Early Stage Disease Diagnosis System Using Human Nail Image Processing Using IBM Watson

A PROJECT REPORT

Done as a part of Externship Program in **SMARTINTERNZ**

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1.INTRODUCTION

1.1 Overview

The main objective is to predict many diseases by observing color of human nails. The types of Diseases can be identified based on the colour and texture of the nails (eg: Bluish nails indicates Heart problems) will be classified and processed by convolutional neural network and the early stage diseases are identified and diagnosed using image processing.

1.2 Purpose

Human's hand nail is analysed to identify many diseases at early stage of diagnosis. Study of person hand nail colour helps in identification of particular disease in healthcare domain. The proposed system guides in such scenario to take decision in disease diagnosis. The input to the proposed system is person nail image. The system will process an image of nail and extract features of nail which is used for disease diagnosis. Human nail consist of various features, out of which proposed system uses nail colour changes for disease diagnosis. Here, first training set data is prepared from nail images of patients of specific diseases. A feature extracted from input nail image is compared with the training dataset to get result.

2 . LITERATURE SURVEY

2.1 Existing Problems

An Integrated Deep Learning Framework Approach for Nail Disease Identification. The human eye is having subjectivity about colours and limitation in resolution, So that small amount of colour change in few pixels on nail would not be highlighted to human eyes which may lead to wrong results, whereas a computer recognizes small colour changes on nails.

2.2 Proposed Solution

Nail Diseases refer to some kind of deformity in the nail unit. Although the nail unit is a skin accessory, it has its own distinct class of diseases as these diseases have their own set of signs, symptoms, causes and effects that may or may not relate to other medical conditions. Recognizing nail diseases still remains an unexplored and a challenging endeavor in itself. This paper proposes a novel deep learning framework to detect and classify nail diseases from images. A distinct class of eleven diseases i.e. onychomycosis, subungulal hematoma, beau's lines, yellow nail syndrome, psoriasis, hyperpigmentation, koilonychias, paroncychia, pincer nails, leukonychia, and onychorrhexis.

3.THEORETICAL ANALYSIS

3.1 Block Diagram of Proposed System

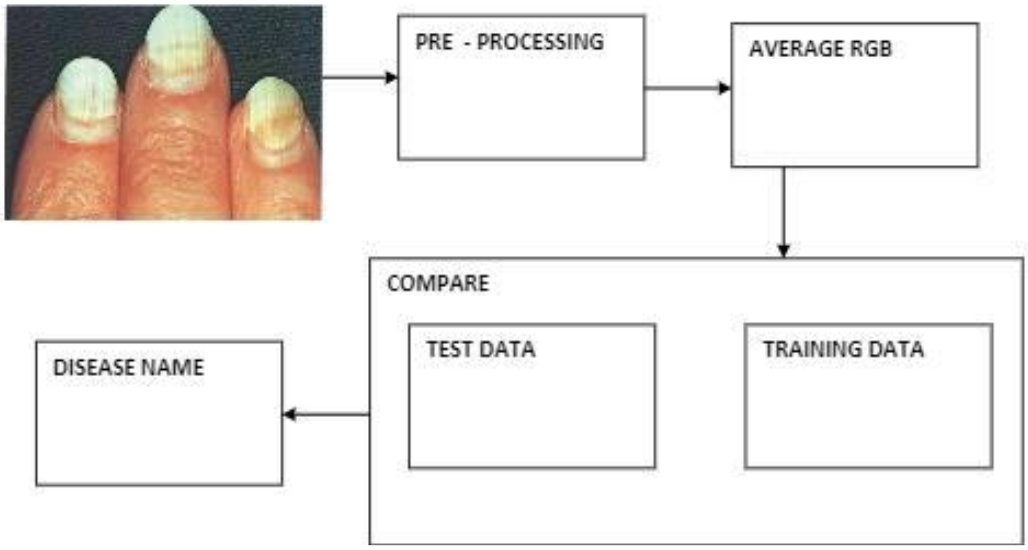


Figure 3.1: Proposed System Block Diagram

3.2 Hardware and Software Requirements

Anaconda provides a platform to manage Python environments and enables accessibility through a Python kernel, integrated seamlessly with Jupyter Notebooks.
The 8 libraries used include Flask, NumPy, Tensorflow, Pandas, Scikitlearn.

- A Device with a constant internet connection
- IBM Cloud
- IBM Watson

4. EXPERIMENTAL INVESTIGATIONS
Analysis of the Project

Import 5 libraries are Flask, NumPy, Tensorflow, Pandas, Scikitlearn. Loading the model The vgg16 model needs to be loaded and we are storing that into a variable called vgg. Adding flatten layer For VGG16 model, we need to keep the Hidden layer training as false, because it has trained weights then adding output layer and create a object model.
Configure The Learning Process:

- The compilation is the final step in creating a model. Once the compilation is done, we can move on to the training phase. The loss function is used to find errors or deviations in the learning process. Keras requires a loss function during the model compilation process.
- Optimization is an important process that optimizes the input weights by comparing the prediction and the loss function. Here we are using Adam optimizer
- Metrics are used to evaluate the performance of your model. It is similar to the loss function, but not used in the training process.

Import the ImageDataGenerator library and configure ImageDataGenerator. Then apply ImageDataGenrator functionality to train set and test set.

Training

Training the model:

Now, let us train our model with our image dataset. The model is trained for 30 epochs and after every epoch, the current model state is saved if the model has the least loss encountered till that time. We can see that the training loss decreases in almost every epoch till 30 epochs and probably there is further scope to improve the model.
Fit_generat or functions used to train a deep learning neural networkArguments:

steps_per_epoch: it specifies the total number of steps taken from the generator as soon as one epoch is finished and the next epoch has started. We can calculate the value of steps_per_epoch as the total number of samples in your dataset divided by the batch size. Epochs: an integer and number of epochs we want to train our model for.

validation_data can be either:

- an inputs and targets list

- a generator

- an inputs, targets, and sample_weights list which can be used to evaluate the loss and metrics for any model after any epoch has ended.

validation_steps: only if the validation_data is a generator then only this argument can be used. It specifies the total number of steps taken from the generator before it is stopped at every epoch and its

value is calculated as the total number of validation data points in your dataset divided by the validation batch size.

Save The Model:

The model is saved with .h5 extension as follows an H5 file is a data file saved in the Hierarchical Data Format (HDF). It contains multidimensional arrays of scientific data.

Testing

Test the Model:

Evaluation is a process during the development of the model to check whether the model is the best fit for the given problem and corresponding data.

Application Building

Create HTML pages:

- We use HTML to create the front end part of the web page.
- Here, we have created 4 HTML pages- about.html, index.html, nailhome.html and nailpred.html
- index.html displays the home page.
- about.html display the about of the project
- nailhome.html displays information about nail disease.
- Nailpred.html takes the input image and displays the prediction.
  For more information regarding HTML : Link
- We also use JavaScript-main.js and CSS-main.css to enhance our functionality and view of HTML pages.
  - Link :CSS, JS

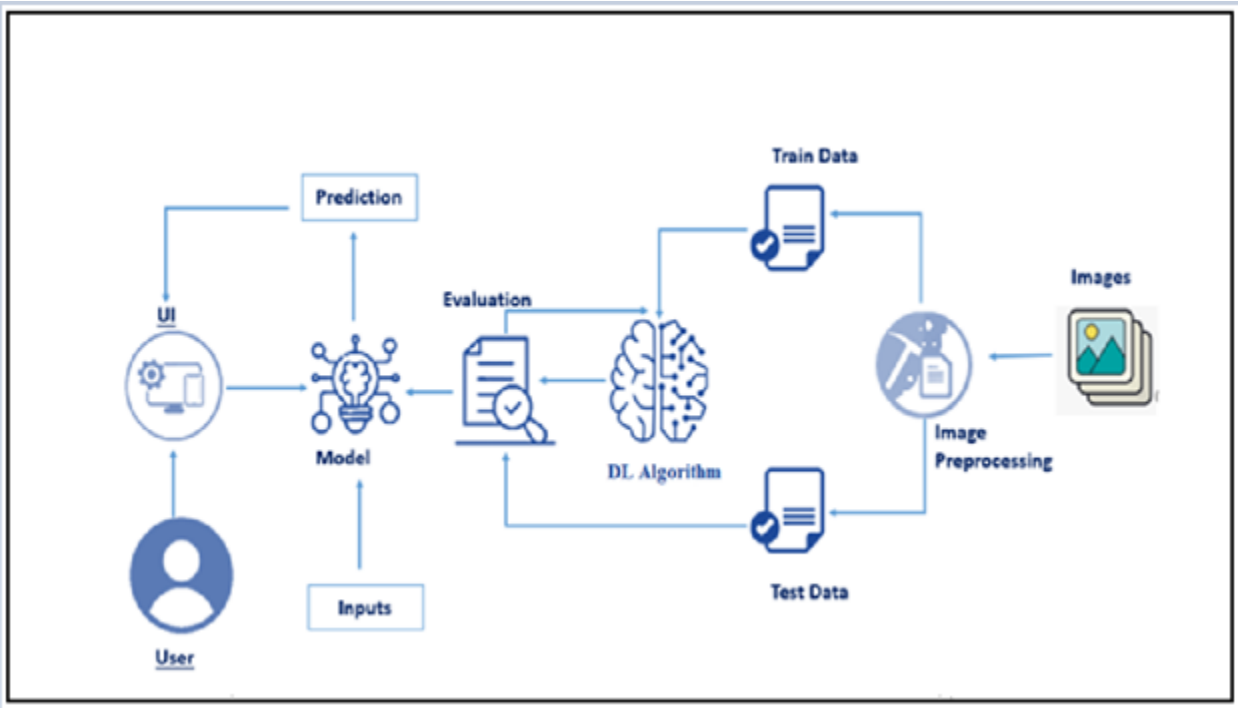
Build the python code:

Here we are building python code to integrate flask and html pages.

Run The Application:

- Open the anaconda prompt from the start menu.
- Navigate to the folder where your app.py resides.
- Now type “python app.py” command.
- It will show the local host where your app is running onhttp://127.0.0.1.8080/
- Copy that local host URL and open that URL in the browser. It does navigate me to where you can view your web page.
- Enter the values, click on the predict button and see the result/prediction on the web page.

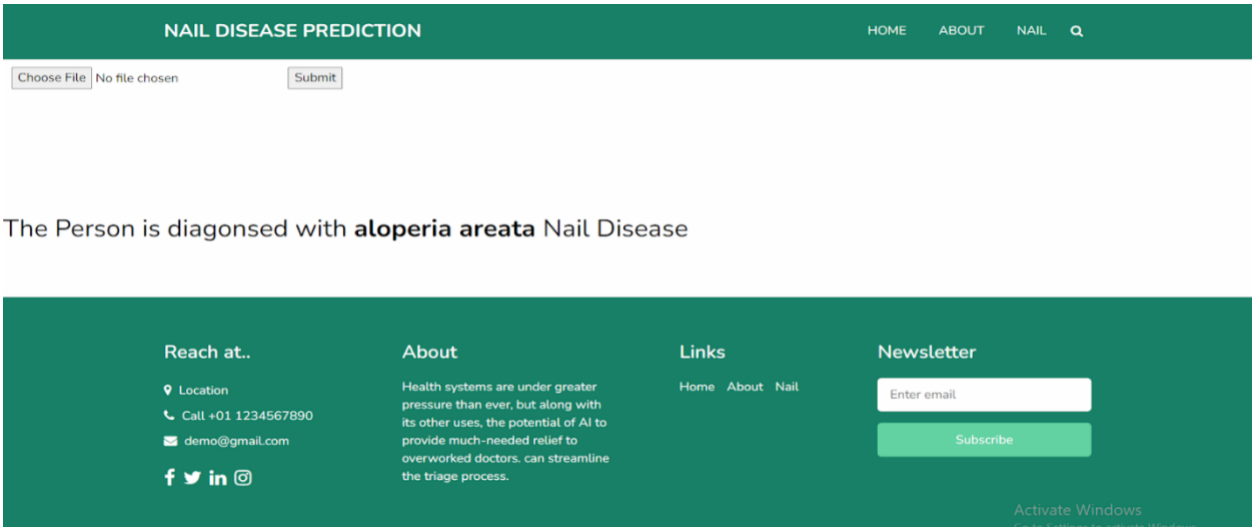
5.FLOWCHART



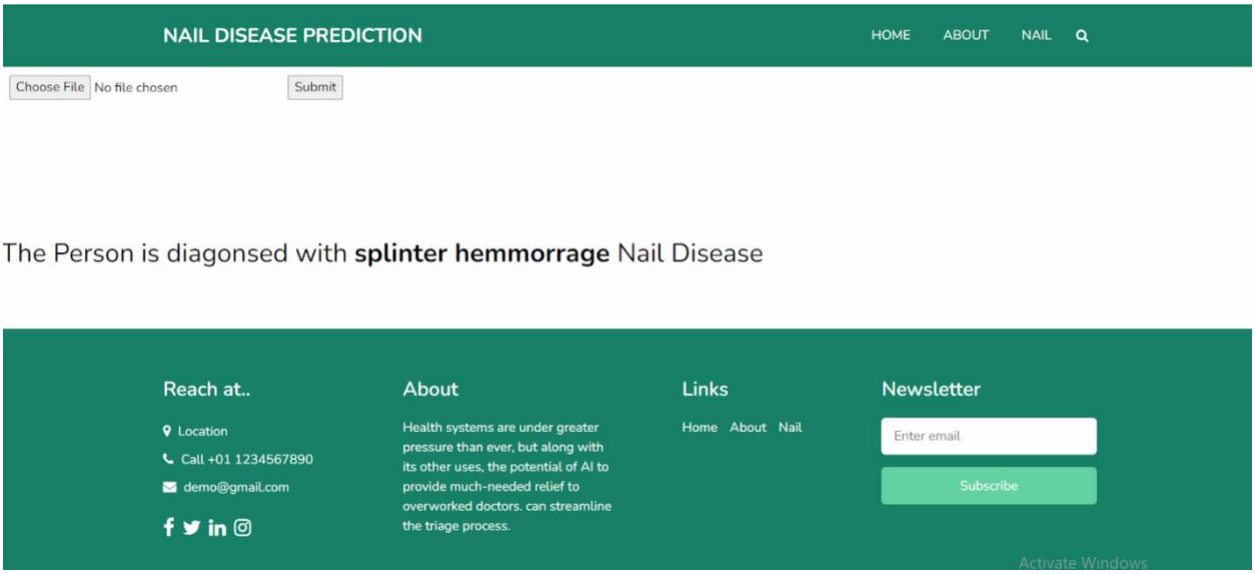
6. RESULTS

FINAL OUTPUT:

Output 1



Output 2:



7. ADVANTAGES AND DISADVANTAGES

A) Advantages

• In the proposed technique we have trained a model that classifies the disease based on the pattern on the nail.
• This proposed system is able to predict the disease for the respective pattern of the nail with high accuracy.
• It is able to identify the small patterns also such that providing a system with higher success rate.

B) Disadvantages

• The limitations of the existing model are eliminated by the proposed model.

8. CONCLUSION

In this way the system is useful in prediction of diseases in their initial stages. As in literature study we mentioned some of the diseases with its related color change in nail. This model gives more accurate result than human vision, because it overcomes the limitation of human eye like subjectivity and resolution power.

9. FUTURE SCOPE

In presented work, nail color's RGB average value from input image is used for classifying the diseases, but in future we can add some other feature of nail like pattern of nail for classifying the diseases. Along with these features we can also collect other symptoms observe in patient as an input to our system for disease prediction. Combining features of nails both color and pattern and other symptoms of patient's for more accurate results. It will be combination of textual features and features extracted from human body parts such as nail features etc.

10.BIBLIOGRAPHY

- https://www.researchgate.net/publication/305001583_Early_Stage_Disease_Diagnosis_System_Using_Human_Nail_Image_Processing

- https://youtu.be/mRVTKrbRYi0

- https://github.com/krishnaik06/Advanced-CNN-Architectures

Appendix

A. Source Code

- https://github.com/bhavagjna19/Early-Stage-Disease-Diagnosis-System-Using-Human-Nail-Image-Processing-Using-IBM-Watson

B.Video Link

- https://youtu.be/6gUmI8EQji8