A Mini-Project Report on

Automated Skin Lesion Analyzer

Submitted in fulfilment of Mini-Project (ITM605) of

Semester VI

in

Information Technology

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CERTIFICATE

This is to certify that

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has completed all the specified work for submission in Mini-Project (ITM605) of Semester VI, as laid down by University of Mumbai in satisfactory manner within the premises of Institute during the academic year 2020-21.

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic with honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke

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Abstract

Throughout the report we are going to develop an automated skin analyser that can take affected skin lesion image from user and predict or approximate 2 skin diseases. To accomplish this goal we are going to use Neural Networks as they are the best data driven models with top most accuracy in all the fields they have been experimented till now. Since Neural Network models also need huge computation power to train the model on the input data and also to predict the output we are going to use a computationally less intensive architecture that can work even on hand held mobiles and embedded systems. To further featuring our model we have added dropout techniques for model regularization and adaptive learning rates to achieve global minima with ease even with the presence of plateaus. This project will very helpful for rural area and the student who pursuing dermatologist study. In rural area there is lack of knowledge of diseases .At last we will deploy a production level web application to serve users across the world.

Chapter 1

Introduction

Our proposed system for this project is to use a deep learning architecture which is more suitable for mobile and embedded based vision applications where there is lack of computation power and then convert the whole model into tensorflow.js format to deploy in the production environment so that users can access the end product any where around the world. Our application also considers user's privacy concerns as our model runs locally and any data that user submits never leaves his mobile or personal computer.

Diagnosis of skin diseases is a problem on which research is going on since last 5-10 years. People have tried so many approaches to solve this problem. Solving this problem using image processing techniques by feature extraction and segmentation.since this is method is related to fine tuning it is not so reliable process to detect skin diseases as the relation between skin and its diseases can not be catched with fine tuned models. Using 3 layer neural network model which takes inputs as colour, area, shape and other hard typed properties. which also need human assistance to get reliable inputs so this lacks for complete automated system for diagnosis.

There have been many endeavors to implement traditional medicine across the different parts of the globe especially in the countries which are not technologically advanced, but the efforts have been met with challenges such as huge cost of medical tools and equipments and also lack of medical expertise. Skin disease typically results from environmental factors along with other causes. The necessary tools required for early detection of these diseases are still not readily available in most populations globally. Here the proposed paper provides an approach to detect various kinds of these diseases. The user gives input of the skin disease image, which then the system processes, does feature extraction using CNN algorithm and use image classifier to diagnose diseases. If no disease is found, the system provides a negative result. Thus in this a novel dermoscopy detection and classification method based on Convolutional Neural network (CNN) is proposed.

Chaper 2

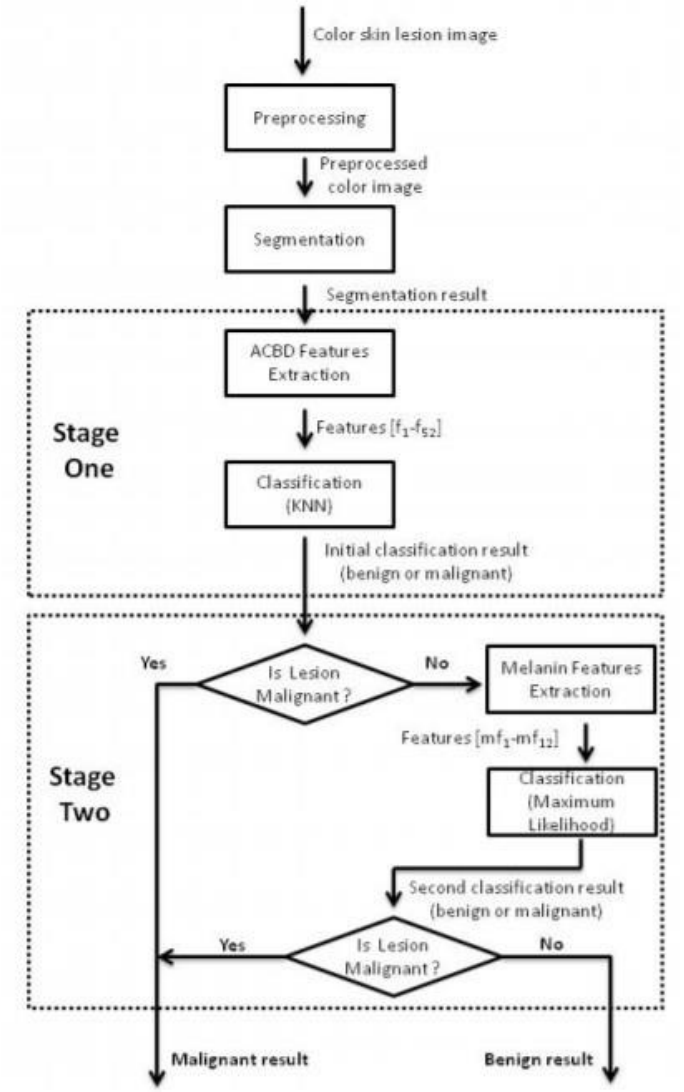
Literature Review

Literature Name	Author	Finding
An Automated Skin Lesion Analyser Using CNN with Adaptive Learning (2019)	Santhi H, Gopichand G, K.Pavan Koushik, A.Nithin Krishna, D. Sai Tharun	1.Predict the disease up to 95% accuracy but due to small datasets may have bad prediction after few years 2.Disease that can be predicted are Melanocytic nevi, Melanoma, Benign keratosis, Basal cell carcinoma, Actinic Keratoses, Vascular skin lesions, Dermato fibroma

Diagnosis of skin diseases using Convolutional Neural Networks (2018)	J. Rathod, V. Waghmode, A.Sodha and P.Bhavathankar	1.Initial training gives the accuracy of 70% approximately. This can be increased by increasing the training data set. 2.Five diseases were initial tested, which can be further increased in the future. A large data set can increase the accuracy to more than 90 percent

Chapter 3

Existing System Architecture/Working



Here the start is done by pre-processing the input image, i.e. attenuating the shading effects, and 25 segmenting the skin lesion. After that, the first discrimination stage is performed, using the 52 features

based on the ABCD rule and a KNN classifier, assigning a benign/malignant label to the imaged lesion. The second discrimination stage tries to enhance as much as possible the melanocytic skin lesion classification sensitivity. All images that have been initially classified as benign are re-classified now using the melanin variation features extracted from inside the lesion and from the healthy skin area surrounding the lesion. The final classification result is provided by a Maximum Likelihood Classifier

Chapter 4

Problem Definition

- Accuracy depends on the quality of the data
- Using KNN with large data the prediction stage might be slow.
- KNN is sensitive to the scale of the data and irrelevant features.
- KNN has low accuracy compared to CNN.

Chapter 5

Objective

We have identified the following as our project objective:

1. To make a user-friendly website to diagnose skin disease.
2. To classify three types of cancer like melanoma, Basal-skin, Squamous-skin cell using CNN.
3. To use our trained model in our website to deploy and serve to online.
4. To reduce the human effort and costs with accuracy.

Chapter 6

Scope

The scope of our project is as follow:

1. Can be used as a reliable real time teaching tool for medical student in the dermatology stream.

2. Can reduce the human effort.

3. Can be used in rural areas where dermatologist are hard to find.

4. Can save lives from early disease prediction.

Chapter 7

Proposed technology stack

1.Backend – TensorFlow.js (Deep Learning) 2.Frontend

– Bootstrap,HTML, CSS, JavaScript.

3. Database – MangoDB.

4. HAM10000_metadata.csv dataset from kaggle

Chapter 8

Proposed System Architecture/Working

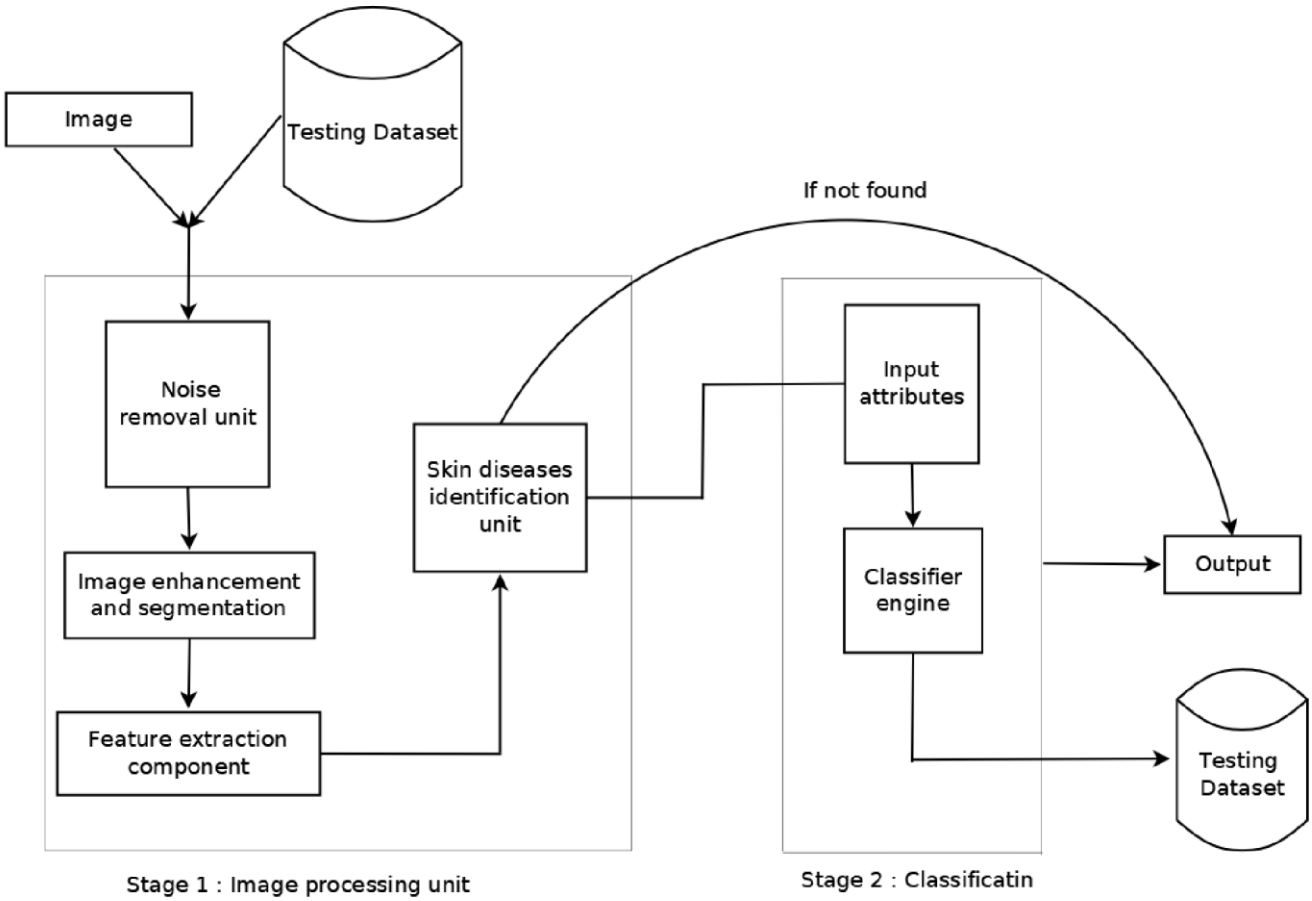


Figure 8.1

STEP1: The first step to this project is to collect reliable data for training our deep learning model and we have preferred data about skin lesions that is provided in kaggle data science web site.

STEP2: Pre processing the acquired data for preventing future run time exceptions while training the model

STEP3: Divide the data into training and testing part. Now augmentation of data has to done to increase the size of the training data as the obtained data from kaggle is not enough for training the deep network model.

STEP4: Prepare a convolutional model to predict the required outputs. As this application is meant for commodity level devices we preferred MobileNet model to train on our dataset.

STEP5: Train the model and valuate it on the validation set and finally evaluate the model based on the learning curves obtained during training.

STEP6: Convert this model in tensorflow js model to deploy it into the web application.

STEP7: Now finally develop a web application that can take input as skin image and display disease probabilities using js model we include in it

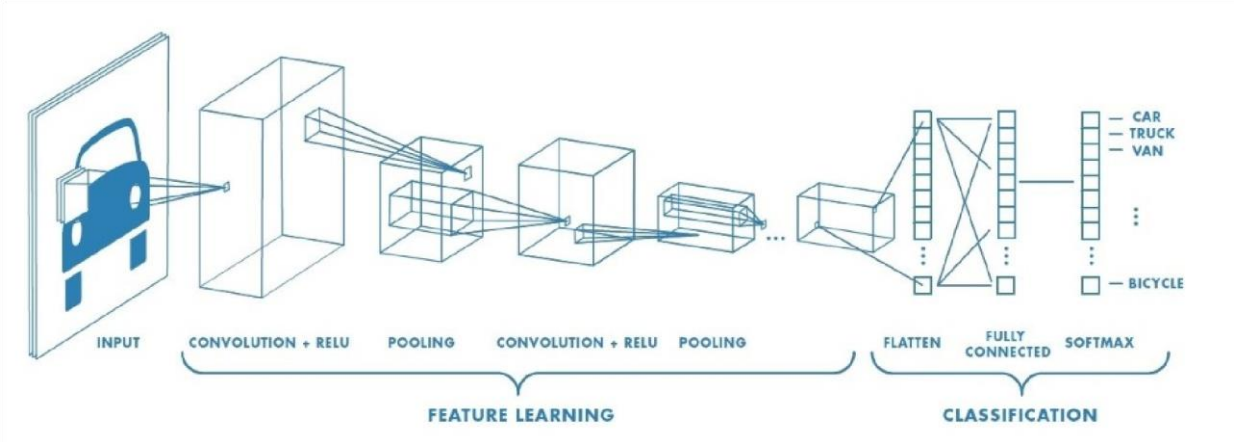


Figure 8.2 Standard architecture of a CNN

Chaper 9

Summary

The proposed system is able to detect the skin disease with promising results combining computer vision and machine learning techniques. It can be used to help people from all over the world and can be used in doing some productive work. The tools used are free to use and are available for the user, hence, the system can be deployed free of cost. The application developed is light-weight and can be used in machines with low system specifications. It has also a simple user interface for the convenience of the user. The image processing and machine learning algorithms were successfully implemented.

References:

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