AI TOOL FOR PRELIMINARY DIAGNOSIS OF DERMATOLOGY MANIFESTATION

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ABSTRACT

The most common diseases in humans is skin disease , This is preliminary diagnosis is an AI-driven tool for the initial diagnosis of dermatological expressions. This tool accesses a system that has developed deep learning algorithms which are fed with about several annotated images of the skin. When patients upload images of their skin they have issues with, this model will conduct an analysis and give an initial map to the diseases they might be having. Additionally, it is user-friendly whereby the patient uploads the images of the skin, the tools process them using a convolution neural network limited to a broad condition of dermatological diseases. Images are processed using histogram normalization technique . These conditions are not suitable to acne, eczema, psoriasis, melanoma .Dermatological conditions, encompassing a wide spectrum of skin disorders, pose significant challenges in the realm of healthcare, demanding prompt and precise diagnostic interventions. This research delves into the development and deployment of an innovative AI-driven diagnostic tool tailored for the preliminary assessment of dermatological manifestations. The tool, grounded in advanced machine learning algorithms, is engineered to scrutinize visual data, particularly images capturing diverse skin lesions and rashes. Its core functionality involves the identification of distinctive patterns, textures, and features associated with a myriad of skin conditions.

Keyword : *Early detection, Image processing, CNN Algorithm ,Deep learning*

1. INTRODUCTION

Dermatological diseases are affecting individuals of all ages ,genders and ethnicities. Accurate diagnosis of over 3000 skin conditions is crucial for effective treatment and management . Unfortunately because these disorders are so complex and varied , patient often suffer from misdiagnosis, delayed treatment and higher rate of consultancy fee, This advances in image recognition and artificial intelligence have led to the development of automated techniques for diagnosing skin disorders. This study introduces an AI application that provides a preliminary dermatological problem using deep learning algorithms and annotated skin images. The goal of the tool are to improve medical outcomes speed up diagnosis process in rural area and places where there is no availability of the dermatology .Dermatology is a field of medicines which deals with skin, hair ,nails and mucous membrane . All things considered, the creation of AI instruments for dermatological diagnosis marks a bright future for medical innovation. These technologies have the potential to revolutionise dermatology by utilising technology to supplement human expertise. This might lead to more precise diagnoses, customised treatment regimens, and better patient outcomes.

2. OBJECTIVE

Development of an AI Model: By building a convolutional neural network (CNN), a deep learning model, photos of skin anomalies may be processed with accuracy, and possible dermatological disorders can be identified.

User-Friendly Interface: Creating user-friendly interface for patients to easily upload images of their skin conditions and input the relevant information of the diseases.

Validation and Performance : The validation and accuracy of the AI tool in diagnosing various dermatology conditions caused by humans. The helps a fast access to the dermatology and get cured .

3. LITERATURE SURVEY

MOHAMED M. FOUAD [1] The last three layers have been dropped out and replaced with a new fully- connected, SoftMax, and classification output layers. By using the SoftMax the proposed model can work through binary and multi-class. The probabilities output of SoftMax ranges from 0 to 1. In binary classification, these probabilities summed to be one. In multi-class classification, the possibility for every classwill be an indicator for each class, but the target class will be the high probability. In the proposed model, no pre-processing such as noise reduction, segmentation, or enhancement is used. The weights of All layers are fine- tuned; also, the proposed model does not overfit even with some classes containing a small number of images

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Multi-Classification for Skin Lesions in ISIC Challenges. In recent years, the classification of multiple skin lesions has become a hotspot with the increasing popularity of using deep learning algorithms in medical image analysis. Before, metadata indicating information such as site, age, gender, etc., were not included, even though this information is collected by doctors in daily clinical practice and has an impact on their diagnostic decisions. Therefore, the algorithm or AI system that includes this information is better able to reproduce the actual diagnostic scenario, and its diagnostic performance will be more credible. The ISIC challenges consider AI systems that can identify the presence of many different pathologies and provide metadata for labelled cases, thus allowing for a more realistic comparison between AI systems and clinical scenarios. Since the International Skin Imaging Collaboration (ISIC) challenge was held in 2016.

4. METHODOLOGY

Deep Learning Model Training: Detail the steps involved in training the deep learning model. Include information on data preparation, model configuration, and optimization.

User Interface Design: Describe the process of designing and implementing the user interface. Discuss user experience considerations and feedback mechanisms.

Integration Process: Explain how different components of the system are integrated. Discuss any challenges faced during integration and solutions applied.

Testing and Validation: Outline the testing strategy for the entire system. Discuss the validation process,including testing scenarios, criteria for success,and the evaluation of results.

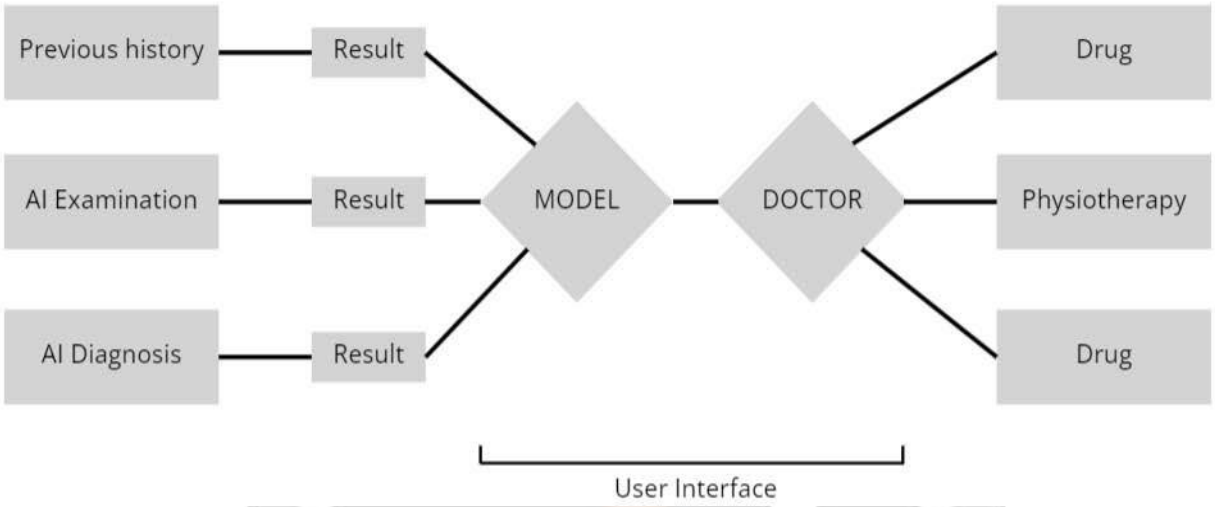

Fig 1: System design

CNN Architecture

Given that data only moves in one direction from the inputs they receive to their outputs, CNNs are feed forward networks. Artificial neural networks (ANNs) and CNNs have a biological inspiration. Their architecture is inspired by the brain's visual cortex, which is made up of alternating layers of basic and sophisticated cells (Hubel & Wiesel, 1959, 1962CNN designs come in a variety of forms, but they usually consist of modules that combine the convolutional and pooling (or subsampling) layers. One or more closely linked layers follow these modules layers, similar to those in a typical feed forward neural network. To create a deep model, modules are frequently layered on top of one another. CNN architecture for an imaginary application that classifies images.

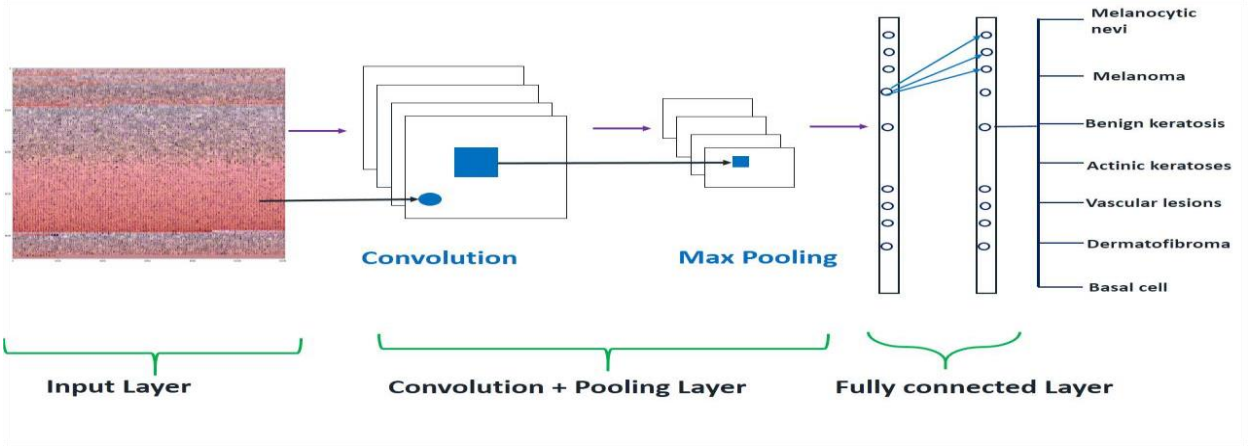

Fig 2: Abstract design on CNN architecture

Layers of CNN:

There are three different kinds of layers in CNNs. These are pooling layers, fully connected layers and convolutional layers. The CNN architecture has been utilized when these layers are stacked. The image below shows a condensed CNN architecture for MNIST classification. Three layers: fully connected, pooling, and two input layers a basic CNN architecture made up of just five strata. There are four main components to the basic operation of the CNN example given above.

➢ Similar to other ANN types, the input layer will store the image's pixel data.

➢ The convolutional layer determines the output of neurons connected to local sections of the input by computing the scalar product between the weights of the neurons and the area related to the input volume. The fully-connected layers will then operate after that. The identical duties as standard ANNs and attempt to provide class scores from

the activations in order to classify them. For better performance, ReLu has been proposed as a potential application between these layers. CNNs are able to change the original by employing this simple transformation method.

Convolutional layers: Convolutional layers identify the feature presentations in the input images by functioning as feature extractors. The neurons in the convolutional layers are organized into feature maps. Each neuron in a feature map has a receptive field, which is connected to a cluster of neighbour neurons in the layer above via a filterbank,which is a collection with trainable weights.

Pooling Layer: The goal of the pooling layers is to create spatial invariance to input translations and distortions by lowering the spatial resolution of the feature maps. In the beginning, average pooling aggregating layers were frequently used to propagate the average of all input values from a small area of an image to the following layer. Using the "MAX" function, the pooling layer scales the dimensionality of each activation mapping in the input.

Fully Connected Layers: These layers, often called dense layers, work in a manner akin to traditional artificial neural networks by connecting every neuron in one layer to every other layer's neuron. Usually positioned at the conclusion of the CNN design, fully linked layers are in charge of learning complex features and forming predictions.

5. PREDICTION

The 7 different diagnostic skin lesion categories to be predicted are:

1. **Melanocyticnvi[nv]**
   Melanocytic nevi are benign neoplasms of melanocytes and appear in a myriad of variants, which all are included in our series. The variants may differ significantly from a dermatoscopic point of view.[6705 images]
2. **Melanoma[mel]**
   Melanoma is a malignant neoplasm derived from melanocytes that may appear in different variants. If excised in an early stage it can be cured by simple surgical excision. Melanomas can be invasive or non- invasive (in situ). We included all variants of melanoma including melanoma in situ, but did exclude non- pigmented, subungual, ocular or mucosal melanoma.[1113 images]
3. **Benignkeratosis-likelesions[bkl]**
   "Benign keratosis" is a generic class that includes seborrheic keratoses ("senile wart"), solar lentigo - which can be regarded a flat variant of seborrheic keratosis - and lichen-planus like keratoses (LPLK), which corresponds to a seborrheic keratosis or a solar lentigo with inflammation and regression. The three subgroups may look different dermatologically, but we grouped them together because they are similar biologically and often reported under the same generic term histopathological. From a dermatoscopy view, lichen planus-like keratoses are especially challenging because they can show morphologic features mimicking melanoma and are often biopsied or excised for diagnostic reasons.[1099 images]
4. **Basalcellcarcinoma[bcc]**
   Basal cell carcinoma is a common variant of epithelial skin cancer that rarely metastasizes but grows destructively if untreated. It appears in different morphologic variants (flat, nodular, pigmented, cystic, etc) [21], which are all included in this set.[514 images]
5. **Actinickeratoses[akiec]**
   Actinic Keratoses (Solar Keratoses) and intraepithelial Carcinoma (Bowen's disease) are common non-invasive, variants of squamous cell carcinoma that can be treated locally without surgery. Some authors regard them as precursors of squamous cell carcinomas and not as actual carcinomas. There is, however, agreement that these lesions may progress to invasive squamous cell carcinoma - which is usually not pigmented. Both neoplasms commonly show surface scaling and commonly are devoid of pigment. Actinic keratoses are more common on the face and Bowen's disease is more common on other body sites. Because both types are induced by UV-light the surrounding skin is usually typified by severe sun damaged except in cases of Bowen's disease that are caused by human papilloma virus infection and not by UV. Pigmented variants exists for Bowen's disease and for actinic keratoses. Both are included in this set. [327 images]

6. **Vascularlesions[vasc]**
   Vascular skin lesions in the dataset range from cherry angiomas to angiokeratomas and pyogenic granulomas. Haemorrhage is also included in this category.[142 images]
7. **Dermatofibroma[df]**
   Dermatofibroma is a benign skin lesion regarded as either a benign proliferation or an inflammatory reaction to minimal trauma. It is brown often showing a central zone of fibrosis dermoscopic.[115 images]

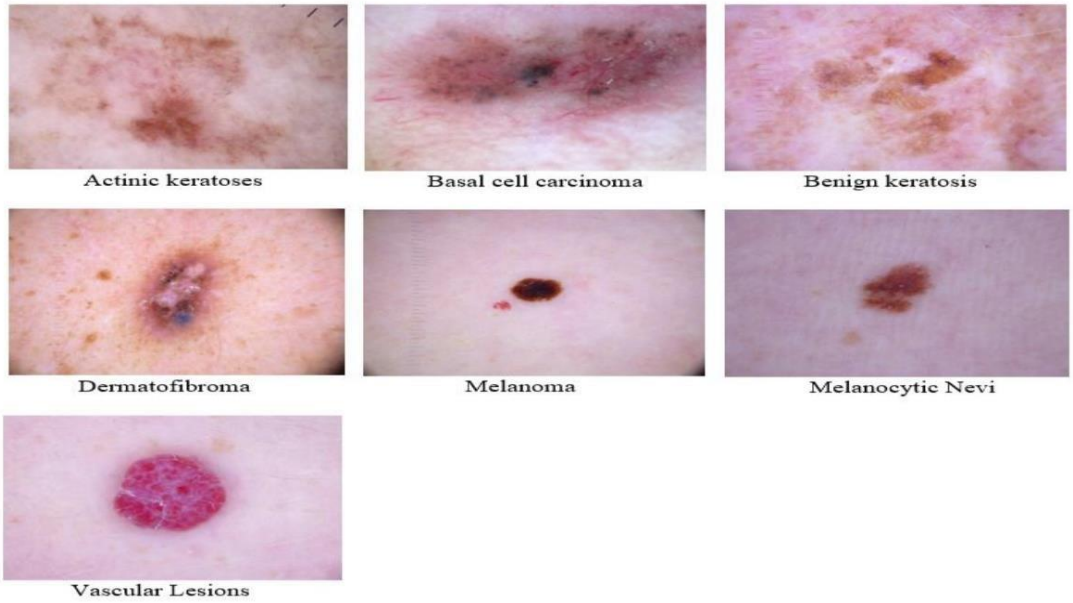

Fig 3: 7 different skin diseases

6.DATA PRE-PROCESSING

- Importing Essential Libraries
- Creating Classes and Defining Functions
- Creating a Dictionary of Images and their Labels
- Importing Dataset
- Reading & Processing Dataset
- Cleaning Dataset
- Exploratory Dataset Analysis (EDA)
- Processing & Resizing Images
- Features and Target Split

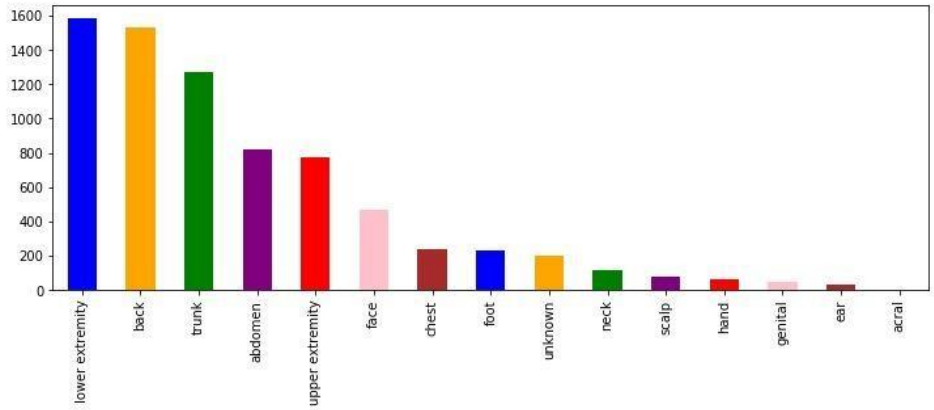

Fig 4: Target splitting

6. RESULTS

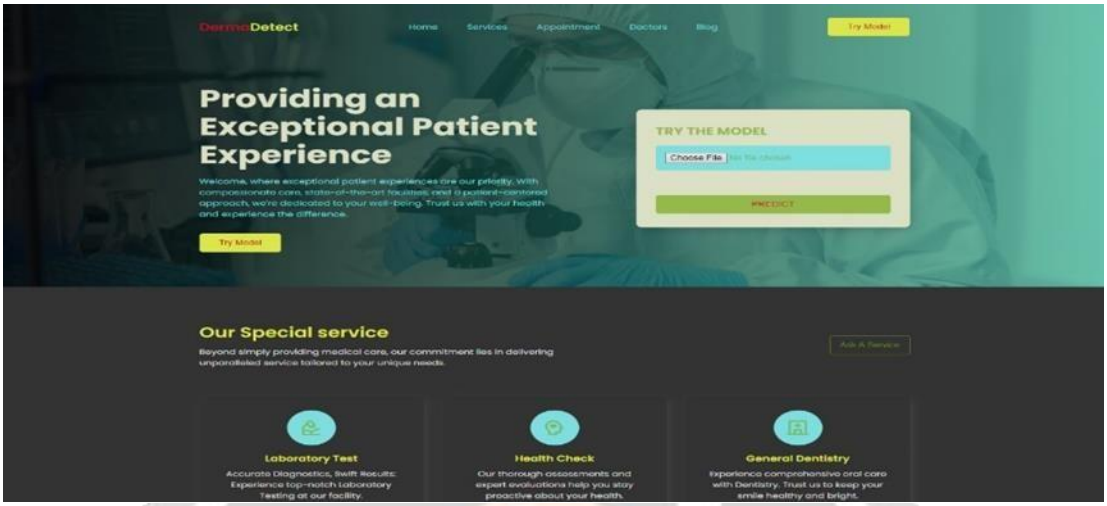

Fig 5: Insertion of Image

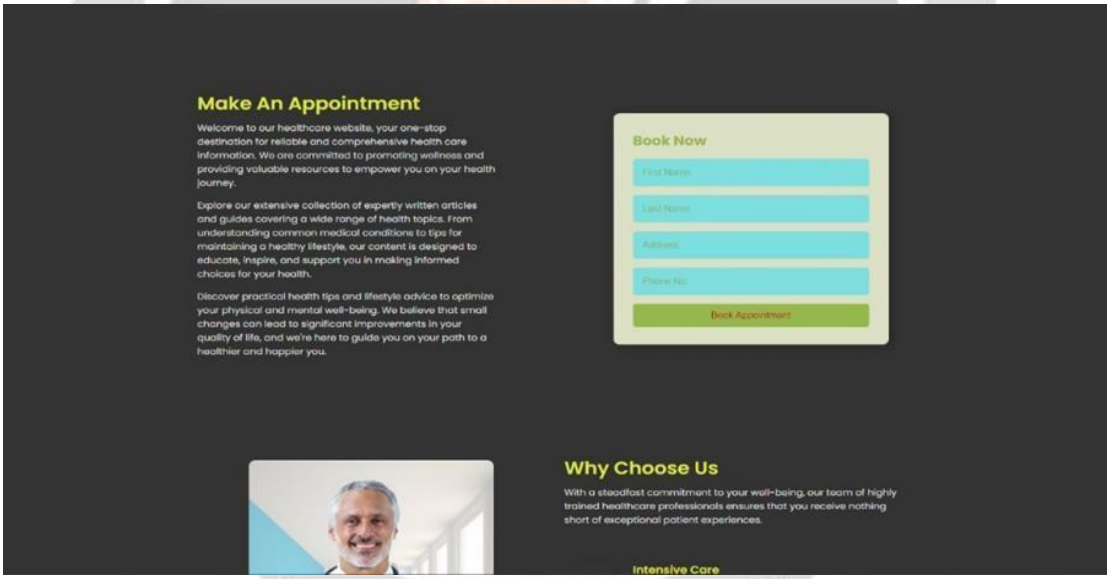

Fig 6: To book an appointment

Fig 7 : Consultancy of doctors

CONCLUSION

The completion Of skin disease Histopathological Image Web Application represents a significant step towards improving the management and accessibility of dermatology histopathological images.The accuracy obtained from the custom built CNN architecture is 72.28% and upon using a pre-trained VGG16 architecture is 87.23%. Future work may include enhancements such as implementing advanced search algorithms, integrating machine learning for image analysis, and expanding the application to support additional types of medical images.The results of the validation trials show that the AI tool is reliable and successful at identifying a variety of dermatological disorders, such as melanoma, acne, actinickeratoses, basalcellcarcinoma, and fungal infections. The creation of an AI tool for initial dermatological diagnosis is a major advancement in patient outcomes, healthcare delivery, and our understanding of skin health.

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