Department of Electrical and Computer Engineering
North South University

Senior Design Project

CSE499

Utilizing Artificial Intelligence for Sustaining Fast and accurate Healthcare System

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DECLARATION

This is to certify that this Project is our original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. Any material reproduced in this project has been properly acknowledged.

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ABSTRACT

This report presents the design and the implementation of an Artificial Intelligence based healthcare system. It will be developed as a web application. The system will be used for the patient care and some fatal disease prediction and diagnose through image processing. Patient can be prescribed though online. This healthcare system will support people with low cost and less amount of time. Because of the convolutional neural networking it analyses images deeply and give a prediction with high accuracy. It can be more efficient than a medical specialist because of the CNN (Convolutional neural network) model. The system will be very helpful to hold an online video chat between doctor and patient. The healthcare system will be reliable and acceptable in future in our society. We get 88% accuracy in breast cancer detection, 96% in pneumonia detection, 99% COVID19 detection, 93% in melanoma detection, 94% in malaria detection, 99% in heart disease detection, diabetes detection in 99%.

Table of Content

List of Figures

List of Tables

8	Decision tree, Random Forest and SVM Model evaluate generator	42
9	Decision tree, Random Forest and SVM Model evaluate generator	42

Keywords: Deep learning; convolution neural networking (CNN); inception v3; feature extraction; VGG16; DenseNET121; pixel wise classification; artificial intelligence.

CHAPTER 1

Introduction

1.1 Introduction

"Utilizing Artificial Intelligence for Sustaining Fast and accurate Healthcare System" is a computer program which will be categorized as a web-based system to predict a simple to complex disease through image processing and symptoms and prescribed the users through online. The main purpose of the system to enable the people and the diagnostic center to take the advantage of the online system to avoid diagnosing error, taking too much time and cost. The system is user friendly so that the people who are not so much advance in technology will be able to use the system. Long distance people will get the benefit of the system because they do not have to spend and time to reach in town or long distance medical to diagnose. They can get the prognosis of their disease through the healthcare system.

1.2 Background study of the project

In the modern healthcare sector, artificial intelligence (AI) is the most powerful technology. The latest successful applications of artificial intelligence (AI) in the healthcare sector have reached their full potential due to the increasingly increasing accessibility of healthcare medical data and the advancements of big data diagnostic techniques. Potential artificial intelligence (AI) strategies can disengage healthcare-appropriate knowledge hidden in the massive amount of data with the aid of essential medical queries, which can maintain healthcare decision-making. Modern healthcare technology has spread to many innovative startups around the world, allowing people to live healthier and longer lives. The advancements were initially driven by the advent of mobility and software, which enabled the health sector to digitize a number of pen-and-paper-based processes and operations that are currently slowing service delivery. Computer software has become much more sophisticated and autonomous in recent years. Machine learning (ML) and artificial intelligence (AI) are used to discuss these new skills. These emerging abilities are addressed under the umbrellas of machine learning (ML) and artificial intelligence (AI), both of which are speeding up the pace of healthcare improvement. Machine learning (ML) and artificial intelligence (AI) applications in healthcare have enabled the industry to address some of the most pressing issues in specific domains.

The use of machine-learning algorithms and software, or artificial intelligence (AI), to simulate human cognition in the study, presentation, and comprehension of complex medical and health-care data is referred to as artificial intelligence in healthcare. Fig 1 shows AI background.

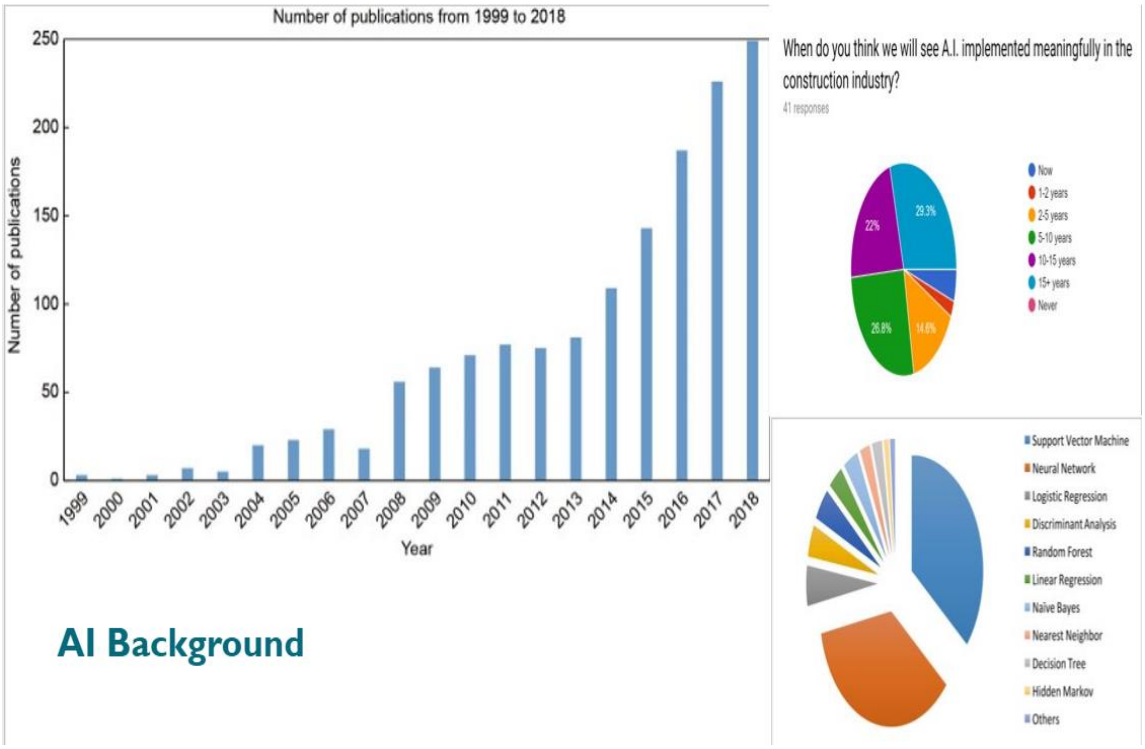


Figure 1: AI background

Here using AI, there are multiple publications from 1999 to 2018. Also, it is growing at a mass rate. We can see from the figures. Clearly, supervised learning produces more clinically relevant findings than unsupervised learning; thus, supervised learning is used most frequently in AI applications in healthcare. (It's worth noting that unsupervised learning can be utilized in the preprocessing stage to reduce dimensionality or identify subgroups, making the subsequent supervised learning phase more efficient.) Linear regression, logistic regression, nave Bayes, decision tree, closest neighbor, random forest, discriminant analysis, support vector machine (SVM), and neural network are examples of relevant approaches. The prevalence of various supervised learning approaches in medical applications is seen in Figure 1, with SVM and neural networks obviously being the most common.

AI is described as the ability of computer algorithms to make educated guesses based solely on input data. Dendral, the first problem-solving software or expert method, was developed during research in the 1960s and 1970s. It was planned for organic chemistry applications, but it served as the foundation for a later scheme. M. M. Kamruzzaman is employed with Architecture of Smart Health Care System Using Artificial Intelligence. With Artificial Intelligence, PATHAI is creating machine learning technology to aid in more accurate cancer diagnosis. Buoy Health is a symptom checker powered by artificial intelligence. Artificial Intelligence is being used by BETH ISRAEL DEACONESS MEDICAL CENTER to diagnose potentially fatal diseases. MYCIN is regarded as one of the most important early applications of artificial intelligence in medicine. MYCIN, as well as other systems like INTERNIST-1 and CASNET, were unable to achieve this goal. MYCIN and other systems such as INTERNIST-1 and CASNET, on the other hand, were not widely used by clinicians. The microcomputer and new levels of network access proliferated in the 1980s and 1990s. During this time, researchers and developers realized that AI systems in healthcare needed to be built to accommodate the lack of perfect data and rely on physicians' expertise. Fuzzy set theory, Bayesian networks, and artificial neural networks have all been used in the development of intelligent computing systems in healthcare.

1.3 Problem Statement

The estimated total population of Bangladesh till 2020 approximately 164.69 million. Which is out of the capacity of the healthcare system. Bringing a large population under healthcare is a big challenge in Bangladesh. Moreover, many people in this huge population die because some diseases are not detected at an early stage. Bangladesh is experiencing a highly unregulated healthcare system. Political uncertainty and lack of a disciplined regulatory process is also responsible for the problem. Unmanageable patient load in hospitals is another problem. Diagnose error because of lacking of proper knowledge about the modern machine and equipment. Weak governance structure weak management and weak institutional capacity in the Ministry of Health and Family Welfare, inefficient allocation of public resources is another problem in healthcare system.

1.4 Project Goals

There are some major goals that we want to focus on with our project. They are as follows:

i. The real-time detection system: The main goal is to detect any disease early with proper analysis. The system can help patient to detect diseases and connect with doctor for proper monitoring and take care like real time.

ii. Accuracy: By using convolutional neural networking model, the system will be able to predict disease with high accuracy through deep analysis of images. Our major goal is to achieve this high accuracy. Different model like Inceptionv3, ResNet50, DenseNet121, VGG16, VGG19 are used to get and compare high accuracy to detect disease.

iii. Prevent wastage of time and money: Another objective is to save time and money. Patient can take appointment to medical Specialist through online to reduce the wastage of time and money.

iv. Simple User Interface: The system has been implemented in such a way that is it easy to operate, the user interface has been kept simple without any complexity.

1.5 Project Detail

There are three types of user modules in the “Fast and accurate healthcare system” system:

1. Admin

The job of the admin is to monitor the whole system and manage the system. They can control many other things of the system. They are allowing-

- To make any type of changes through the whole system
- To control the user access
- To add or delete or update the user and other information

2. Doctors Profile Module

In case of doctor profile module, there will be some tasks:

- To fix/edit/update the appointment schedule
- Uploading the personal images with proper information of the doctor
- To monitor the patients and prescribe them through online

Doctor can give his information to the patient and communicate with patient by his/her own profile in the system.

3. Patient Profile Module

The patient module is a responsive module in the system. They are the main focus of the system. They can create own account in the system. They can take appointment through online. They can upload their skin lesion or images of the problems of x-ray and finalize the disease.

1.6 System related to our project

The "Fast and accurate health care system" will give the opportunity to upload image, contact with doctor. The Keras model Inception V3, RESNET50, DENSENET121, machine learning, deep learning is related to the healthcare system.

1.7 Summary

This chapter gave us the idea of the modules that we have in the proposed system. This chapter provided a clear picture on how this system is effective to use with the help of the elaboration of the project goals. This chapter gave us the insight of the modules that we have in the proposed system. This chapter provided a clear picture on how this system is effective to use in diagnostic centers with the help of the elaboration of the project goals.

In this report the remaining part that we discussed about is, Section 2 lays down the method and methodology of the program. outline of the system, pre-processing, which model is being used and object detection. Section 3 project detail. Section 4 Related works. Section 5 design impact. Section 6 results and analysis. In Section 7 at long last our paper has been concluded with the summery of the extend, future work and result of the inquire about.

Chapter 2

Methods and methodology

2.1 Introduction

In this chapter, we discuss about Methodology which we need to implement the system

2.2 Methods and Methodology

In figure 2, we represent our work through a block diagram of the system and an overview of the model of convolutional neural networking. Here, we can see that inceptionv3 and vgg16 model are consisted of ImageDataGenerator, Inception V3/VGG16 model, Average_pooling2d, Batch_normalization_273, conv2d, Activation_275, Dense_2, Flatten_2. A deep learning algorithm and machine learning algorithm is used to predict the diseases. The methods we follow tin this “Fast and healthcare system” are given below-

1)We collect dataset from Kaggle which is used in this project.

2)After collecting the dataset we get noise and different size of images. So, we preprocess the data for removing noise and resize images.

3)Then we used a convolutional neural networking model (VGG16, VGG19, INCEPTIONV3, ResNET50, DenseNet121) or machine learning.

4)The preprocessed data are used to training and testing with the CNN model.

5)Then we check the accuracy.

We use categorical cross entropy, Adam optimizer, SoftMax classifier.

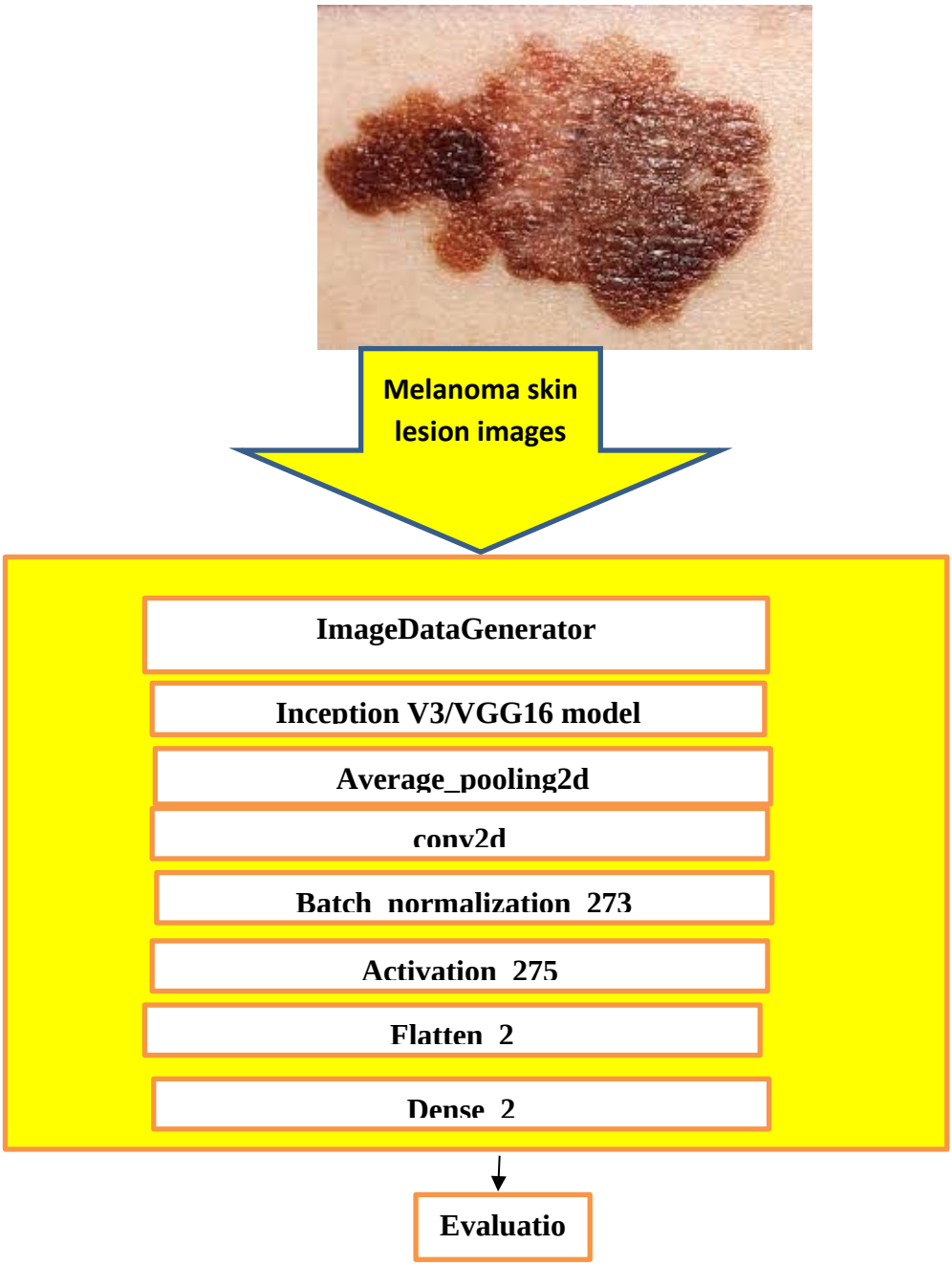


Figure 2: The process of melanoma detection.

In the coding part, the batch size was 32, experimental runtime was GPU. We use 10 epochs, 50 epochs in our coding in case of hypermeter.

This section contains the methods and materials parts that are adopted in order to implement the goal of the system. The aim of this system is to predict multiple disease like Pneumonia,

Covid19, Cancer, Diabetes, Melanoma and so on. Using or uploading their particular diseases X-ray images or MRI images to our system any patient or user can detect their diseases in their primary stage. AI can ‘learn' features from a massive volume of healthcare data using complex algorithms, and then use the findings to aid clinical practice. It could also have learning and self-correcting capabilities to enhance accuracy depending on input. Physicians can benefit from AI systems that provide up-to-date medical information from journals, textbooks, and clinical practices to help them provide effective patient care. Furthermore, an AI system can aid in the reduction of diagnostic and treatment errors, which are unavoidable in human clinical practice. Furthermore, an AI system collects usable data from a huge patient population to aid in developing real-time conclusions for health risk alert and prediction.

For creating any kind off diseases model, we collected dataset of particular diseases like images or CSV data. Here for creating any kind off model we used different types of models like Random Forest, Decision Tree, SVM, CNN, Resnet, Inception, Autoencoder etc. Data preprocessing will be getting ready of arranging the rough data and making it suitable for a machine learning and deep learning illustrate. It is the essential and crucial step though making a machine learning illustrate. Then data augmentation, data augmentation methods in CNN utilizing Tensorflow and Keras. But a few times as of late any procedure: Images resizing. The preeminent commonly utilized image broadening strategies with code cases and representation of pictures after extension. From here onwards, data will be alluded to as pictures. We are going be utilizing Tensorflow or OpenCV composed in Python in all our cases. After that the feature extracted. In machine learning and measurements, classification could be an administered learning approach in which the computer program learns from the input information and make the show which has been utilized for evaluate the performance, result analysis. Fig 3 shows the creating model procedure for particular disease:

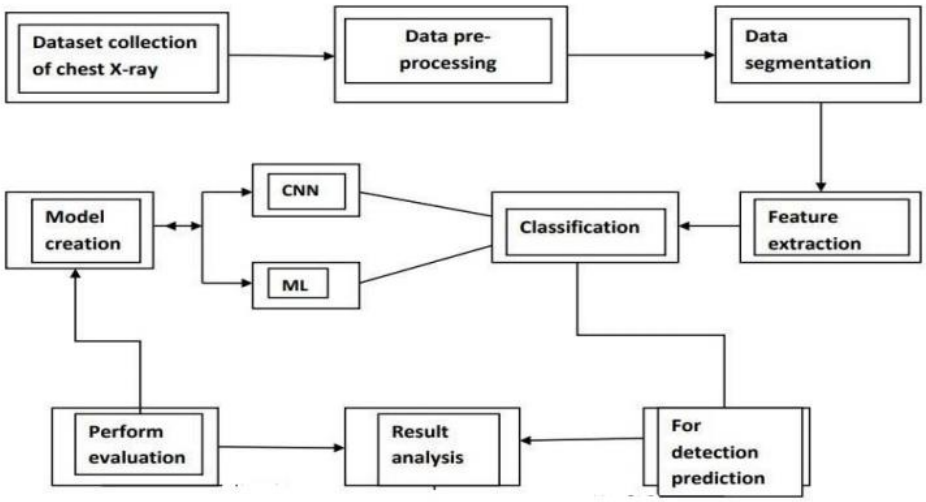


Figure 3: Creating Model of any disease

This image processing techniques helps in object detection based on color, size and shape of images. Different benchmark CNN models have been embraced in our proposed work. They have been trained individually to make independent predictions. Then the models are combined, using the new method of weighted average assembling technique, to predict a class value. This modern proposed assembling strategy is anticipated to create the expectation more robust. Our pro-posed work comprises of three pre-trained model Autoencoder and CNN models such as DenseNet, Resnet50 and Inception model. We have used Keras and TensorFlow based on given parameters to train model. At that point run the prepared models on the test pictures and select lesson name 0 or 1 based on weighted normal gathering of the 3 models. Whereas partitioning the pictures into preparing and testing, guarantee that there's no persistent cover i.e., distinctive pictures of the same quiet isn't display in both preparing and testing datasets.

DenseNet Architecture:

First of all, a DenseNet's convolution creates a greater number of highlight maps. The number of yields include maps of a layer is characterized as the development rate. DenseNet has lower

require of wide layers since as layers are thickly associated there's little excess within the learned highlights. Fig 4 shows the architecture of CNN model DenseNet.

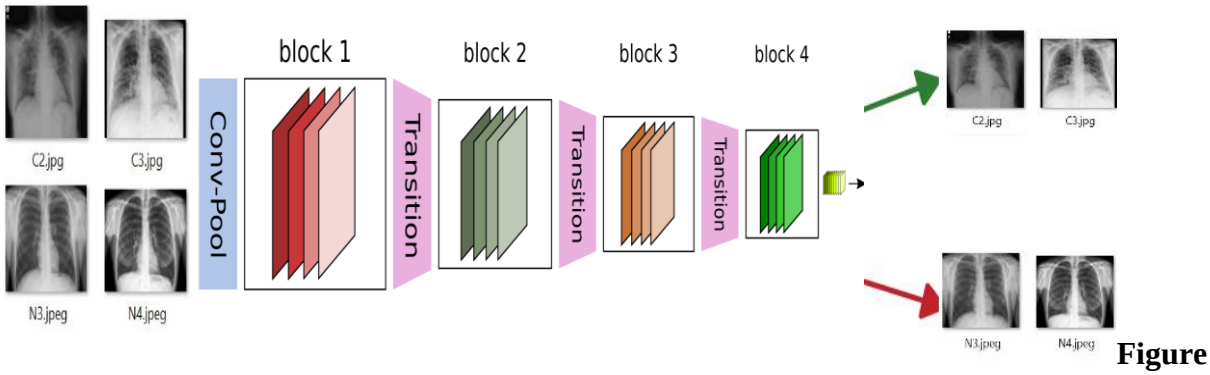


Figure 4: DenseNet Architecture

Densely connected Convolutional Systems, DenseNets, are the following step on the way to keep expanding the profundity of profound convolutional systems. Conventional feed-forward neural systems interface the yield of the layer to the following layer after applying a composite of operations. We have as of now seen that ordinarily this composite incorporates a convolution operation or pooling layers, a group normalization and an actuation work. DenseNets are separated into Dense Blocks, where the measurements of the highlight maps remain steady inside a piece, but the number of channels changes between them.These layers between them are called Move Layers and pay attention of the down sampling applying a bunch normalization, a 1x1 convolution and a 2x2 pooling layers. Within the new deeper level speaking to the primary Thick Layer inside the primary Thick Square, able to see how really this behavior of including 32 times the number of layers is accomplished. We perform as the creators propose a 1x1 convolution with 128 filters to diminish the highlight maps estimate and the perform a more costly 3x3 convolution (keep in mind to incorporate the cushioning to guarantee the measurements stay steady) with this chosen 32 number of include maps of development rate. Then, the input volume and the result of the two operations (which are the same for each Thick Layer inside each Thick Piece) are concatenated,

Inception Module:

The paper proposes a modern sort of engineering – Google Net or Initiation v1. It is essentially a convolutional neural organize (CNN) which is 27 layers profound. 1×1 Convolutional layer some time recently applying another layer, which is primarily utilized for dimensionality reduction. Fig 5 shows the architecture of CNN model Inception Module.

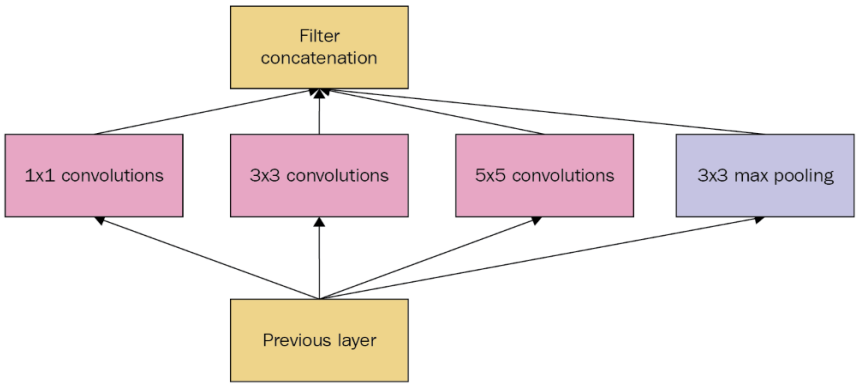


Figure 5: Inception Module

Beginning Modules are consolidated into convolutional neural systems (CNNs) as a way of diminishing computational cost. As a neural net bargain with an endless cluster of pictures, with wide variety within the included picture substance, moreover known as the salient parts, they have to be be outlined fittingly. The foremost disentangled adaptation of a beginning module works by performing a convolution on an input with not one, but three distinctive sizes of channels (1x1, 3x3, 5x5). Too, max pooling is performed. At that point, the coming about yields are concatenated and sent to the following layer. By organizing the CNN to perform its convolutions on the same level, the arrange gets dynamically more extensive, not more profound.

Random Forest Architecture:

The machine learning algorithm we used was the Random Forest algorithm. Random Forest is a versatile and user-friendly software technique that produces excellent results without the use of super parameters in the majority of cases. Fig 6 shows the architecture of Random Forest Module.

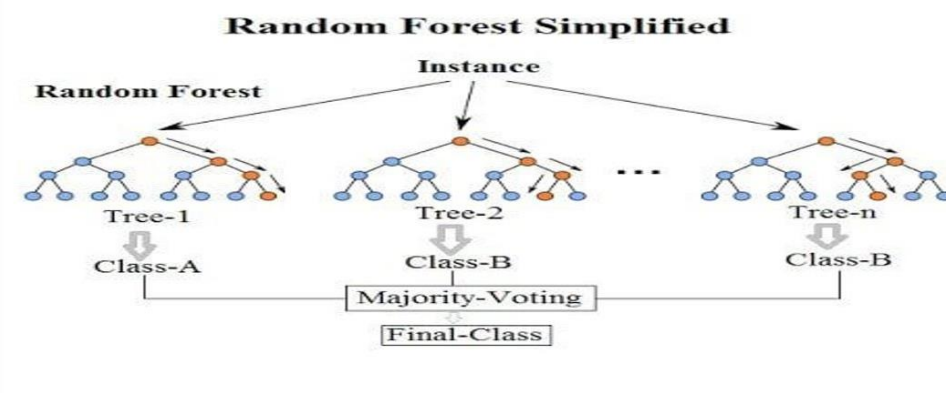


Figure 6: Random Forest Architecture

It's simple to use and can be used to classify and predict data. Random Forest is a learning algorithm that is supervised. To put it simply: The random tree generates and merges a variety of options.

2.3 Summary

In this chapter, we get an idea about the methods and methodology.

CHAPTER 3

System Architecture

3.1 Introduction

In this chapter we discuss the architecture of the first and accurate healthcare system. We also focus on the architecture as to why our system will be effective one.

3.2 Architecture of the healthcare system

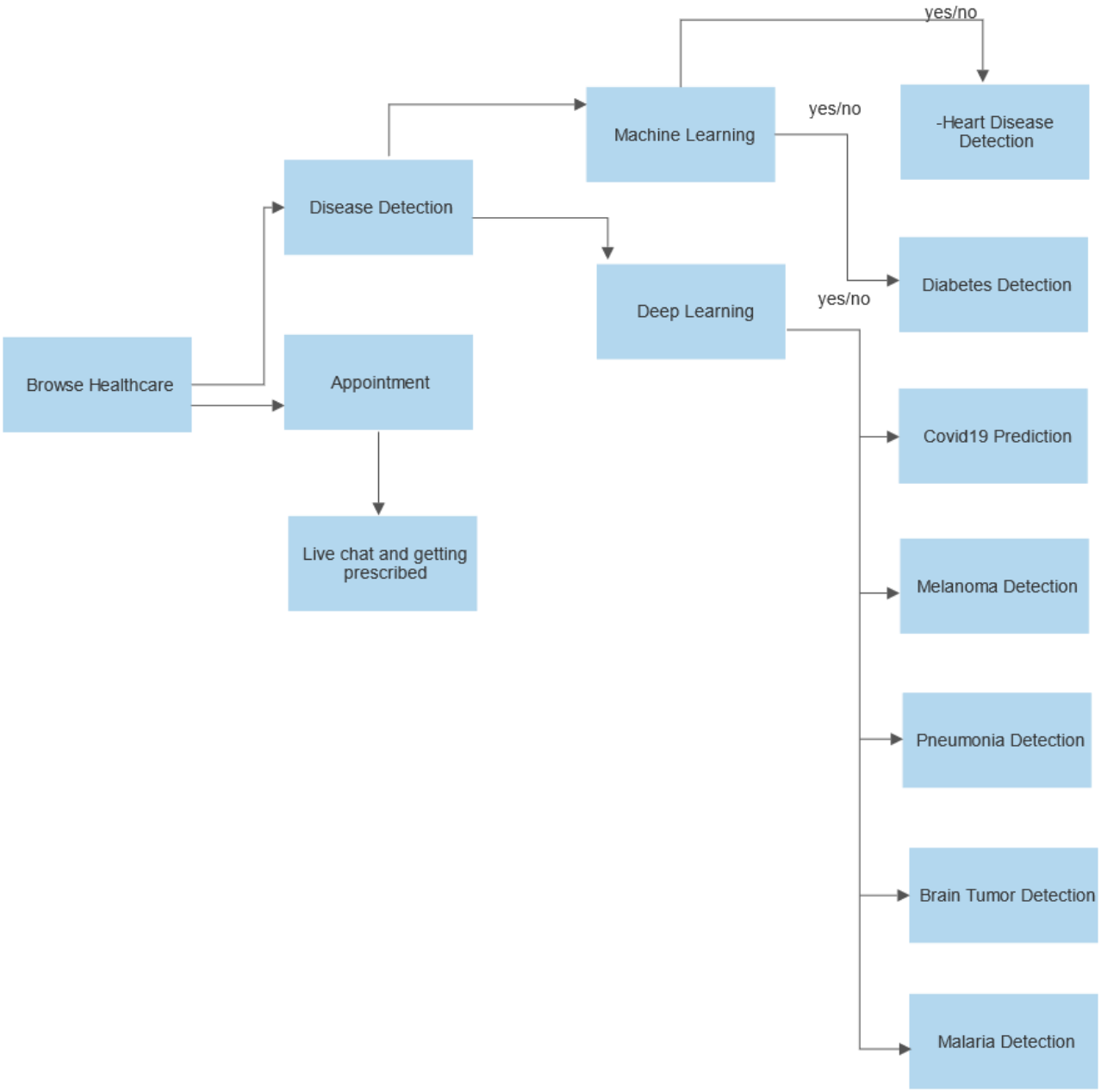


Figure 7: Architecture of the Fast and accurate healthcare system.

In figure 7, after browsing for the system, we get two options-1) disease detection, 2) appointment then we use machine learning or deep learning model to detect disease. A Fast

and accurate Healthcare System is a computer program which enables users to predict a simple disease to large disease through image processing and symptoms and prescribed the users through online. Our Healthcare System are typically designed to: Connect doctor and patient through online, Predict and diagnose disease with high accuracy, Guide the patient to correct care based on the diagnosis and prediction. For creating the model, we used machine learning, deep learning, neural network.

3.3 Flowchart of the healthcare system

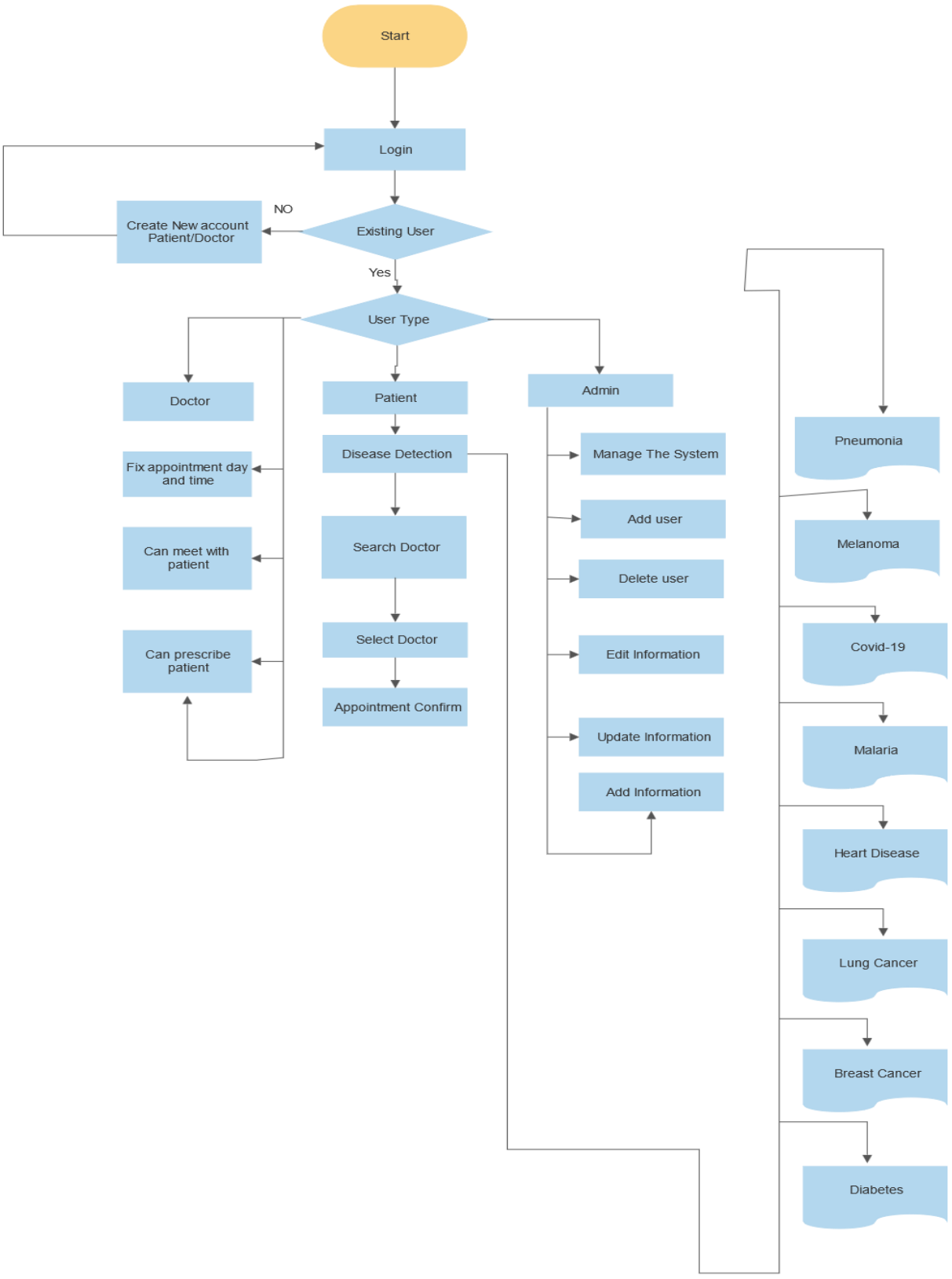


Figure 8: Flowchart of the Fast and accurate healthcare system.

In figure 8, the flowchart illustrates the whole process of the healthcare system.

3.4 Summary

In this section, we show the architecture and system flow diagram to get a clear idea what can perform the system.

CHAPTER 4

Related works

4.1 Introduction

Programmers are working tirelessly to diagnose disease at an early stage by reviewing its early features. In this context, many people are working in the same domain to find out many ways using convolutional neural networking, deep learning. In this chapter we will discuss about the existing similar works, problems with the current system, proposed solution.

4.2 Review of the existing similar system

For this task, developers and programmers try to develop an effective system using deep learning. A lot of work has been published in the domain of skin cancer classification using deep learning and computer vision technology. IEEE, MDPI, Research Gate publish many papers of various deep learning-based disease detection system. M. M. Kamruzzaman works at Architecture of Smart Architecture of Smart Health Care System Using Artificial Intelligence which has 93% specificity [1]. PATHAI is built machine learning technology to help pathologists in making more accurate diagnose by reducing error in cancer diagnosis and developing methods for individualized medical treatment [2]. This technology is working with drug developers like Bristol-Myers Squibb and organizations like the Bill & Melinda Gates Foundation to expand its AI technology into other healthcare industries [2]. “Buoy Health” is an AI-based symptom and cure checker that uses algorithms to diagnose and treat illness [2]. A chatbot listens to a patient's symptoms and health concerns, then directs them to proper care depending on the patient's diagnosis [2]. In “Melanoma Diagnosis Using Deep Learning and Fuzzy Logic” [3] system uses ABCD (Asymmetry, Border irregularity, Color variation and Diameter) rule and the Menzies method. Jemal et al. implemented the system using YOLO (You only look once) whose system is organized like a regular CNN. In Skin lesion location detection performance analysis of YOLOv3 the system achieved 97.77% sensitivity, 97.65%specificity on ISIC 2019 dataset. The system achieves 92.94% accuracy, 88.88% sensitivity, and 94.37% specificity on ISIC 2019 dataset.

4.3 Problems with the current systems

Doctors gives some test to identifying the lesion. To determine the melanoma X-rays, CT scans and positron emission tomography (PET) scans tests are used. X-rays have high radiation level. So, it has bad effects on our body like vomiting, bleeding, fainting, hair loss. CT scan has the possible bad effects like abdominal cramping, diarrhea, nausea or vomiting, constipation. PET scan causes nausea, vomiting, headache, itching, flushing, allergic reaction and mild rash. So, these are the problems with the current systems. The current systems are time consuming. People also have to wait for the report. These systems are complex. So, people want to get easier system. Even we see the current paper work based system which is very time consuming and difficult to store the information and retrieve data.

4.4 Proposed Solution

Our proposed solution is to use “Fast and accurate healthcare system” as web-based system. This system provides online communication between doctor and patient. This system is less time consuming. It also provides a great deal of help to doctors and patient. Till now We have been able to do proposed the particular model which we will use for disease detect in the frontend part.

4.5 Summary

In this chapter we know the problems of the existing systems. We also get motivation to develop our system for diagnosing any disease in early stage at home. It will open a new door, new hope for medical diagnosing system. People will get it user friendly. They will get it efficient and reliable.

CHAPTER 5

DESIGN IMPACT

5.1 Introduction

In this chapter, we discuss about the various impacts that our system has been able to generate.

5.2 Environmental Impact

Although it may not be directly given, a software project does have some environmental merit, first and foremost, it saves movement and when movement is saved, it saves the time and transportation cost. Other environmental considerations maybe that since pictures these days are digital, paper is also being saved.

5.3 Economic Impact

The money for movement and the money for other sources (such as physical diagnosis) is being saved. With some of these costs being saved from the society, this is going to put a positive impact onto the microeconomics of the society and thus the economy shall rise. Other than that, there will be greater money inflow for the clinics that shall use the system, the doctors can also give more detailed approaches to the diagnosis. Here, human power is less. In economic side people know the result of so many diseases with less cost and don't need to go hospital to take treatment because in this pandemic situation going outside of home (hospital) is not safe at all. Also, we see for COVID19 how people loss their job and they are facing problem in economic side but to use our system no need any cost they only need the idea about technology a little bit and MRI, X-ray, Cell images cost for upload to our system and get the result of their diseases prediction.

5.4 Social Impact

There has positive impact on social design. In social side people are advanced about technology, learnt the proper use of technology and they take particular disease treatment in primary stage. This is a project that aims to diagnose a population that are under privileged form many aspects, since this is a project that comes in handy for those that are hard in movement, with physical constrictions, time constrictions as well as health constrictions, one can say that this project has a very positive social impact. The project can also cause the

movement of even greater and more beneficial research and algorithm that shall lead to greater development. It will reduce the mortality rate.

5.5 Sustainability

If we improve the accuracy of the system, fix the sensitivity and specificity of the system, the system performance will grow faster. It will become suitable for medical use. And without any complexity people can early diagnose without any complexity. As we are now in very initial phase, so our works have some limitations. As it is not costly so it will be reliable for anyone. It will become real time system in future. In our country all people are not educated enough and some people doesn't have the capability to take high-cost treatment but our system have cost less they can easily get the result by putting the images or data of his or her particular disease. Our work system is very easy that's why people easily can use the system. On the other hand, those whom are not understand the system we can make it familiar to them and by their comment we can also update our system.

5.6 Income Generation

Yes, there have possibility of income generation to the people because we see Health Problem and Diseases is increasing day by day and people are also conscious about the matter and people are too much interested to use updated system that's why people can earn easily by this project.

5.7 Benefit

People will be benefited from this project throw knowing the result of his/her particular disease and take treatment. In this situation go outside of home (hospital) and take treatment is not a easy and safe task. We also know that get any kind off disease test result take time but in between this time patient health condition is getting worst and their health condition reached in critical situation but using our system people get the result very quickly and they start their treatment in primary situation. People benefited mainly decrease the rate of major disease like Brain Tumor, Covid, Pneumonia, Heart Disease, Melanoma, Diabetes, Breast Cancer, Malaria, Lung Cancer etc.

5.8 Summary

This chapter has covered the different types of impacts that our system.

CHAPTER 6

Table and Figures

For different kind of disease, we used different deep learning and machine learning models. For different types of model, we used different loss such as binary, categorical crossentropy and mean squared error etc. Here are all the tables and every model training accuracy is showing below.

Brain Tumor using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 2 different model and for Autoencoder we got better accuracy from CNN. In table 1, shows model evaluate generator for the comparison of our model.

Table 1: Autoencoder and CNN Model evaluate generator-

Model	Accuracy
Autoencoder	99.97
CNN	97.31%

Pneumonia using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 3 different model and for Custom CMM we got better accuracy from DenseNet169 and MobileNet. In table 2, shows model evaluate generator for the comparison of our model.

Table 2: CNN, Densenet169 and MobileNeT Model evaluate generator-

Model	Accuracy
Custom CNN	96.32%
Densenet169	93.65%
MobileNet	88.21%

Covid-19 using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 3 different model and for CNN we got better accuracy from Inception and GoogleNet. In table 3, shows model evaluate generator for the comparison of our model.

Table 3: Inception, Googlenet and CNN Model evaluate generator-

Model	Accuracy
CNN	98%
Inception	92%
GoogleNet	89.29%

Malaria using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 3 different model and for CNN we got better accuracy from Vgg16 and GoogeNet. In table 4, shows model evaluate generator for the comparison of our model.

Table 4: CNN, Vgg16 and Googlenet Model evaluate generator-

Model	Accuracy
CNN	95%
Vgg16	93%
GoogleNet	91.29%

Breast Cancer using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 2 different model and for Custom CNN we got better accuracy from GoogleNet. In table 5, shows model evaluate generator for the comparison of our model.

Table 5: CNN and GoogleNeT Model evaluate generator

Model	Accuracy
Custom CNN	88.32%
GoogleNet	78.83%

Melanoma using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 3 different model and for Inceptionv3 we got better accuracy from Resnet50 and CNN. In table 6, shows model evaluate generator for the comparison of our model.

Table 6: InceptionV3, Resnet50 and CNN Model evaluate generator

Model	Accuracy
InceptionV3	92.48%
Resnet50	90.83%
CNN	64.64%

Lung Cancer using Deep learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 2 different model and for ResNet50 we got better accuracy from Inception. In table 7, shows model evaluate generator for the comparison of our model.

Table 7: Resnet50 and Inception Model evaluate generator

Model	Accuracy
Resnet50	98%
Inception	96.29%

Heart disease using machine learning model:

For brain tumor detection we firstly collected dataset then train the dataset go 3 different model and for Random Forest classifier we got better accuracy from Decision tree and SVC. In table 8, shows model evaluate generator for the comparison of our model.

Table 8: Decision tree, Random Forest and SVM Model evaluate generator

Model	Accuracy
RandomForestClassifier	100%
DecisionTreeClassifier	99%
SVM	89%

Diabetes using machine learning model:

For brain tumor detection we firstly collected dataset then train the dataset got the accuracy. At the same dataset we performed 3 different model and for Decision tree classifier we got better accuracy from Random Forest and SVC. In table 9, shows model evaluate generator for the comparison of our model.

Table 9: Decision tree, Random Forest and SVM Model evaluate generator

Model	Accuracy
DecisionTreeClassifier	98%
RandomForestClassifier	100%
SVM	81%

So that's all are the different model and different accuracy according to their different layer.

CHAPTER 7

Results And Analysis

Here are the results of multiple diseases results and plotting of training and validation where we tried multiple deep learning and machine learning model for knowing which will better perform on same dataset images and CSV data into particular disease. Here is showing that particular model graph which we actually got the best accuracy for the disease.

Deep Learning Model:

Brain Tumor:

Here we used Autoencoder and CNN for the comparison which actually gives better accuracy in the same dataset for brain tumor classification.

For the **Autoencoder** model, we are trained the dataset images for 20 epochs and steps-per-epoch is 40. Here model fit generates. The time taken for model training is first 38s and after that 4s/epoch. It can be shown with the help of both graphs below. Fig 9 shows the graph of the loss:

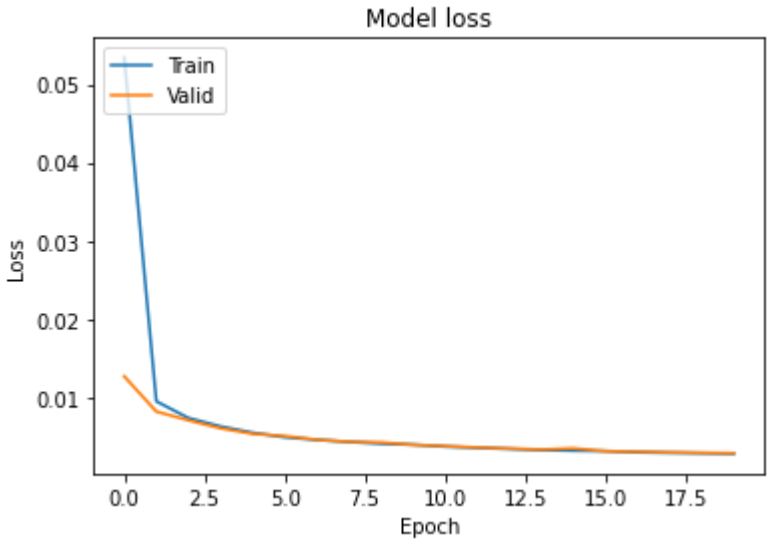
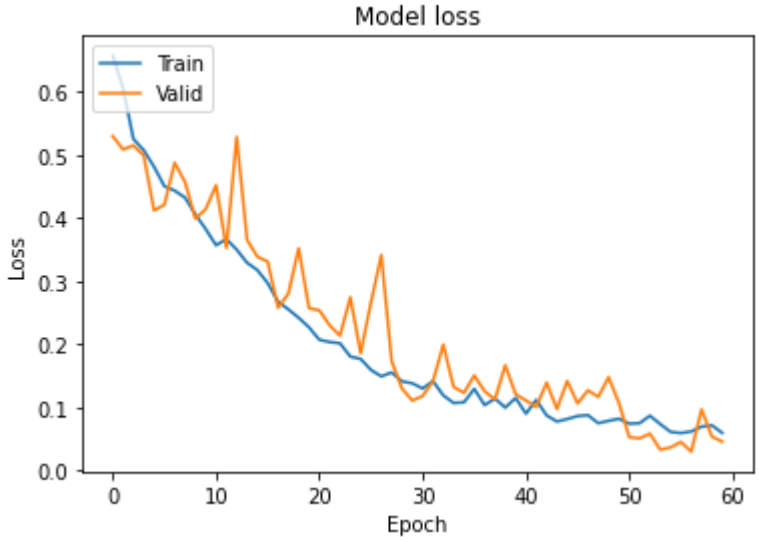
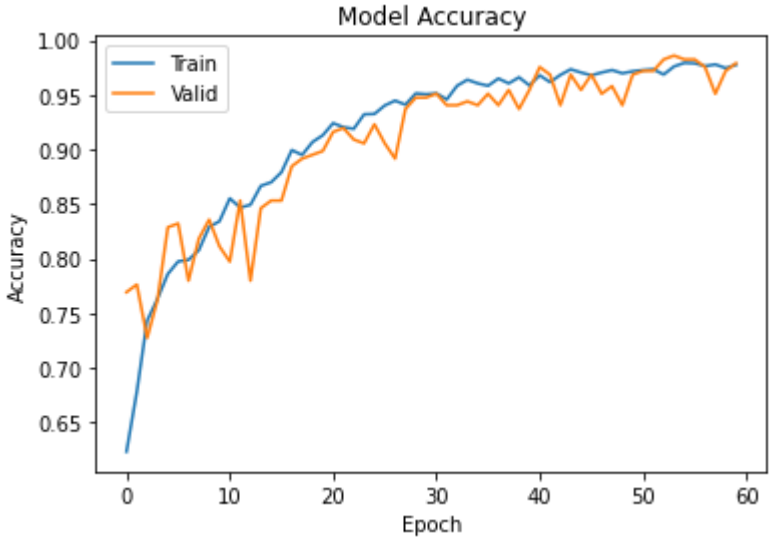


Figure 9: Training and Validation loss for Autoencoder

For the **CNN** model, we are trained the dataset images for 60 epochs and steps-per-epoch is 85. Here model fit generates. The time taken for model training is within 9s to 11s per epoch. It can be shown with the help of both graphs below. Fig 10 shows the graph of the loss and accuracy:



Training and Validation loss for CNN (a)



Training and Validation accuracy for CNN(b)

Figure 10

Pneumonia:

Here we used CNN. We have used 5 epochs in malaria hypermeter and steps-per-epoch is 627. Here model fit generates and the model saves as .h5 files name. The time taken for model training is 144s/epoch. Also got better accuracy for the model. Fig 11 and 12 shows training, validation accuracy and loss.

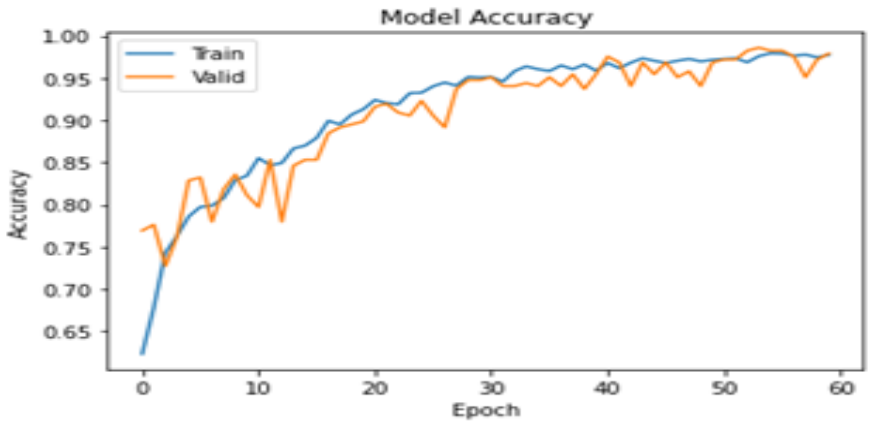


Figure 11: Pneumonia Accuracy

The accuracy we got after training is 96% and validation accuracy is 91%

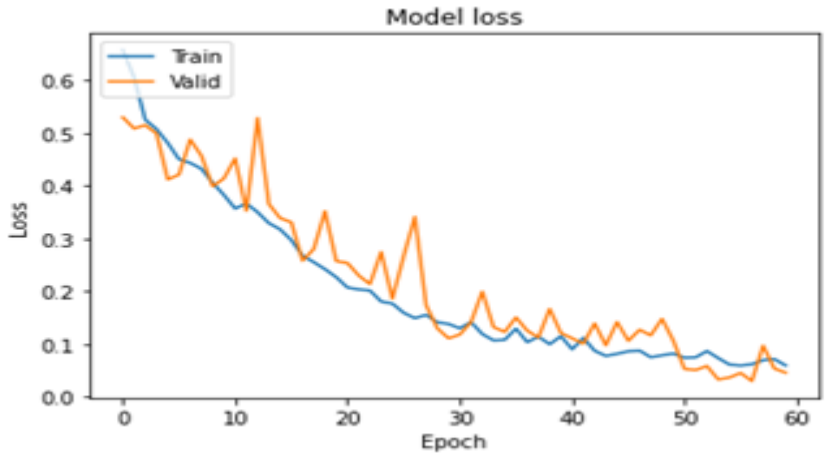


Figure 12: Pneumonia loss.

The loss we got after training is 0.1294 and validation loss is 0.1672.

Malaria:

Here we used CNN. We have used 5 epochs in malaria hypermeter and steps-per-epoch is 627. Here model fit generates and the model saves as .h5 files name. The time taken for model training is 144s/epoch. Also got better accuracy for the model. Fig 13 and 14 shows training, validation accuracy and loss.

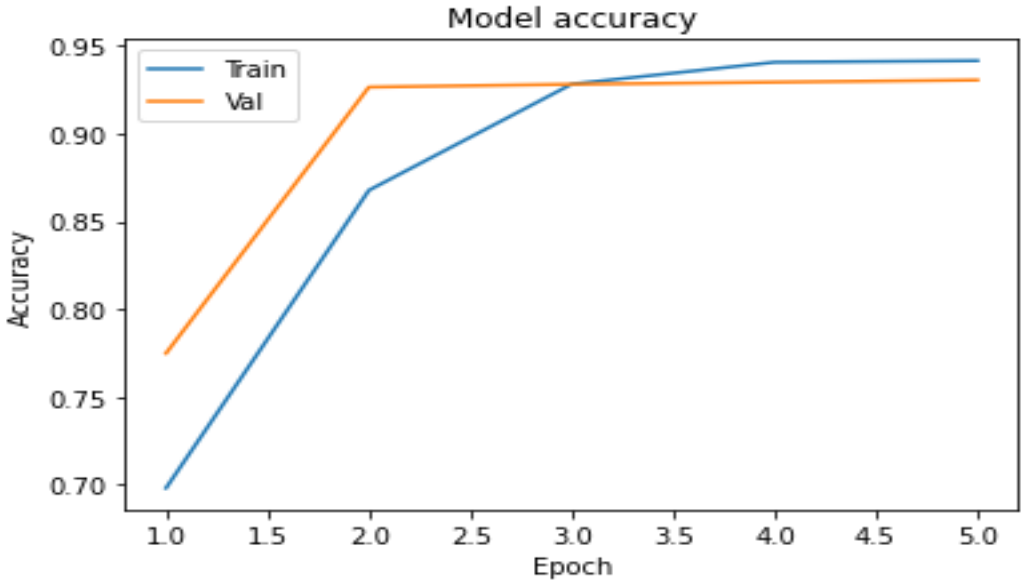


Figure 13: Malaria Accuracy

The accuracy we got after training is 95% and validation accuracy is 94%.

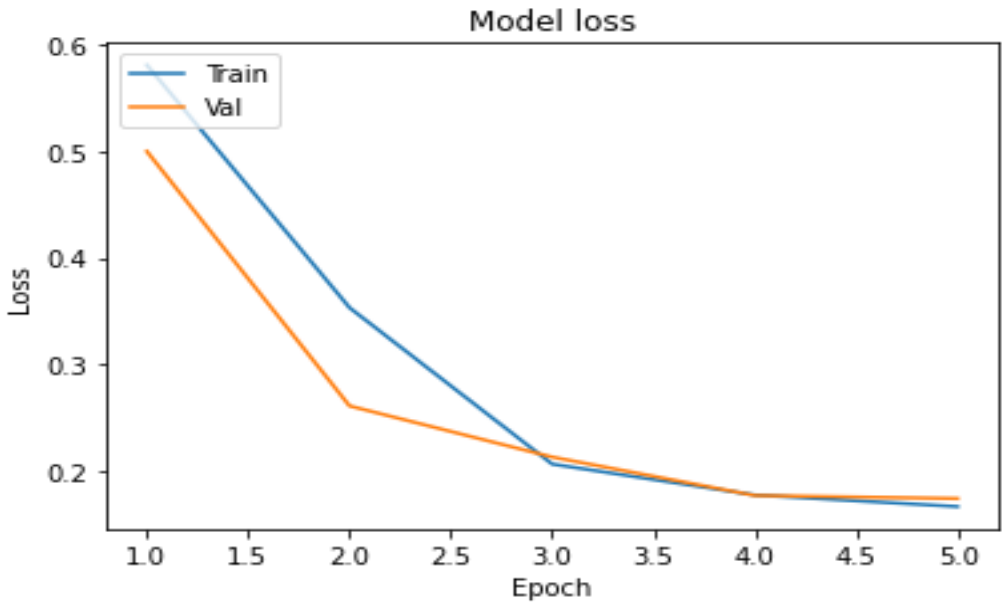


Figure 14: Malaria loss graph.

The loss we got after training is 0.1294 and validation loss is 0.1672.

Covid:

For this confusion metrics the True Positive/Negative name refers to the anticipated result of a test, whereas the True/False refers to the real result. In Fig 15 it can be seen the confusion matrix table of performance evaluation.

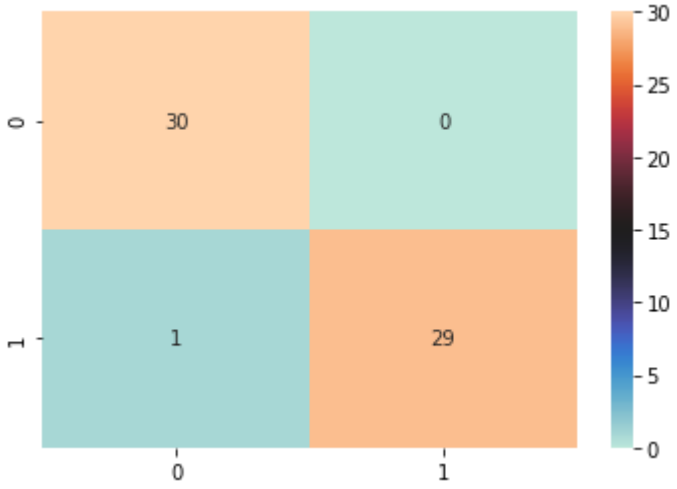


Figure 15: Confusion matrix Table

Here, TP is 30, TN is 29, FP is 1 and FN is 0. So, train generator class indices Covid is 0 and Normal is 1.

All the models are trained for 10 epochs and steps-per-epoch is 7. Here model fit generates and the model saves as .h5 files name. The time taken for model training is 9s/epoch. It can be shown with the help of both graphs below. Fig 16 and 17 shows the graph of the accuracy and loss:

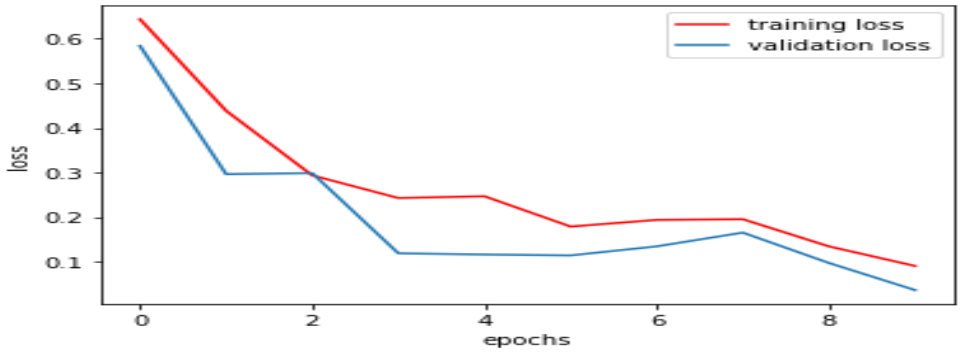


Figure 16: Training and Validation loss

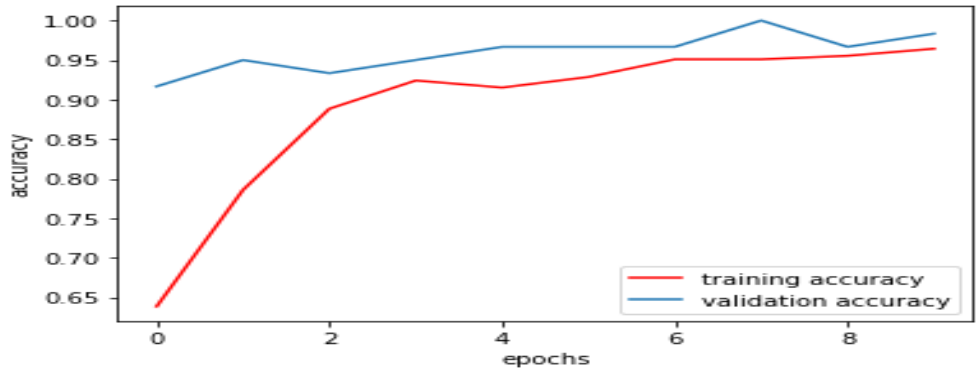


Figure 17: Training and Validation accuracy

Training loss is 0.09 and validation loss is 0.03.

Melanoma:

Here we used InceptionV3. We have used 10 epochs in malaria hypermeter and steps-per-epoch is 63. Also got better accuracy for the model. Fig 18 and 19 shows training, validation accuracy and loss.

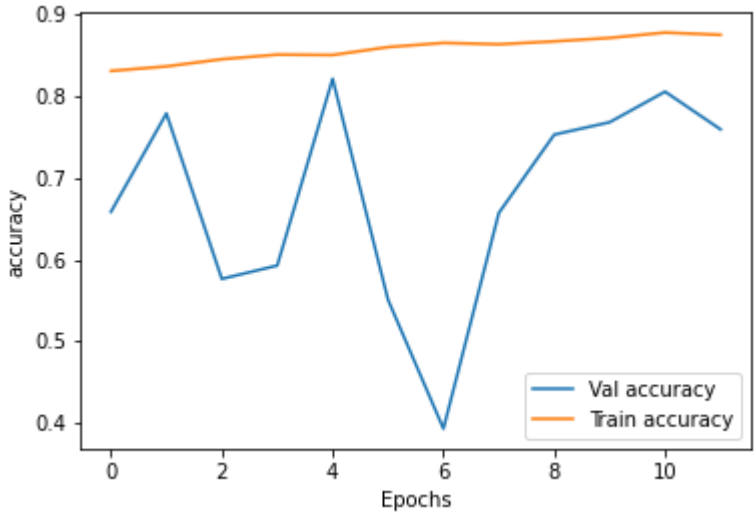


Figure 18: Melanoma Accuracy

The accuracy we got after training is 92% and validation accuracy is 75%.

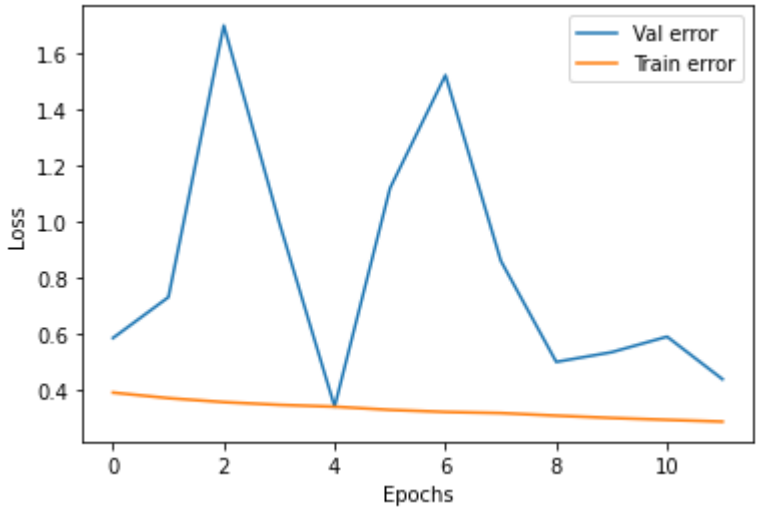


Figure 19: Melanoma loss

The loss we got after training is .2838 and validation loss is .45.

Lung Cancer:

Here we used Resnet50. We have used 10 epochs in malaria hypermeter and steps-per-epoch is 350. Here model fit generates and the model saves as .h5 files name. The time taken for model training is 70s/epoch. Also got better accuracy for the model. Where Train accuracy Score is 99.905 %, Val accuracy Score is 96.667 %, Test accuracy Score is 96.222 %, F1 Score is 96.202 %, Cohen Kappa Score is 94.330 %, ROC AUC Score is 95.430 %. Fig 12 \ shows testing, validation confusion matrix. Where 0 for Lung ACA, 1 for Lung N, 2 for Lung SCC. Fig 20 shows the confusion matrix for lung cancer.

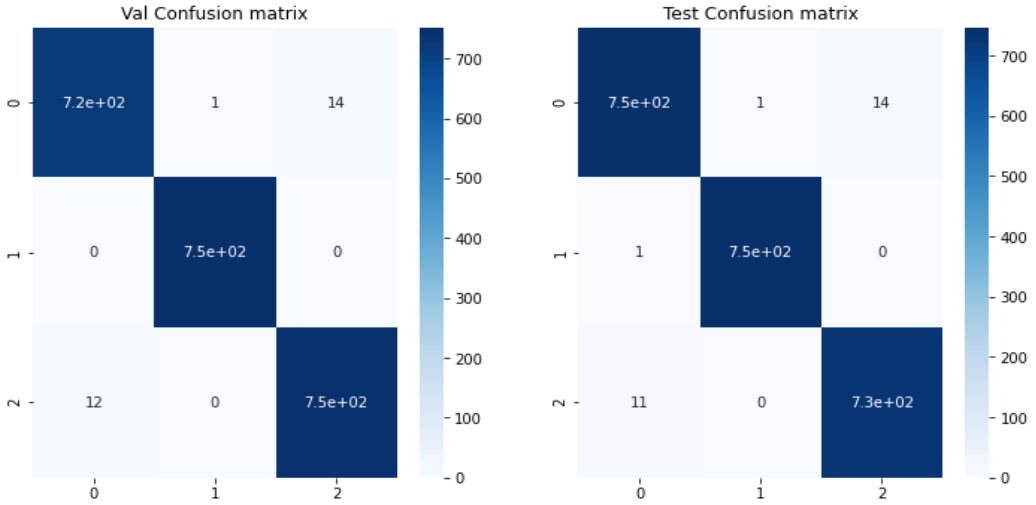


Figure 20: Confusion matrix Table

Breast Cancer:

Here we used Custom CNN. We have used 25 epochs in malaria hypermeter and steps-per-epoch is 169. Here model fit generates and the model saves as .h5 files name. The time taken for model training is 32s/epoch. From any kind off online source, we did not get the better dataset for the breast cancer image processing. Also got better accuracy for the CNN model. Fig 21 and 22 training, validation accuracy and loss.

Figure 21: Breast Cancer Accuracy

The accuracy we got after training is 89% and validation accuracy is 74%.

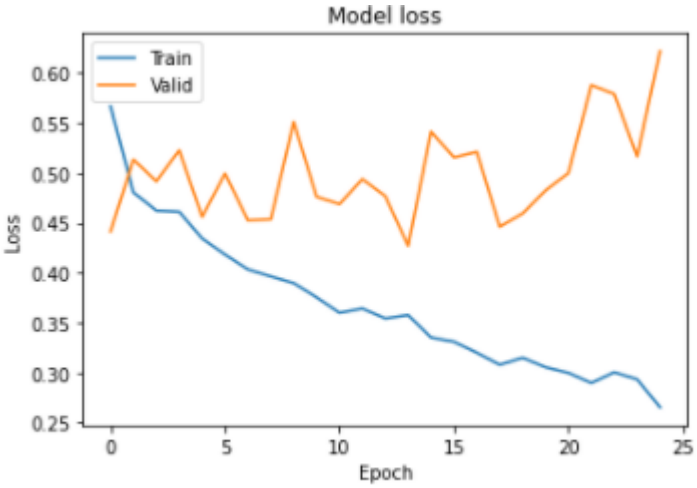


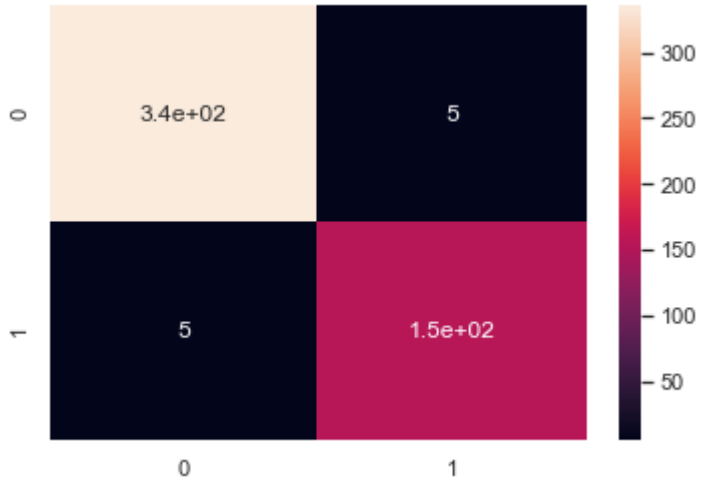
Figure 22: Breast Cancer Accuracy

The loss we got after training is 0.265 and validation loss is 0.621.

Machine Learning Model:

Diabetes:

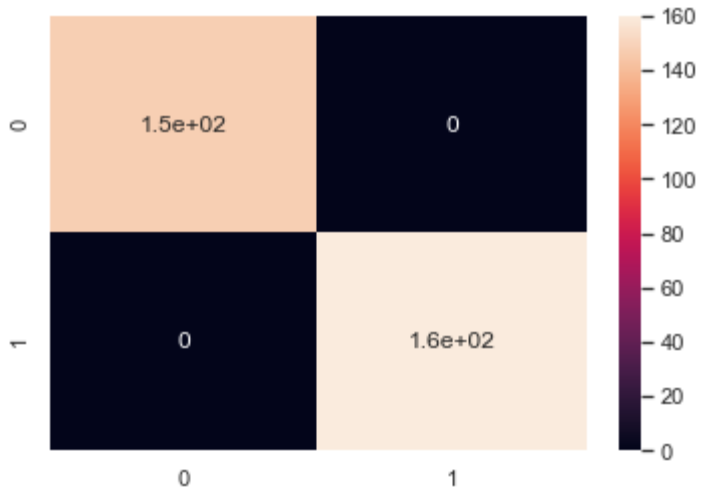
Here we used different types of models. Random Forest, Decision Tree, SVM etc. The best accuracy we got for Decision Tree Classifier. For this confusion metrics the True Positive/Negative name refers to the anticipated result of a test, whereas the True/False refers to the real result. In Fig 17 it can be seen the confusion matrix table of performance evaluation.



Here, TP is 3.4e+02, TN is 1.5e+02, FP is 5 and FN is 5. So, train generator class indices Diabetes is 0 and Normal is 1.

Heart Disease:

Here we used different types of models. Random Forest, Decision Tree, SVM etc. The best accuracy we got for Random Forest Classifier. For this confusion metrics the True Positive/Negative name refers to the anticipated result of a test, whereas the True/False refers to the real result. In Fig 18 it can be seen the confusion matrix table of performance evaluation.



Here, TP is 1.5e+02, TN is 1.6e+02, FP is 0 and FN is 0. So, train generator class indices heart disease is 0 and Normal is 1

Here are all the disease models result and analysis where we used different types of deep learning and machine learning model. The best accuracy we got, is shown here through analysis.

CHAPTER 7

CONCLUSION AND FUTURE WORK

Conclusion

The better the system, the better the results and the less complexity and cost. If the system works accurately. In this paper, a deep convolutional network-based architecture has been proposed for disease detection and segmentation of lesions. This architecture adopts an enhanced deep convolutional network that is interconnected with series of skip pathway. The multi-stage approach overcomes the limitation of some deep convolutional networks in producing coarsely segmented outputs when processing challenging skin lesion images. In this approach, the whole network is divided into stages, with each stage handling different section of features learning and extraction. A new method is devised to classify melanoma and non-melanoma lesion based on the results from the softmax classifier. The system adapts dice loss function that learns and computes losses from the overlap in-between the predicted output and the ground truth label into softmax classifier for pixel-wise classification. This loss function consumes lesser system resources since it does not perform sample re-weighting unlike some other loss function. The system goal is to reduce deep learning architecture complexity in detecting melanoma so that people can use it at home without any complex and time-consuming process. It also aims at developing an efficient system that can meet up with real-time medical diagnosis task in diagnosing melanoma cancer, diabetes, malaria, heart disease, breast cancer. The proposed method is feasible for medical practices skin lesion publicly available skin lesion image dataset. As we get an encouraging accuracy and prediction, so it will be able to detect disease, minimize the mortality rate by early diagnose. It will be feasible

for any people. The ‘Fast and accurate healthcare’ System is primarily web-based. The system takes care of all the requirements of an average medical. To conclude, we will achieve to develop such efficient system for the sake of healthcare of people. People can grab opportunity by sitting at home without much time and spending much money. It can be possible to research with different application on the healthcare system. Our focus was not only to finish the project in due time but to design this system in such a way that it would genuinely be useful in the real world. Thus, we have faith that this is just the beginning of innovation in the medical field. It will become a more efficient system and reliable system to the user. Will try to make such a framework that will be easy to use for not so educated people as well. Using Deep learning and Artificial neural network, we will increase the accuracy of the model. A user-friendly desktop tools. Also, we will try to make our system available in website platform.

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