnostic tools for dermatological symptoms have emerged as a promising solution for both dentists and patients. nature shows its benefits and effects Doctors and patients. Harnessing the power of artificial intelligence, these tools offer new ways to improve the diagnostic process, make it more accurate, and ultimately improve patient outcomes. The need is more urgent than ever. Dermatological manifestations range from problems such as acne and eczema to conditions such as melanoma and psoriasis. The difference in symptoms, combined with the lack of dermatologists, often leads to delays in diagnosis and treatment, causing serious problems in terms of treatment in the world. Algorithms show promise in analyzing dermatology images, medical records and patient histories. By learning from different recorded images and expert diagnoses, this tool can identify patterns, identify features and provide an initial assessment of the skin with very high accuracy.

Additionally, AI based dermatology tools have the potential to improve access to dermatology care, especially in underserved areas where dental access is limited. By allowing primary care physicians and even patients to make an initial assessment, these tools can help improve early diagnosis, timely intervention, and improve skin management. Huge challenges and decisions remain. Ethical issues surrounding patient privacy, data security, and algorithmic transparency need to be carefully considered to ensure responsible and ethical use of these tools. Additionally, continuous validation and improvement are essential to improve the performance and reliability of AI-based dermatology systems. Significant improvements in performance with the potential to increase diagnostic accuracy, effectiveness and efficiency. As research and development in this field continues, collaboration between physicians, scientists, and technologists is essential to complement all specialized skills in dermatological treatment

LITERATURE REVIEW:

1.A survey on deep learning techniques for image and video analysis in dermatology" by Esteva et al. (2019)

This survey examines deep learning techniques used in dermatology, such as picture categorization, segmentation, and illness detection. This survey paper explores the application of deep learning techniques in dermatology, focusing on various tasks such as image categorization, segmentation, and disease detection. The authors discuss the potential of deep learning to revolutionize dermatological diagnosis and treatment by analyzing large datasets of dermatological images.

2.Deep Learning for Dermatological Image Analysis" by Haenssle et al. (2020)

This comprehensive paper looks at the use of deep learning techniques in dermatology, focusing on objectives like image categorization, segmentation, and disease identification. The authors address the potential for deep learning to transform dermatological diagnosis and therapy by evaluating enormous datasets of dermatological images.

3.Artificial intelligence for the diagnosis of skin cancer: A review of the literature and future directions" by Tschandl et al. (2020)

The article "Artificial Intelligence for the diagnosis of skin cancer: A review of the literature and Future Directions" was published in 2020 by Tschandl et al. Although this review focuses on the diagnosis of skin cancer, it also discusses the limitations and potential applications of artificial intelligence in dermatology.

4.Advances in Artificial Intelligence and Digital Health Technologies for Dermatology" by De Fauw et al. (2020)

An overview of the most current advancements in artificial intelligence (AI) and digital health technologies that are revolutionizing dermatology practice is given in this review article. It covers a wide range of topics, including telemedicine, tailored therapy suggestions, and automated diagnostics.

METHODOLOGY

Data Collection:

Dermatological images: High-definition pictures of abnormalities, rashes, and other
Skin conditions.
Dermoscopic Images: Pictures taken with a dermoscope to make skin surface features more visible.

Meta Data:

Patient information includes age, gender, and race, all of which can affect skin symptoms.
Weight and other relevant information

Data argumentation:

Make data different: Use techniques like rotating, rotating, scaling, and changing color to add it to your dataset.

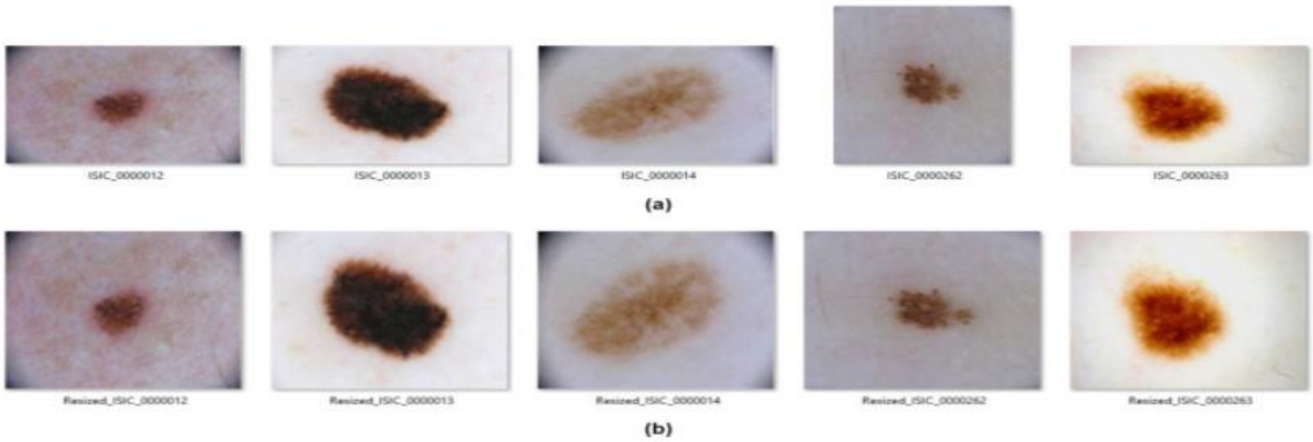
Image preprocessing:

Image preprocessing will convert the image into a more accessible and useful format. Skin ph otos may contain unwanted hair, noise, or distortion. The quality of the image determines the performence of the image. Skin imaging should be performed to increase the effectiveness of dermatology findings. It improves image quality, reduces complexity and increases accuracy f or
further processing. The first step is divided into three parts: resizing the image, removing fuzz, and removing noise.

Image resizing:

Images of different sizes may not necessarily have the same number of features. To solve this problem, the size of the input image is increased or decreased. It also reduces the running time and improves the overall performance of the system. We measure all the given images as 512 × 512. The process of dividing an image into nonoverlapping groups or segments is called image segmentation. Adjust grayscale, brightness, color, consistency, texture, etc. takes into consideration. It distinguishes the same disease from surrounding healthy skin. This is the mos t

important stage of image verification because it determines the accuracy of the next process. However, accurate segmentation is difficult in microscopic images due to large variations in si ze,
shape, and color of lesions. There is also a negative difference between the wound and the surrounding healthy skin. Image segmentation method is divided into threshold-based, region-based, group-based and edge-based



Dataset Filtering:
Images are selected from our data. Papers are stored and classified as one of thefollowing: Fiv e Purpose Diseases (Buruli ulcer, leprosy, mycetoma, scabies and yaws) performed remotely a nd in person by two physician dermatologists with over a decade of local diagnostic experienc e.

Data Analysis:
Select images from our database and examine five disease types for diagnosis (Buruli ulcer, le prosy,mycetoma) by two dermatologists with more than a decade of knowledge, disease and disease experience**.**

Segmentation:
The process of dividing an image into non-overlapping groups or segments is called image segmentation. Adjust grayscale, brightness, color, consistency, texture, etc. takes into consideration. It distinguishes the same disease from surrounding healthy skin. This is the most important stage of image verification because it determines the accuracy of the next process. However, accurate segmentation is difficult in microscopic images due to large variations in size, shape, and color of lesions. There is also a negative difference between the wound and the surrounding healthy skin. Image segmentation method is divided into threshold-based, region-based, group-based and edge-based

Dataset:

ISIC Archives (International Skin Imaging Collaboration)

ISIC Archives provides high quality dermoscopy images to aid cancer diagnosis and research.Other diseases of the skin.

Note: Dermatologists provide a diagnostic report for each photo.

Purpose: To create a basic data set to create an automated skin care system.

Human Against Machine with 10,000 Training Photos is known as HAM10000 Synopsis:

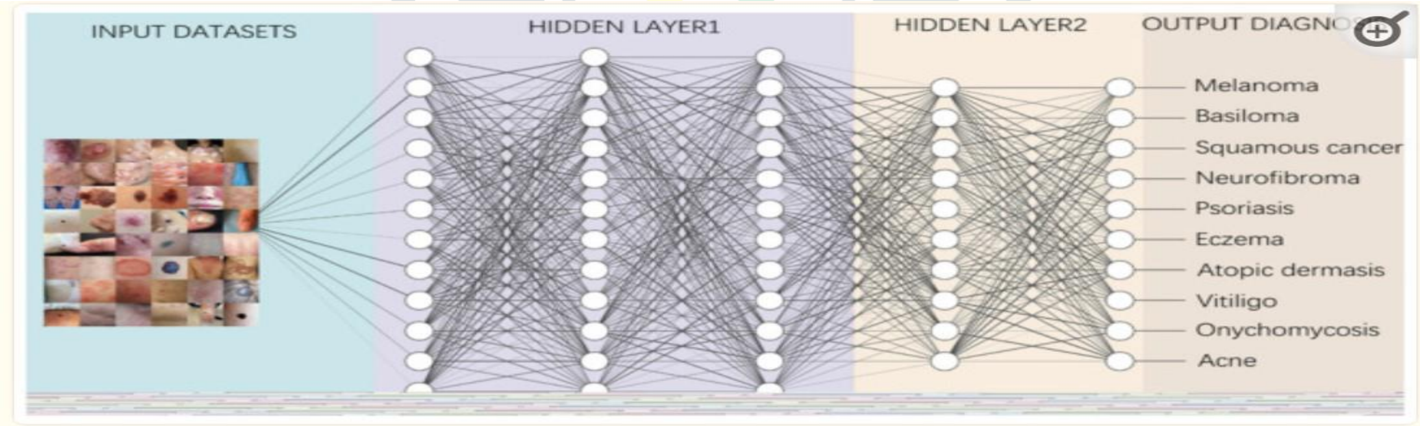
Designed to serve as a foundational dataset for automated systems for analyzing skin lesions.

Content: Ten thousand dermoscopic pictures show seven common types of benign and malignant skin lesions.

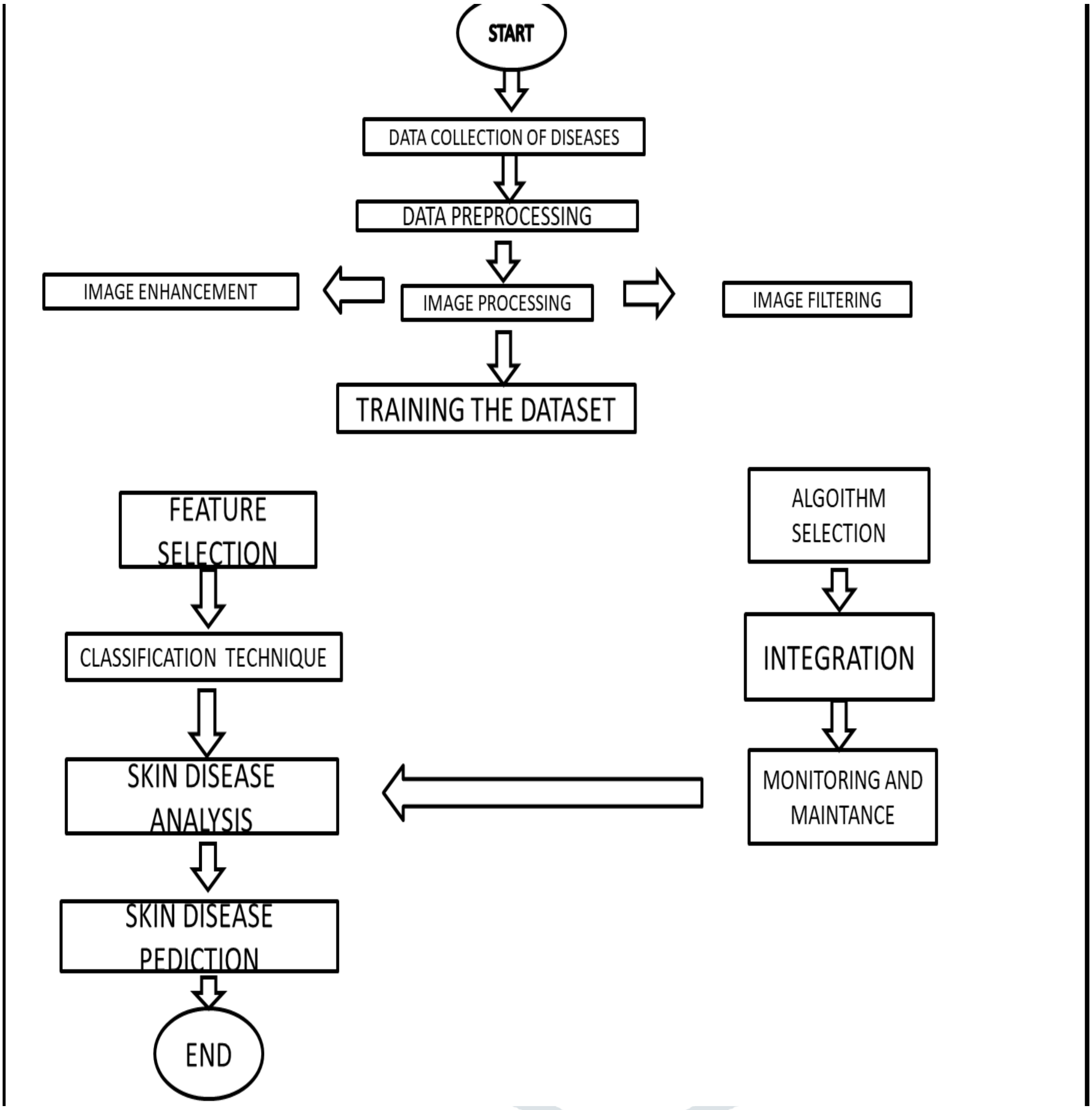
Note: Dermatologists with experience have confirmed the diagnostic labeling.

Classification:

We use three different methods to classify skin lesions: support vector machine (SVM), K-nearest neighbor (KNN), and decision tree (DT). Support vector machine (SVM) is a classification control technique used to solve classification and regression problems. It produces more accurate results than other algorithms. We use different types of SVM and two methods: one-to-one and one-to-one rest to classify eight skin diseases. It uses a kernel technique to transform the data to create a good decision boundary between the results. K-Nearest Neighbors is a non-parametric method that can be used in both classification and regression. It uses “attribute similarity” to estimate the value of unknown data items. In this study, the Euclidean distance between two points was used to determine the similarity between new and existing events.



ARCHEITECTURE DIAGRAM:



Disease dataset:

A disease dataset is a collection of unique information about various diseases and their characteristics, patient information, and other conditions. Acne, pigmentation etc. Organize images of various diseases such as into the dataset tube, which converts the raw data into a clean and usable state. Signal processing is a process in machine learning that extracts important information from raw data and presents it in a more comprehensive and detailed way

Data preprocessing:

Before supplying raw data to a machine learning model, it must first be cleaned up and made into a format that is easily readable. This procedure is known as data preprocessing. This is an important stage since it guarantees the data's quality and consistency, which has an immediate effect on the model's performance. Preprocessing is a multi-step procedure that addresses various flaws in the
data with multiple ways.

Algorithm selection:
Data attributes include the quantity, caliber, and diversity of the dataset.Model Complexity: The compromise between interpretability and model complexity.Performance measurements include specificity, sensitivity, accuracy, and other pertinent data.Computational Resources: The hardware and processing capacity that are at hand.

Feature selection:
Feature extraction is a process in machine learning that extracts relevant information from raw data to generate key features that can be used as input for machine learning algorithms

Classification technology:
Classification Strategy, machine learning, it is a method used to classify input data into one or more categories or categories based on the characteristics of the data input.

Dermatology estimate:
It is a machine learning and prediction technique for predicting skin diseases based on a variet y of actors, including symptoms, patient demographics, treatment history pain, and sometimes the shapeof the skinlesions

Test dataset:
Data used to **test the performance of** machine learning models **is** called **test data** or simply t est
data.

Skin disease analysis:
The methodical inspection and assessment of skin conditions for the purpose of diagnosing, tracking, and treating different dermatological problems is known as skin disease analysis. Dermatologists can carry out this study with the use of artificial intelligence (AI) technologies, or they can use their clinical experience and sophisticated diagnostic tools.

Skin disease prediction:
Based on recent and past data, skin disease prediction uses statistical and machine learning models to predict the chance of getting a specific skin condition or to detect the presence of a skin illness. Enhancing early detection, increasing diagnostic precision, and enabling prompt action are the objectives.
ACCURACY:
Compare the AI model's diagnostic predictions to actual diagnoses in test data.
Accuracy is calculated by dividing the percentage of successful tests by the total number of tests in the test data.

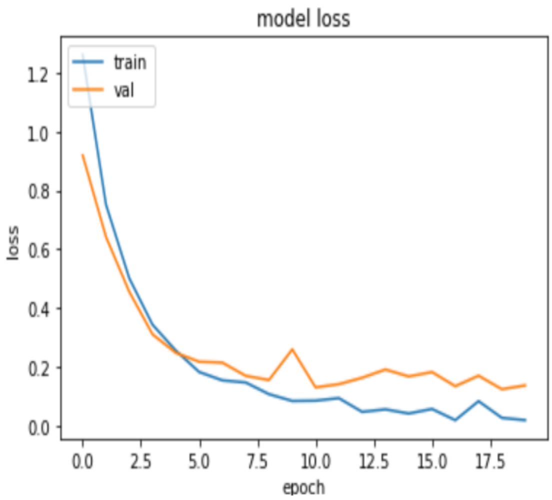
TESTING ACCURACY:

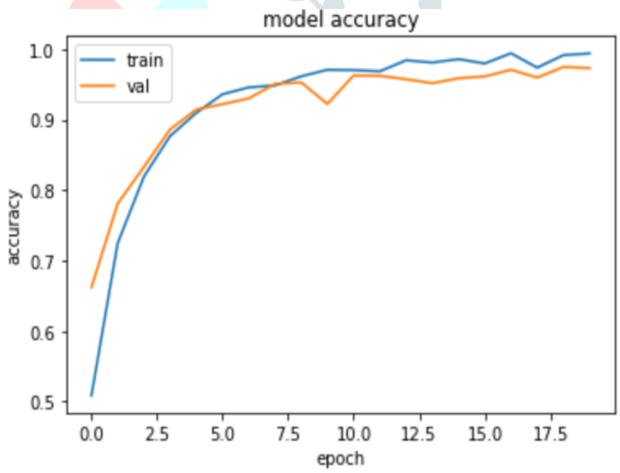
$$\text{Testing Accuracy} = \frac{\text{Number of Correct Predictions on Testing Data}}{\text{Total Number of Testing Instances}}$$

This analysis will evaluate the effectiveness of AI-driven solutions on unknown data. A high level of accuracy measurement is required to ensure that the equipment is actually in place. If the accuracy rate is lower than the training accuracy, it may indicate an overfitting problem that needs to be improved or replaced

RESULT:

	lesion_id	image_id	dx	dx_type	age	sex	localization
0	HAM_0000118	ISIC_0027419	bkl	histo	80.0	male	scalp
1	HAM_0000118	ISIC_0025030	bkl	histo	80.0	male	scalp
2	HAM_0002730	ISIC_0026769	bkl	histo	80.0	male	scalp
3	HAM_0002730	ISIC_0025661	bkl	histo	80.0	male	scalp
4	HAM_0001466	ISIC_0031633	bkl	histo	75.0	male	ear





Dataset	Model	Accuracy	Precision	Recall	F1-score
ISIC 2019	SVM	52.00	20.63	18.63	18.38
	KNN	42.00	18.63	18.75	18.63
	DT	40.00	17.88	17.75	17.75
HAM10000	SVM	71.00	33.71	24.57	24.57
	KNN	55.00	23.00	21.71	22.71
	DT	57.00	22.14	24.29	23.86

Full distribution preliminary data evaluation for support vector machine, K-nearest neighbor and decision tree classification of ISIC 2019 and HAM10000 datasets. Figure 10 shows the distribution of the SVM classifier using the HAM10000 dataset. We found that most of the NV classes were also predicted, but a few DF classes were not. This is due to dataset imbalance issue.

Fig (a) Performance metrics of the proposed models for imbalanced dataset

Dataset	Model	Accuracy	Precision	Recall	F1-score	Log loss (%)
ISIC 2019	SVM	95.00	95.13	95.00	94.88	18.09
	KNN	94.00	93.88	93.88	93.38	25.49
	DT	93.00	93.13	93.00	92.50	24.49
HAM10000	SVM	97.00	97.71	97.57	97.43	11.37
	KNN	95.00	95.71	95.57	95.14	15.59
	DT	95.00	95.14	95.14	94.71	17.37

Fig (b) Performance metrics of the proposed models for balanced dataset

The average performance obtained by the SVM classifier is more excellent than the other two classifiers

FUTURE SCOPE:

More machine learning and deep learning are being added to the tools to make diagnoses more accurate and efficient. Increase the number of skin diseases identified, including rare skin diseases. Multimodal data integration is the process of combining genetic data, medical history, patient demographics, and imaging data with other types of data to create a more comprehensive diagnosis.

The importance of interpretation and explanation in medical AI cannot be overstated, especially in clinical decision making where transparency and belief pressure are important. In the future, video extraction techniques will become important in creating features that can be interpreted by clinicians and shed light on the diagnostic process of pain. Methods such as saliency mapping, feature visualization, and model free interpretation can help understand the extracted features and increase the utility of -based dermatology diagnostic systems. Advances - State-of-the-art AI-powered dermatology diagnostics, improving diagnostic accuracy, robustness, and interpretation, ultimately improving dermatology patient care

CONCLUSION:

AI-powered diagnostics have the potential to revolutionize dermatology through continuous research, optimization, and integration into clinical practice to improve patient outcomes and accelerate recovery. Possible procedures in dermatological care. This technology has the ability to be intuitive and efficient, and can measure and interpret data using machine learning algorithms, deep learning, and large datasets. By comparing output images, AI algorithms can detect patterns, identify key features, and make differential diagnoses with speed and accuracy beyond human capabilities.

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