SKIN CANCER DETECTION & CLASIFICATION USING MACHINE LEARNING

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled **"Skin Cancer Detection & Classification using Machine Learning"**, submitted by Ahsanul Hossain and Iftakharul Islam, Student ID No 191-15-12488 and 191-15-12413 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 26 January.

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DECLARATION

We hereby declare that, this work has been done by us under the supervision of **Md. Sadekur Rahman, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

Our work topic is skin cancer detection and its type detect. For that we are using CNN (Conventional Neural Network) specially confusion matrix and auc-matrix. Which actually able to detect the accuracy. Achieving a high-level performance with accuracy we use HAM 10000 data for getting this. We also use some model for getting the perfect accuracy value. Our data set is vast but imbalanced for that we are using up-sampling method for balancing the data. Our data is imbalanced but able for performing. We are use VGG-19, Xception net model for getting the accuracy and 94.7% accuracy we get. We are using the provided data from International Skin Imaging Collaboration (ISIC) 2018. Skin is important for the neurological system. A growth or mass of abnormal tissue in the epidermal layer of the skin is called a skin cancer. And this can sometimes have catastrophic results. Early cancer and tumor detection allows for quicker treatment and increased survival rates. Digital imaging systems can detect tumors. There are times, though, when it just isn't enough. The capacity to segment pictures is essential in medicine. This might be used to identify cancerous skin cancers. However, there are a lot of barriers that prevent picture segmentation. The disappearing gradient is one of these problems. Which implies that deep convolutional neural network training may require more time and computational resources. We introduce a Deep Convolutional Neural Network (CNN) for completely automated skin tumor segmentation in digital imaging data to solve the vanishing gradient problem. The recommended procedure starts by classifying digital skin photos using Resnet-50 to evaluate whether or not a tumor is present. The levels of accuracy of the two CNN models were then compared. The VGG-19 structure and Resnet-50 encoder were then used instead. And so far, the outcomes have been very remarkable. This property permits the propagation of gradients to higher layers before they are attenuated to insignificant or zero levels. Only when digital imaging systems have undergone preprocessing and enhancement utilizing methods like rotation, zoom, horizontal and vertical shift, horizontal and vertical shear, and flipping are they employed in our model. We were able to identify and localize the tumor in the skin using our suggested model since it produced superior outcomes.

TABLE OF CONTENTS

CONTENT **PAGE**

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

1.1 Introduction

The most invasive skin cancer in recent years was malignant melanoma. It has been sprauchled fatally over the world. On early detection, malignant melanoma is gratifyingly treatable. Cancer is essentially caused by abnormal cells growing unchecked. DNA is the building block of cells. These healthy cells split once again to create new healthy cells. But because of a genetic flaw, DNA becomes defective, and defective DNA produces abnormal cells.

Once an abnormal cell is created from a DNA flaw, the cell divides normally to produce a large number of additional defective cells, which ultimately lead to cancer. Melanocytic cells are present in the human body, but malignant melanoma is caused by the fast proliferation of defective melanocytic cells. Skin cancer is also referred to as melanoma because malignancy is a characteristic of skin.

Melanoma typically exists on the skin and occasionally manifests itself as an unexpected black patch. Sun exposure's UV radiation and genetic mistakes are the primary causes of the illness. Malignant melanoma begins as a skin growth that, over time, penetrates deeper into the skin, enters the blood vessels, spreads to other parts of the body, and impacts various organs. Malignant melanoma is accustomed to benign lesions. Benign lesions are only black spots, like typical moles, and are not detrimental to the human body. However, cancer brought on by malignant melanoma is the cause of mortality.

1.2 Motivation

Our objective is to develop a system that can identify melanoma cancer at an early stage. Early detection by the system makes it more accurately and satisfactorily treated. This will lessen the number of fatalities. Basically, the diagnosing procedure for melanoma cancer makes it fatal. It is difficult to catch since it looks like a typical mole. However, it expanded to several areas of the body and began to harm various human organs as soon as it emerged from the skin and demonstrated the visible difference between a regular mole.

This disease's infection to death ratio is clearly noticeable. Making the distinction between a mole and a malignant melanoma during the early detection phase is difficult, thus it takes time. As a result, it spreads throughout the body and infects different organs. Therefore, by properly detecting the infection at an early stage, our system will solve this problem in a short amount of time while also producing satisfactory, trustworthy results.

1.3 Rationale of study

Skin cancer with melanoma is a fatal condition. Every year, a large number of people live. Therefore, early identification of this form of cancer is crucial for saving lives and reducing the amount of money needed for treatment. We created a technology that can be used to diagnose and treat this condition. Because this particular form of cancer is studied through image and image processing, it is crucial to develop an accurate algorithm for cancer detection. The major objective of our work is to assist patients by using appropriate methods to detect at an early stage and minimize the enormous costs associated with therapy, both physically and financially. By adopting a deep convolutional neural network, our built system will be able to recognize melanoma cancer more accurately and fast than the prior analog method. Basically, melanoma skin cancer is diagnosed by a picture, which can occasionally result in mistake since it is handled by a human. But in a short period of time, our system will more accurately recognize this illness. While an automated system produces results quickly, its analysis is more reliable. A trained system only needs a suitable picture to inspect what's within.

- Assisting medical institutions by supplying the system that will be used to identify cancer at an early stage and the number of cancer cells in order to get better results with greater accuracy rates than manual therapy.
- Detecting tumors at an earlier stage will aid for a better therapy and patient will receive time for right means of getting cured, lowering the mortality rate and cancer.
- To provide physical and monetary support for the patient and their family since cancer and tumor early identification will lower the cost of treatment.

1.4 Research Questions

Research questions is the outcome about related study along with theoretical analysis and data exploration. Here, the query is addressed as to how the task is accomplished and provides a quick overview of the system.

- How may tumors and cancer be detected in their early stages?
- How will the system distinguish between melanoma skin cancers at various stages?
- How can a tumor lead to skin cancer called melanoma?
- How do we get information about skin cancer and tumors?
- How may raw picture data from an infected patient be collected?
- What kind of algorithms are suited to carry out our tasks more precisely?
- How much information do we need to successfully carry out our work?
- How can this model be trained using the right data set?
- Is there any proposed model exists? If so, how was it created and how effectively does it function?
- How may the shortcomings of the current model be fixed?

How did we create a recommended model that might be more accurate than the current model?

1.5 Expected Outcomes

The expected outcomes of our proposed work are to detect both tumor and cancer at early stage along with better accuracy using selected algorithms and train a model by training.

- Early detection of both tumors and cancer
- The result of the examination will be more accurate than the physical examination.
- This will aid in lowering the infection and mortality rates. The likelihood of a patient surviving will rise when the system is giving improved precision.
- The patient will receive both material and financial support.
- Relief patient and their family from mental stress.

1.6 Project Management and Finance

In pursuance of to complete our thesis work, we had to visit hospitals to get information on primary skin tumors and cancers brought on by tumors. Our objective was to run and execute our Python code on Google Colab in order to train various deep learning algorithms. We have been able to detect tumors and cancer cells in the primary stage with greater accuracy thanks to these algorithms. We had visited a number of hospitals for this reason. There were some transportation expenses as a result. There are 2 people in our group. We each went to three hospitals to gather information. We were able to visit a total of six hospitals as a consequence. An estimated 3000 BDT were spent on visits to the hospitals. However, from a time and money standpoint, it was challenging to physically gather data. As a result, we also gathered some information from websites for cancer foundations and hospitals that are open to the public. Python has been used to run the algorithms. Additionally, Google Colab, an online platform, was employed. We needed an internet connection because of this. The price of internet was about 2000 BDT. The total amount spent is 5000 BDT.

1.7 Report Layout

This project is based on thesis and has a total of six segments. The work presents a variety of perspectives, each of which is represented by a chapter. Distinct subheadings are divided up into each chapter and presented in an understandable manner. A list of everything in this report is provided:

Chapter 1

Introduced the effort and discuss its goals, drivers, research questions, and expected outcomes. The topics we have discussed: 1.1 Introduction, 1.2 Motivation, 1.3 Rationale of the Study, 1.4 Research Questions, 1.5 Expected outcome 1.6 Project Management and Finance and 1.7 Report Layout.

The introduction, including the phases of melanoma skin cancer and how they might affect a person's health. And it has been debated how they develop, disseminate, and affect the body. The primary driving force for our thesis study was covered in the section on motivation. The study's major goal was covered in the section on the Rationale of the study part. The Research question chapter explains the major questions that pertain to our investigation. The expected outcome section includes a description of the result we've been working toward. The Project Management and Finance document details the financial costs and the correct project management. The Report layout structure breaks out our whole project into chapters.

Chapter 2

It provides a summary of earlier work that has been done in this situation. Studying earlier work makes it easier to fully comprehend the work that has to be done for our research. We witness the effects of the authors' choice to draw a line through this field of study later in Chapter 2. The following subjects have been covered: Preliminaries/Terminologies, Related Works, Comparative Analysis and Summary, Scope of the Problem, and Challenges are all included in this report.

Chapter 3

It is relevant to this study's theoretical debate. Extending the already used statistical techniques to explore the theoretical element of the research was one aspect of this endeavor. The workings of deep learning are also shown in this chapter. There are: 3.1 Research Topics and Equipment, 3.2 Method/Dataset Used for Data Collection, Statistics Analysis, 3.4 Applied Mechanism/Proposed Methodology, 3.4.1 Processing of data, 3.4.2 Data enhancement, 3.4.3 The Suggested Methodology classification, 3.4.4 3.4.5 Inception V3 Introduction 3.4.6 ResNet-50 Introduction, 3.4.7 Segmentation of images using the suggested model and the 3.5 implementation requirements.

Chapter 4

Presents the experiment results, analyzes the data, and discusses the conclusions. This section presents some experimental photographs that were taken whilst the project was being developed. It has been covered in 4.1 Experimental Setup, 4.2 Experimental Results & Analysis, and 4.3 Discussion

Chapter 5

Specifies what is trustworthy to appear in the complete project report and proposal. The chapter comes to a close with a discussion of the limits of our study, which may be used as a springboard for other people's future research. We have talked about the following subjects: Impact on Society, Environmental Impact, Ethical Aspects, and Sustainability Plan are all listed in section 5.1.

Chapter 6

Provides an overview of the research and upcoming projects. We have talked about the following subjects: 6.1 The Study's Executive Summary, 6.2 The Findings, and 6.3 Implication for Future Research The study's executive summary provides an overview of our whole body of work. Our whole study, including the findings, is displayed in the conclusion. The subsequent development of our work has been detailed in the section titled Implications for Further Study.

CHAPTER 2

Background

2.1 Preliminaries

One of the most delicate organs in the human body is the skin. Skin is used to sense the majority of physical activity. However, melanoma skin cancer has become more deadly in recent years. A significant number of lives are lost to this disease every year. In addition to taking lives, this illness also causes financial loss and emotional anguish for the patient's family. The disease known as melanoma skin cancer is caused by the rapid proliferation of abnormal cells in the body. It may be fatal and result in the destruction of property and the loss of life. Therefore, melanoma skin cancer can enhance survival when detected early, and infection rates will drop as a result. In order to identify tumors at the primary level and to diagnose skin cancer early on, image processing algorithms are utilized. Since this condition is discovered by a human (a doctor), there is a chance for error during examination, which might spell tragedy for the patient's family. Automated melanoma skin cancer screening is currently gaining popularity. because the detection accuracy rate is so precise. There are certain restrictions on the prior research in this area. Therefore, we are working within those constraints to fix problems that will improve the accuracy of our system. We analyzed 15 publications that were relevant to our study out of the more than 35 that we investigated in order to provide a better outcome that would directly benefit infected patients and their families.

2.2 Related Works

Melanoma skin cancer has made some tremendous progress by the past few years due to automated detection. It is not just increased the accuracy of detection; the process is also becoming faster than before. The automated skin cancer detection using digital images has sped up the treatments procedure which fairly saved a lot of time for better diagnosis for the patients and their family, which will ensure to get a better treatment in time.

We are also proposed to work it another medical center for working several segments. Melanoma skin cancer can be identified through a medical screening process by looking at the skin part. Digital imaging techniques are thought to be used to capture the various skin layer portions so that a three-dimensional image may be afterwards rebuilt. The process of removing the most important information from 3D images is more difficult. Because of this, the majority of methodologies for evaluating skin cancer photos take 2D slices into account. The authors suggested a machine learning method to make it simple to assess the tumor locations. The grade of the tumor region was determined. A machine learning approach was suggested to do it. The machine learning approach employs a series of processes, including pre-processing, post-processing, and classification processes. The Fuzzy-Tsallis thresholding aids the Social Group Optimization (SGO) method, which enhances the pre-processing. The recommended thresholding was also supported by the noise-corrupted MRI slices. The post-processing implements Level-et Segmentation (LSS) to mine the tumor area. The performance of the LSS is validated using segmentation techniques like Active-Contour (ACS) and Chan-vase (CVS) approaches. The authors employed a Gray level co-occurrence matrix to extract the essential information from the tumor section and using statistical tests dominant characteristics. To validate the performance, Random Forest and K-Nearest 10 Neighbor (KNN) were also employed.

2.3 Comparative Analysis and Summary

In our research, we have suggested a deep learning method to more effectively identify brain tumors. We have suggested a Deep Convolutional Network (CNN) for entirely automated skin tumor segmentation in digital pictures that can address the disappearing contour issue in order to meet our objectives. We evaluated our proposed approach using a dataset that is openly accessible. The publicly viewable data set we utilized was acquired from Kaggle. Data scientists may still engage with one another on a range of topics using the Kaggle platform. Dataset preprocessing and augmentation were undertaken after sampling. It boosted the dataset's quality and length. In attempt to decide if a tumor is visible on the digital pictures or not, skin tumor segmentation has been implemented. Resnet-50 and Denset-121 have both been used to achieve this. Based on their level of accuracy, the two algorithms have been examined. Another model merging U-net architecture using Inception v3 has been established in order to compare overall performance. Then, the accuracy standards of the two models were compared. The site of the tumor has then been anticipated that use the model that has the greatest accuracy. To evaluate our proposed model, Accuracy, Precision, Recall, and F1-score have also been generated.

2.4 Scope of the Problem

A mass of abnormal tissue known as a skin tumor can form in the basal cell layer of the deep layer of the epidermis. There are basic kinds of this illness depending upon where it developed. Primary tumors develop from the epidermal tissue where they first manifest. Inside the skin, tumors can cause a wide range of health issues depending on their size. Even though they press against nearby tissues and organs, tumors can infrequently induce irritation or other symptoms. Even benign skin tumors can be lethal. This is deadly to many people. Not to mention the financial hardships the patient and their family must endure while pursuing medication. The probability of survival for people with melanoma skin tumors can be improved with early identification. Additionally, it might aid the patient's financial position. Automated melanoma skin tumor detection can make it simpler and more accurate to find sensitive skin. To achieve this, machine learning techniques can be applied. We concentrated on applying deep learning techniques to better accurately and precisely detect tumors. We also concentrated on finding ways to address the problems that arise while employing deep convolutional neural networks. such as the absence of vanishing gradient problem. Melanoma skin tumors can be identified sooner in the course of therapy utilizing our accurate recommendations. This dramatically improves the patient's chances of surviving.

2.5 Challenges

The major obstacle we confronted while working was accumulating and assessing the information. Due to unforeseeable circumstances, it was difficult for us to gather data in person while we couldn't go to the clinics and hospitals. We were forced to gather the information for our research online as a result. The next step was to choose the datasets that would work best for our research. Our data was gathered via Kaggle. This is a platform where data scientists may compete with one another on the chosen field of specialization. Another trouble started once the data had been compiled. To appropriately have used the artificial intelligence, we needed to restructure our data into pictures after collecting digital medical photos. We have to push ourselves to work constantly in to achieve superior quality and higher accuracy.

CHAPTER 3

Research Methodology

3.1 Research Subject and instruments

Our research subject mainly on the base on skin cancer. Here we basically try to detect the type of skin cancer. Mainly for detecting the type we focus the seven types of skin cancer on our work. skin cancer diagnosis is based on skin lesion imaging techniques such as dermoscopy examination which dermatologists use to evaluate skin pigmentation in terms of colour and texture because it avoids surface reflections on the skin and allows access to deeper layers [3].1stly we are using a some several of model for getting the better accuracy. From the image we are just try to find out the cancer segment part from this. From this research all the image helps us to find out to detect the cancer & where the cancer is located it tell us.

3.2 Data Set utilized

We are mainly collected our data from Kaggle.com site. Our data size is almost 3 GB. Almost all the types data are present our expected type (there we mainly focus 7 type data). From the type we are focusing the major amount of type data. Here mainly 7 types data present there. Our target goal is to detect the cancer type on the basis cancer type. All the csv file are imported 10,000 images on different types. Here mainly focus some attributes as like age, gender, diseases type. Affected place like nek, chest, knee finger, hand etc. RGB image are also use here which mentioned size 500 x 470 pixel and other 403 x 400 size are also mentioned here. It acts to offset the action of over-sampling for classes with smaller which actually need. Number pf under-sampling for classes with greater number of samples.

We are also collecting our data from HAM segmented skin lesions site here also presented 10000+ data which also help us to detect the cancer type.

ISIC dataset we are mainly use here. From the original data it actually helps to detect the skin cancer. We use this site because International Skin Imaging Collaboration (ISIC) help to prevent some challenges. Our dataset is imbalanced for that case we are using here the up – Sampling method.

3.3 Statistical Analysis

For machine learning image processing we just focus the statistical portion on their various part. From all the types we are basically use to this for detect the cancer types. Here mainly the detect the others factor of the. At this paper where mainly detect 7 types of cancers with 10,000 images.

1.Melanocytic nevi (6500 images)

2.Melanoma (1038 images)

3.Benign keratosis-like lesions (1038 images)

4.Basal cell carcinoma (500 images)

5.Actinic keratoses (400 images)

6.Vascular lesions (324 images)

7.Dermatofibroma (200 images)

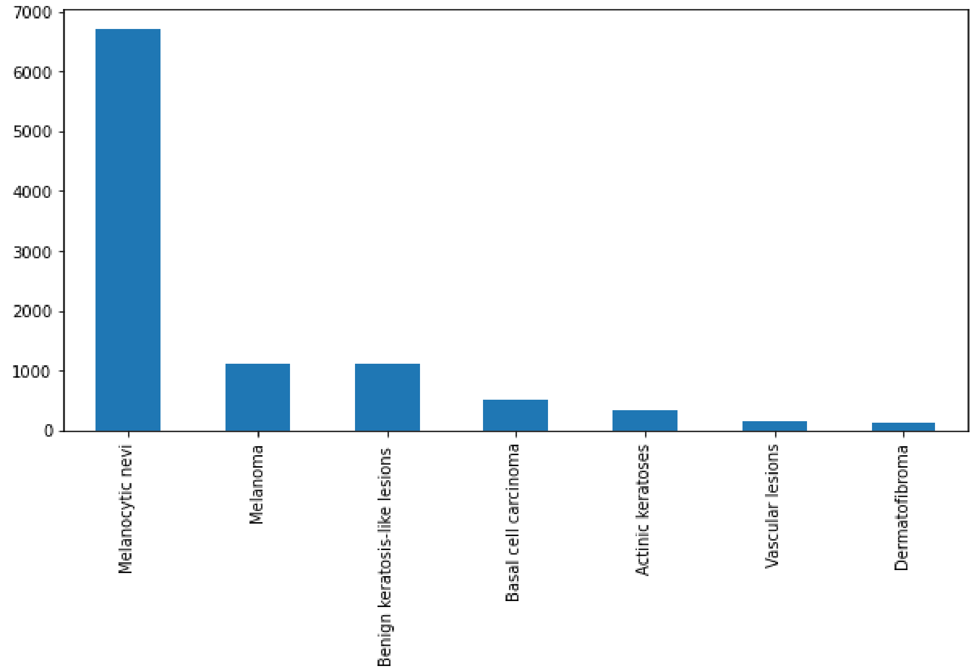

Figure 3.1: Distribution of the 7 different classes of cell types

Another time we are going to re-sampled the data from the given training data with respect to the re sampled data

1.Melanocytic nevi 1500
2.Melanoma 1113
3.Benign keratosis-like lesions 1099
4.Basal cell carcinoma 514
5.Actinic keratoses 327
6.Vascular lesions 142
7.Dermatofibroma 115

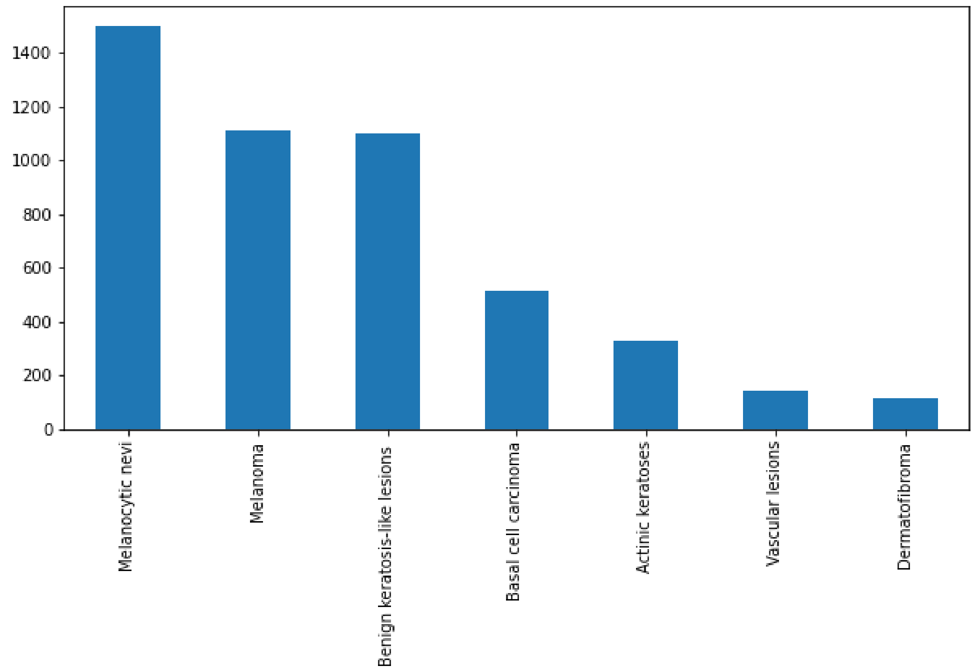

Figure 3.2: Re-sampled data with the cancer type

On our body aspect we are try to find the location of the body where the cancer will be located. it 's actually help us the to find out the location body part where the cancer located.

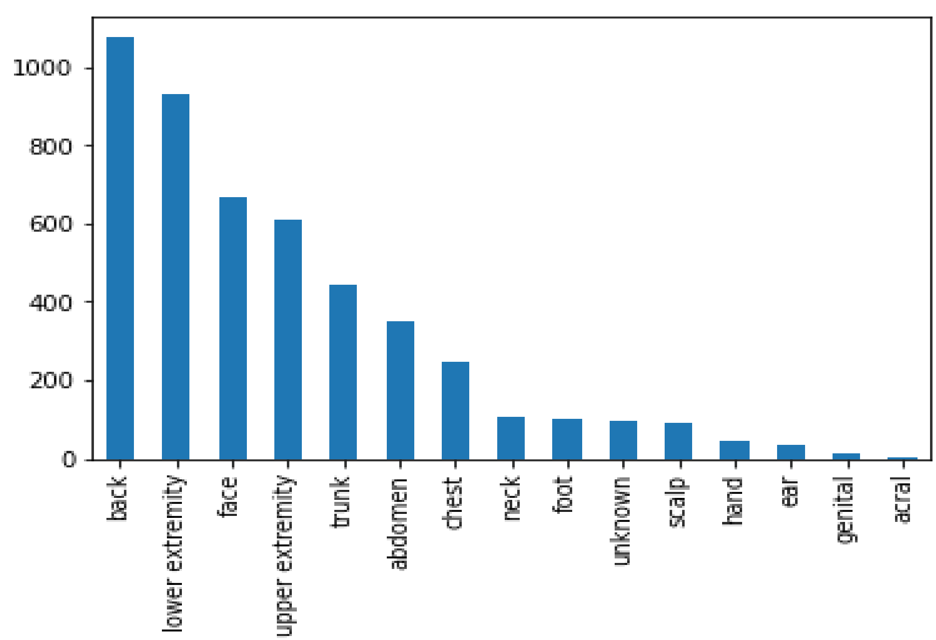

Figure 3.3: Plotting the distribution of localization field

On the respect of age, we are also going to see the cancer detected with respect their age by the g raphical re-presentation. For this we are going to divide it into 4 age range which actually given a t the below.

1(.0-20) age 3%
2.(20-40) age 7%
3.(40-60) age 42%
4.(60-80) age 48%

Table 3.1: Distribution of Age with ratio

No	Age Range	Percentage
1	0-20	3%
2	20-40	7%
3	40-60	42%
4	60-80	48%

The graphical representation at the below with the age with the cancer type detection

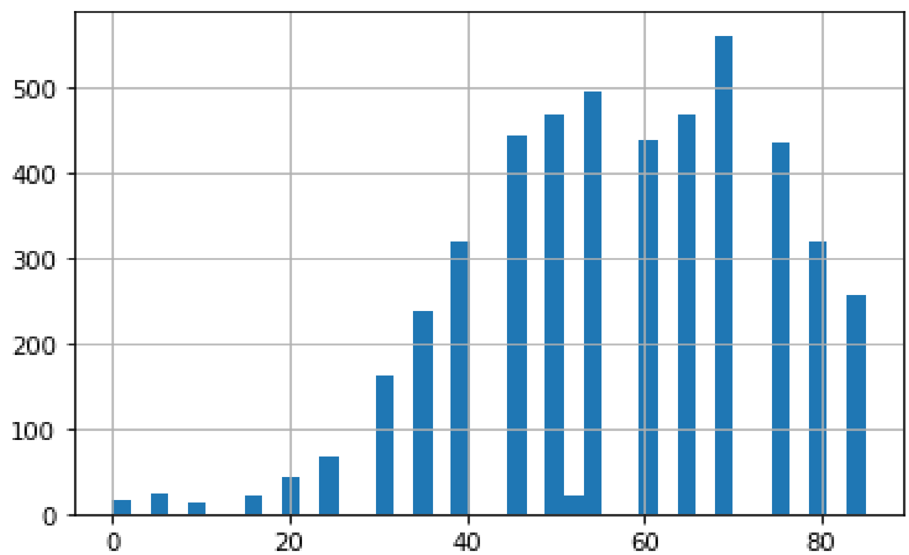

Figure 3.4: Distribution of Age

On the basis on gender, we are also classifying the cancer type with gender. Its actually help us f or getting the thought of gender

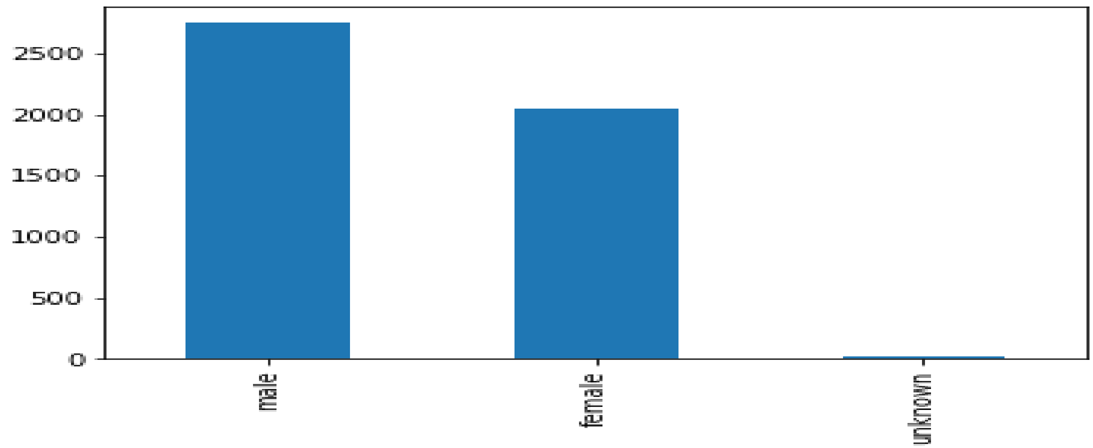

Figure 3.5: Distribution of gender

Table 3.3.2: Preview Data with respect age, sex& Localization

No	Lesion Id	Image Id	DX	DX_Type	Age	Sex	Location
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

3.4 Applied Mechanism

1.up-Sampling

2.Down -Sampling

3.Accuracy Matrix

4.Confussion Matrix

5.Auc Score Matrix

3.4.1 Up-Sampling Method

Our data is imbalanced for that case we need to settled down this for getting the perfect accuracy of our measurement data. The Up-sampling method is a tool in post-production software to increase resolution. It's most common in graphic and photography design to increase the resolution of an image, but it can also be used to increase the resolution of a video file (say, from 360p to 1260p) or any other visual data.

At the image we are There are two major situations where up sampling an image is a good idea. The first is when you're working with a digital file that is extremely small, maybe just a few hundred pixels across. The second is when you're printing an image and want to avoid pixelation in the details. I'll go through both of those below.

3.4.1.1 Low Resolution image:

3.4.1.2 Printing Method:

3.4.1.1 Low Resolution image method:

If we come across a tiny image online (public domain hopefully) and we want to put it in a presentation or send to a device, we may be surprising if we can use an up-sampling algorithm to increase its level of detail.

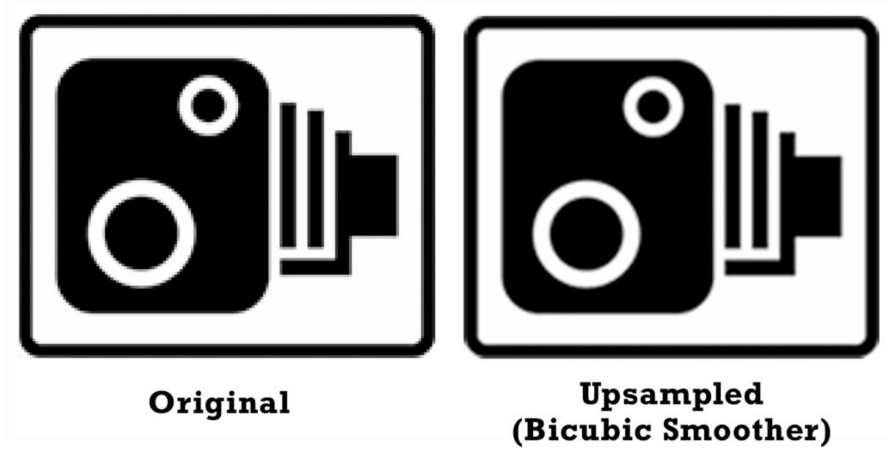

Figure 3.6: Low Resolution Image [MDPI]

3.4.1.2 Printing Method

At this segment we are just prediction the high-level picture which actually captured by DSLR camera or high-level range camera like iPhone or another device camera. Here mainly we use this for ensuring the perfect accuracy.

3.4.1.3 Auc Score Matrix

At machine learning this type of matrix help us our accuracy measurement state. This help to verify the others step of this to verify.

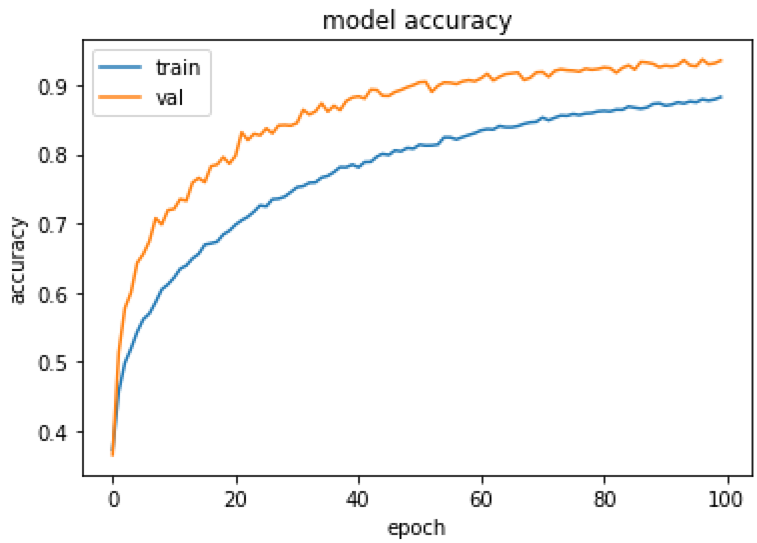

Figure 3.7: auc- Score matrix measurement

3.4.1.4 Confusion Matrix

In the problem of machine learning we need to fixed up our problem then try to solve this problem. Here Confusion matrix help us to solve this problem. It's another name is Error detect matrix. It's another special theme is that it has special layout templet. It has special type of table layout for detecting some sites.

Its use some content.

1.TP: True Negative

2.TN: True Negative

3.FP: False Positive

4.FN: False Negative

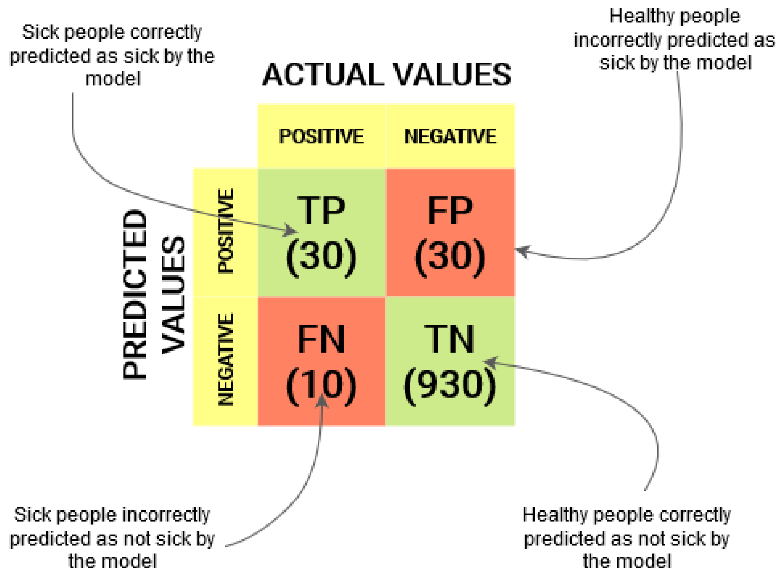

Figure3.8: Confusion Matrix [google]

$$Precision = \frac{30}{30 + 30} = 0.5$$

$$Recall = \frac{30}{30 + 10} = 0.75$$

Figure 3.9: precession & Recall with example [google]

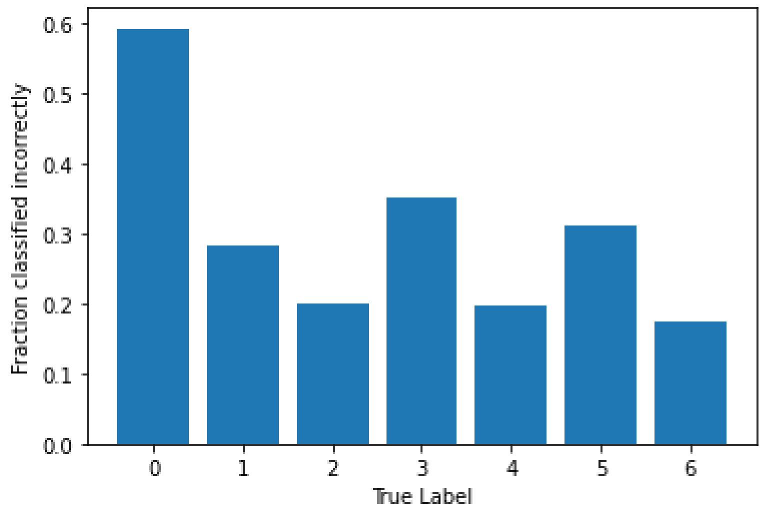

Figure 3.10: Detect fraction classified incorrectly level

3.5 Implementation Requirements

Tools:

3.5.1. TensorFlow Kera's

3.5.2. SciKit Learn

3.5.3. NumPy

3.5.4. Pandas

3.5.5. HAM10000 Skin Cancer dataset

3.5.6. Pre-trained weights from ImageNet for the VGG16 model

3.5.1 TensorFlow Kera's

For training we are basically use TensorFlow site. For this we are 1st trained up our model with this. TensorFlow site help us by making a structure. Basic structure help to build up the content theme of our project. We 1st training up a machine look like our model then it actually gives some relevant image for training up this. After going to trained up this we basically work by using site. At this platform we basically apply a multiple machine learning by giving some tasks at a time. Kera's is a high-level neural network library. Here our all apply library like CNN, VG-16 all are execute here with a proper segment.

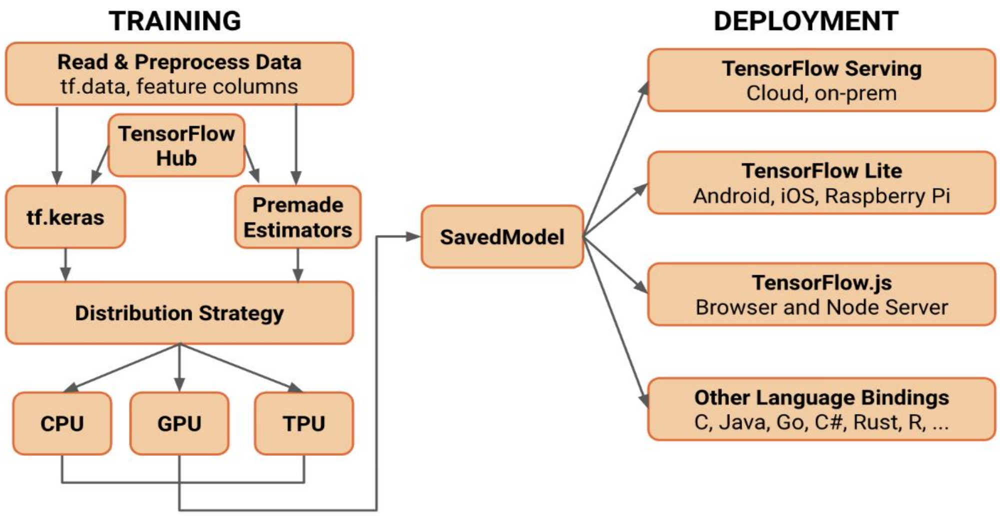

Figure 3.11: TensorFlow Body Structure [google]

3.5.2 SciKit Learn

It's basically use for scoring of some several types of pictures. Its help to describe all the model efficiency by evaluating.

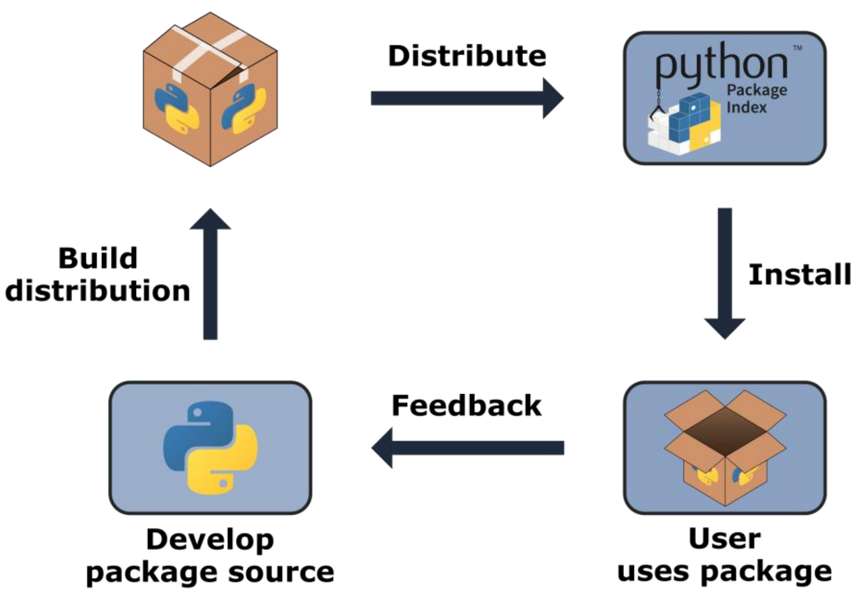

Figure 3.12: SciKit Learn Structure [google-10]

3.5.3 NumPy

It's an essential library which actually help us to do scientific calculation as we as computation specially at machine learning. For scientific calculation its mainly use at python. It's a more compact than others list in python for getting the better accuracy.

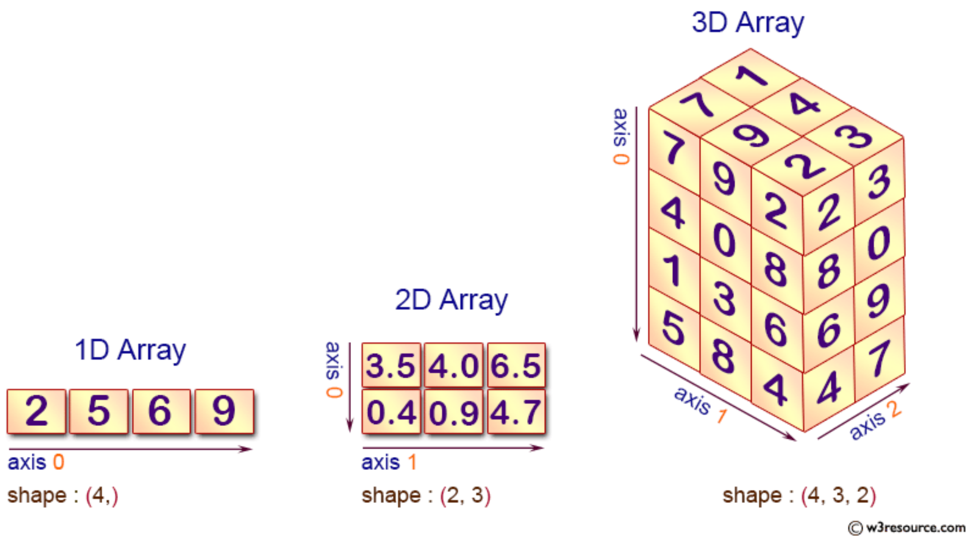

Figure 3.13: NumPy Library [google]

3.5.4 Pandas

For data analysis Pandas is used. It's basically a library for data analysis. It's used for compact package as a tool for compact.

Before panda's library it's so difficult to find out the multiple combine's package. Pandas basically discover at 2008. Pandas library have vast feature to find out data. Basically, it uses 4 types features.

3.5.4.1: Pivot Table

3.5.4.2: Split apply combine

3.5.4.3: Data Visualization

3.5.4.4: Working with missing data.

3.5.5 HAM10000 Skin Cancer dataset

We use this data from the Kaggle site. Here almost present 10000+ data which divided into many types. We basically use here 7 different types of data. For going to collect data we were facing some challenges. We mainly prefer ISIC data set for our work. It ensures us all the types data (here mainly our target is 7 types data).

The infected location site is located throughout out the body part.

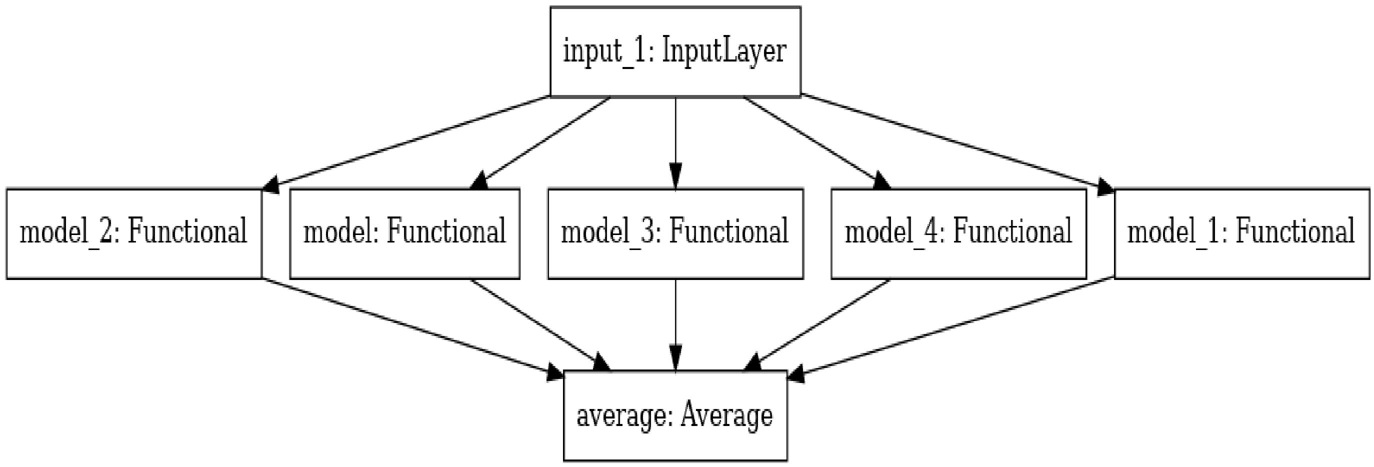

Figure 3.14: Data set from the input resulted value [google]

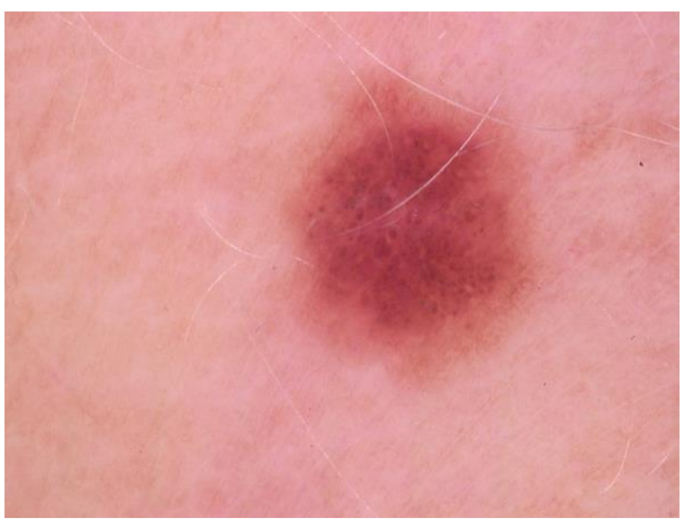

Figure 3.15: Sample data test

Model Name

3.5.7 VGG16

It's a part of Conventional Neural Network model architecture. It's actually on of the excellent vision model network for image processing till now. It actually works layer wise by like 2x2 and 4x4 layer.

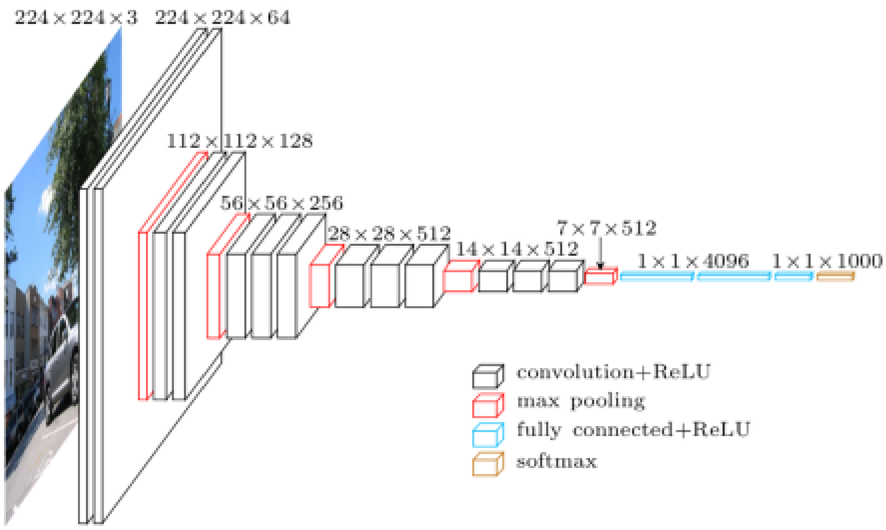

Figure 3.16: Architecture of VGG-16 Model [google]

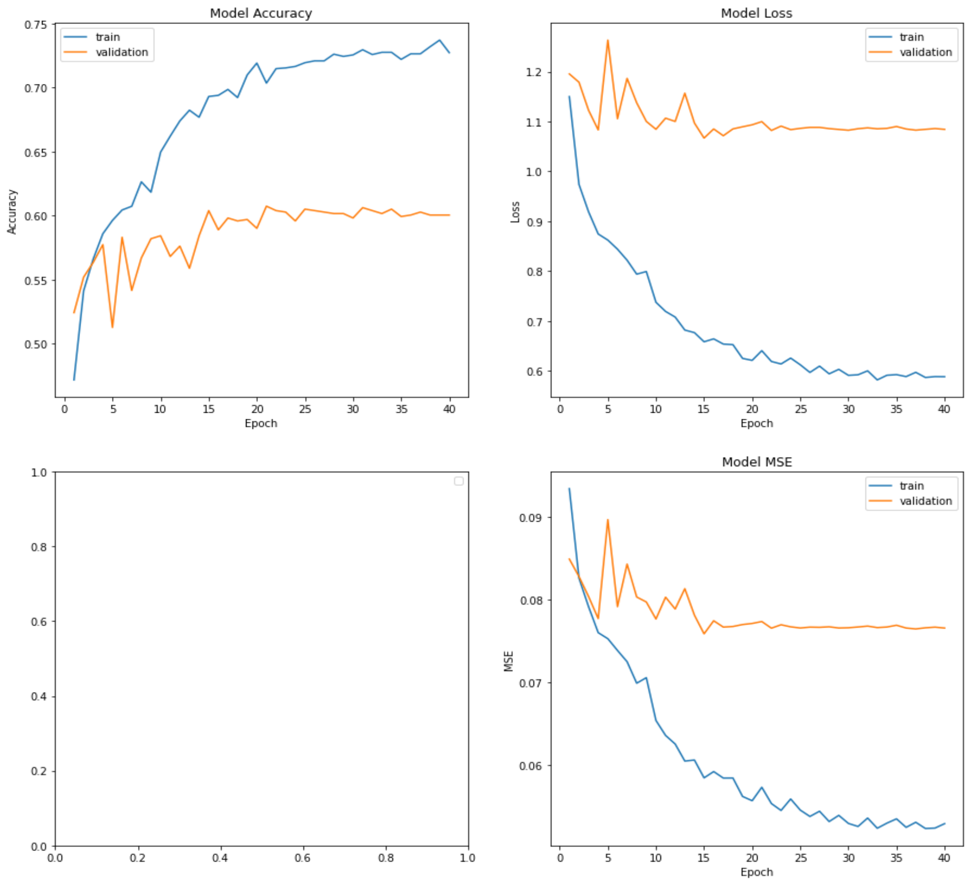

Figure 3.17: VGG-16 Model training result

3.5.8 REsNet50

Though CNN (Conventional Neural Network) is capable to detect high-Mid-low level for all the aspect from the image. But after using REsNet 50 architecture is more capable for detecting the more frequent. So, for getting more frequent result after comparison between the two pictures. So, getting better we use this.

layer name	output size	18-layer	34-layer	50-layer	101-layer	152-layer
conv1	112×112	7×7, 64, stride 2				
		3×3 max pool, stride 2				
conv2_x	56×56	$\begin{bmatrix}3\times3, 64\\3\times3, 64\end{bmatrix}\times2$	$\begin{bmatrix}3\times3, 64\\3\times3, 64\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 64\\3\times3, 64\\1\times1, 256\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 64\\3\times3, 64\\1\times1, 256\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 64\\3\times3, 64\\1\times1, 256\end{bmatrix}\times3$
conv3_x	28×28	$\begin{bmatrix}3\times3, 128\\3\times3, 128\end{bmatrix}\times2$	$\begin{bmatrix}3\times3, 128\\3\times3, 128\end{bmatrix}\times4$	$\begin{bmatrix}1\times1, 128\\3\times3, 128\\1\times1, 512\end{bmatrix}\times4$	$\begin{bmatrix}1\times1, 128\\3\times3, 128\\1\times1, 512\end{bmatrix}\times4$	$\begin{bmatrix}1\times1, 128\\3\times3, 128\\1\times1, 512\end{bmatrix}\times8$
conv4_x	14×14	$\begin{bmatrix}3\times3, 256\\3\times3, 256\end{bmatrix}\times2$	$\begin{bmatrix}3\times3, 256\\3\times3, 256\end{bmatrix}\times6$	$\begin{bmatrix}1\times1, 256\\3\times3, 256\\1\times1, 1024\end{bmatrix}\times6$	$\begin{bmatrix}1\times1, 256\\3\times3, 256\\1\times1, 1024\end{bmatrix}\times23$	$\begin{bmatrix}1\times1, 256\\3\times3, 256\\1\times1, 1024\end{bmatrix}\times36$
conv5_x	7×7	$\begin{bmatrix}3\times3, 512\\3\times3, 512\end{bmatrix}\times2$	$\begin{bmatrix}3\times3, 512\\3\times3, 512\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 512\\3\times3, 512\\1\times1, 2048\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 512\\3\times3, 512\\1\times1, 2048\end{bmatrix}\times3$	$\begin{bmatrix}1\times1, 512\\3\times3, 512\\1\times1, 2048\end{bmatrix}\times3$
	1×1	average pool, 1000-d fc, softmax				
FLOPs		1.8×10^9	3.6×10^9	3.8×10^9	7.6×10^9	11.3×10^9

Figure 3.18: REsNet50 Architecture [google]

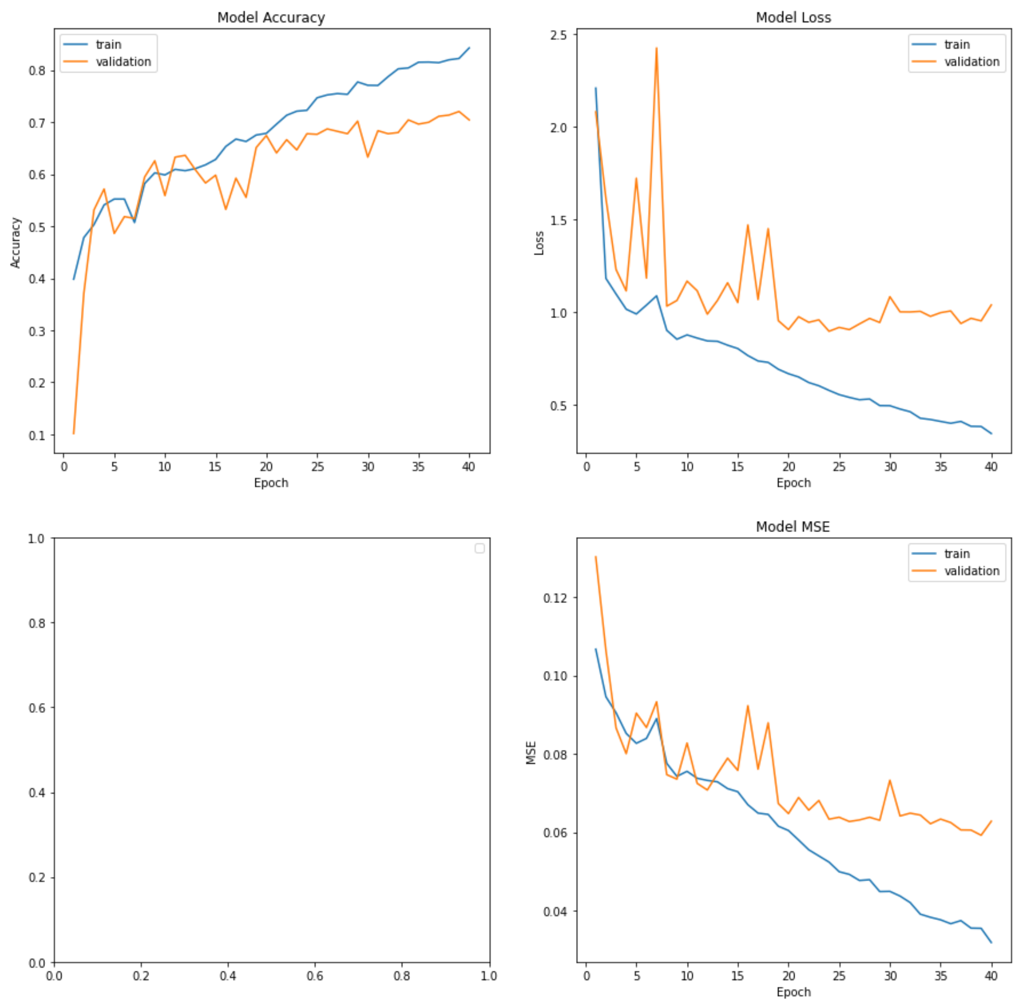

Figure 3.19: REsNet 50 Model training result

3.5.9 Mobile Net v

It's one kind of type conventional Neural Network where actually designed embedded system design and embedded vison application. It's also essential for our model.

Table 1. MobileNet Body Architecture

Type / Stride	Filter Shape	Input Size
Conv / s2	$3 \times 3 \times 3 \times 32$	$224 \times 224 \times 3$
Conv dw / s1	$3 \times 3 \times 32$ dw	$112 \times 112 \times 32$
Conv / s1	$1 \times 1 \times 32 \times 64$	$112 \times 112 \times 32$
Conv dw / s2	$3 \times 3 \times 64$ dw	$112 \times 112 \times 64$
Conv / s1	$1 \times 1 \times 64 \times 128$	$56 \times 56 \times 64$
Conv dw / s1	$3 \times 3 \times 128$ dw	$56 \times 56 \times 128$
Conv / s1	$1 \times 1 \times 128 \times 128$	$56 \times 56 \times 128$
Conv dw / s2	$3 \times 3 \times 128$ dw	$56 \times 56 \times 128$
Conv / s1	$1 \times 1 \times 128 \times 256$	$28 \times 28 \times 128$
Conv dw / s1	$3 \times 3 \times 256$ dw	$28 \times 28 \times 256$
Conv / s1	$1 \times 1 \times 256 \times 256$	$28 \times 28 \times 256$
Conv dw / s2	$3 \times 3 \times 256$ dw	$28 \times 28 \times 256$
Conv / s1	$1 \times 1 \times 256 \times 512$	$14 \times 14 \times 256$
$5\times$ Conv dw / s1 Conv / s1	$3 \times 3 \times 512$ dw $1 \times 1 \times 512 \times 512$	$14 \times 14 \times 512$ $14 \times 14 \times 512$
Conv dw / s2	$3 \times 3 \times 512$ dw	$14 \times 14 \times 512$
Conv / s1	$1 \times 1 \times 512 \times 1024$	$7 \times 7 \times 512$
Conv dw / s2	$3 \times 3 \times 1024$ dw	$7 \times 7 \times 1024$
Conv / s1	$1 \times 1 \times 1024 \times 1024$	$7 \times 7 \times 1024$
Avg Pool / s1	Pool 7×7	$7 \times 7 \times 1024$
FC / s1	1024×1000	$1 \times 1 \times 1024$
Softmax / s1	Classifier	$1 \times 1 \times 1000$

Figure 3.20: Architecture of Mobile net V [google-7]

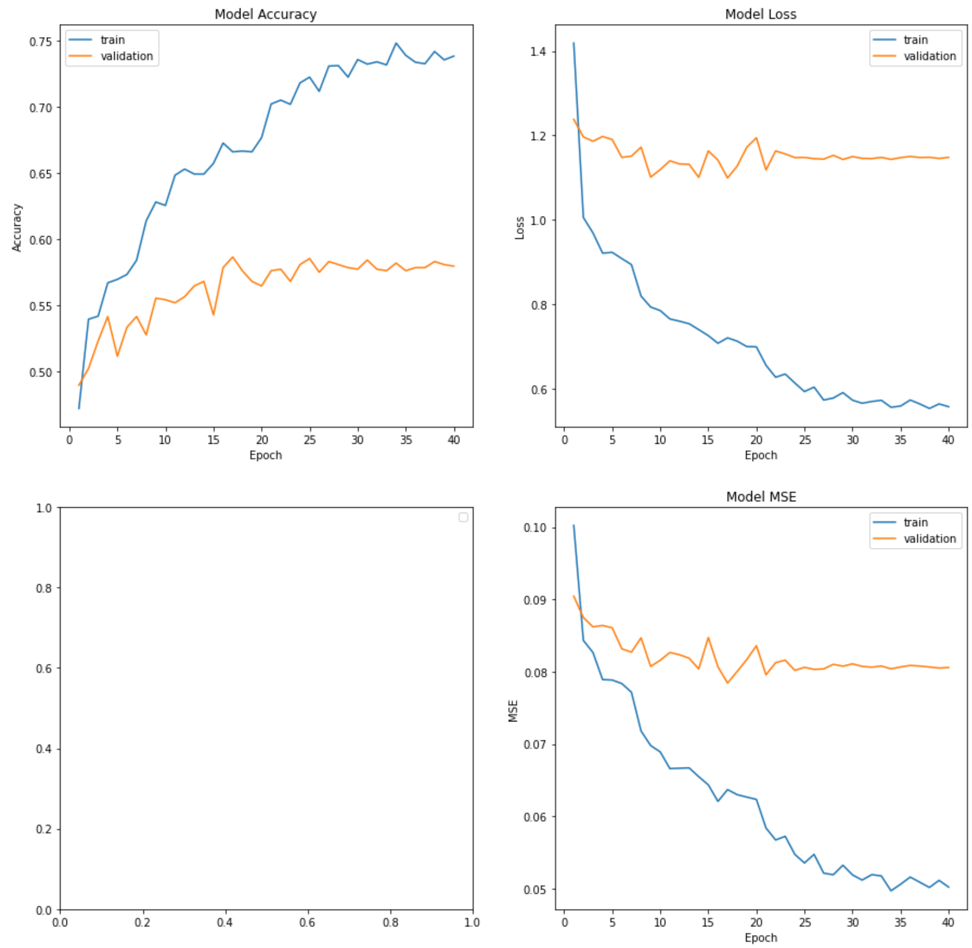

Figure 3.21: Training result for Mobile net V Model

3.5.10 Xception net

It’s also part of CNN Model. We are actually use this model for getting our expectable accuracy for our work.

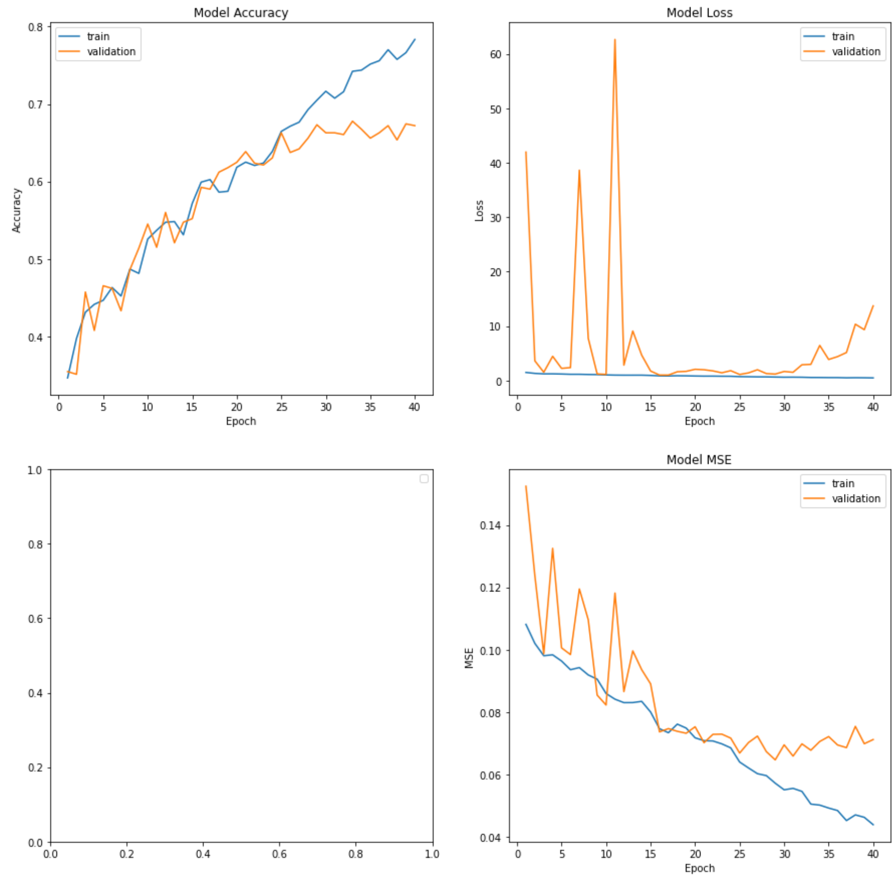

Figure 3.22: Training result for Mobile Xception net Model

After all those models we are also use this model. Which we are going to mentioned at the below.

3.5.11. Efficient net

3.5.12.VGG-19

3.5.13. Densest 121

CHAPTER 4

Experimental Results and Discussion

4.1 Experimental Setup

We are using both online and offline site for this experiment. For online we both use google co-lab and Kaggle site. For this we need to ensure the ram size of our disk and others issues like sustainable net connections and running cell. for offline we need to set up

A machine equipped with an Intel Core i7-8800 @ 3.4GHZ, 16GB of memory, and an NVIDIA graphics card GTX1080Ti GPU card.Which actually keep running this process Our machine runs Ubuntu 17.04 and PyTorch [29] version 0.4.2 with CUDA 9.0 and cudnn 8.0.5.

Our environment needs to prefer for the setup or the experiment. Its need to ensure for better environment for this experiment.

4.2 Experimental Results & Analysis

We are using a several types of models for this Our motive are too simple and that is we need to performed multiple models.

As our work is skin cancer detection so for that case, we get satisfy Lebel. Our resulted accuracy level going to increasing by one to other one. This accuracy we get by using vg16-model most which help us to detect more than others model.

4.2.1 Confusion Matrix

We are actually applied this for predict the types from the data set. Our dataset is vast for getting the actual types from this large data set we actually use this.

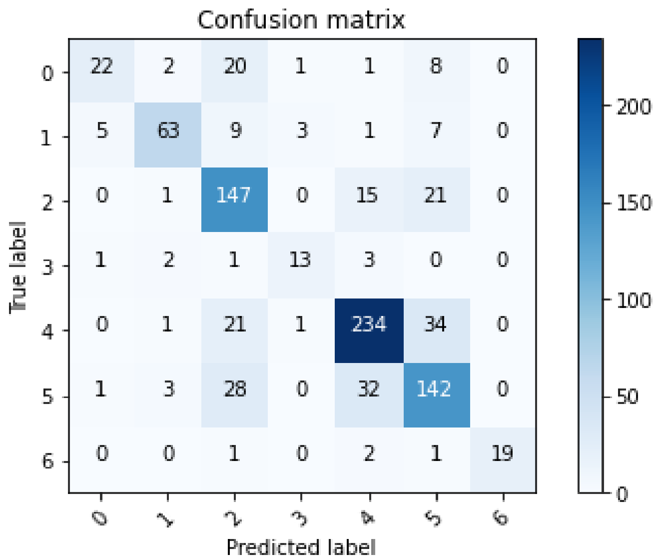

Figure3.23: Predicted level using Confusion Matrix

```
16/16 [======================
oss: 1.0250 - accuracy: 0.7256
9864.0000
28/28 [======================
oss: 1.1988 - accuracy: 0.7055
8628.0000
ResNet50
Validation: val_accuracy = 0.7
62
Test: accuracy = 0.725572  -
```

Figure 3.24: Measurement of accuracy matrix

After using vgg-19 model here, we get 82% accuracy.so it's given us a more compact result than the others one. Further which increase 94.7%.

```
206/206 [==============================] - 16s 78ms/step
- loss: 0.4792 - accuracy: 0.8244 - val_loss: 0.2884 - va
l_accuracy: 0.9037

Epoch 00055: saving model to best_model.h5
Epoch 56/100
206/206 [==============================] - 16s 79ms/step
- loss: 0.4776 - accuracy: 0.8243 - val_loss: 0.2804 - va
l_accuracy: 0.9032

Epoch 00056: saving model to best_model.h5
Epoch 57/100
206/206 [==============================] - 16s 79ms/step
- loss: 0.4850 - accuracy: 0.8213 - val_loss: 0.2892 - va
l_accuracy: 0.9015
```

Figure 3.25: Result (accuracy)

4.3 Discussion

Our work is cancer type detection and for that case we using multiple models for getting the better result. After applying multiple models, we get VGG-19 model which give us better accuracy for detecting the type.

All the model which I applied here on the base on CNN model but for going to the layer segment part in depth we found our acceptable level part.1st we trained our model then we are try to find out the type of cancer. Here we actually detect 7 types of Cancar. We actually proposed the type of cancer.

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 impact on society

It has been observed that convolutional neural network (CNN) method used for detecting skin cancer is more precise and features a high degree of accuracy. Precise prediction of cancer types is critical for cancer diagnosis and therapy. Conventional machine learning method is used to detect cancer cells shows less accuracy and slower prediction of cancer type. Patients diagnosed with cancer such as lung cancer, breast cancer tends to spend a considerable amount of money on cancer diagnosis, but using CNN method to detect cancer can plunge the diagnosis cost significantly. Doctors can also predict/ the cancer type much faster with higher accuracy. Many people receive skin cancer diagnoses each year. And many lives are lost in the absence of competent care. In the United States, there were 99,780 brain tumor diagnoses and 7650 deaths. When considering the entire planet, the figure increases significantly. As a result of the hundreds of deaths it causes each year, skin cancer is one of the largest hazards to civilization. Tumors, which are unnatural cells, create cancerous cells.

Skin cancer is brought on by the development of abnormal cells under the epidermal layer of skin. Treatments at an early stage is needed to prevent the formation of abnormal cells and skin cancer In order to detect skin cancer, digital imaging is required. Digital imaging has seen a lot of development. However, the procedure for diagnosing the illness remains the same. Manual infection detection is done by the doctors. There is always a potential that a doctor may make a mistake because they are also people. Not to mention the fact that a cancer diagnosis can sometimes mean the difference between life and death.

Our project is more dependable and adaptable thanks to the features. Deep learning techniques were used to complete the entire job. In comparison to earlier melanoma skin cancer detection techniques, our suggested approaches produced improved outcomes. Because of this, our project can swiftly and precisely identify cancer.

Our effort aims to benefit society at large and the medical industry. We frequently support the patient's family as well. If the growth is not found sooner, it might develop into cancer. It may put financial and emotional strain on the patient's family as well as the sufferer. Due to the high expense of cancer treatment, melanoma skin cancer might result in financial loss. This can bring in morbidity and early death. Not to mention the financial and psychological strain the patient's family faces.

The wage earner in the family may pass away occasionally. This might ruin the financial situation of the family. These can cause worry, anguish, and depression in both the patient and the patient's family. The expenditure of therapy increases significantly if cancer is not diagnosed sooner, and medication waste can have a negative impact on the environment. Consequently, how cancer may impact society as a whole. In these circumstances, our project frequently assists. It speeds up the skin cancer detection procedure. It may result in the patient receiving therapy earlier. Early cancer therapy is typically beneficial for recovery. The patients and their families may then live healthier and more regular lives like the rest of us. Consequently, the social impact of our initiative.

5.2 Impact on Environment

It is possible to view skin cancer as a curse on humanity. This sickness has claimed many lives throughout the years. One of the most delicate elements of the human body is the skin. A tumor is mostly an aberrant cell development. Since there is currently no treatment for skin cancer, many individuals pass away from it every year. Preventing it is the answer, then. However, the work might be exceedingly challenging at times.

If skin cancer can be found early on, the survival percentage is often substantially greater. Digital imaging is utilized to do that. To diagnose a delicate illness like skin cancer, however, the same approach is currently being utilized. The majority of the time, when doctors are viewing the photos, tumors are found. However, physicians are also fallible human beings, and human beings make mistakes. Again, a technical error might occur occasionally. Digital images that are blurry and dim can be confusing. An error in judgment can result in significant loss.

Around the world, thousands of people receive a skin cancer diagnosis each year. Thus, the detection of cancer involves the utilization of countless digital photographs. Plastic was mostly employed to make the digital pictures that are used. because plastic does not decompose in soil. Because of the soil pollution it creates, it greatly harms the ecosystem. Additionally, burning the plastic is useless since it pollutes the air.

Therefore, the disposal of actual digital photos contributes significantly to environmental damage. It might be bad for both people and the entire eco system. Not to mention the chemical waste of the cancer-treating medications if a tumor is not found early. This problem will also be resolved by our project. In our study, deep learning methods were employed to create an automated skin cancer and tumor detector. Our project's major objective is to automatically identify melanoma skin cancer with more accuracy and speed than the current method of cancer detection.

Compared to the majority of the conventional deep learning techniques, our suggested method produces superior outcomes. Our project is more dependable and adaptable thanks to the features. As a consequence, our project is capable of detecting a variety of skin tumors. Thus, our project is even more adequate.

Since our project is automated and employs deep learning techniques, there is less of a requirement for actual digital photographs. This means that our project can only detect skin tumors using digital data. It has the potential to significantly affect the environment. There will be fewer actual digital photographs if skin cancer can be identified using our automated technology in the majority of locations. There will be reduced plastic consumption because these digital reports are composed of plastic. The soil and air will be preserved as a consequence. It can result in a more wholesome atmosphere. And a healthy environment translates into a healthier way of life for the inhabitants.

Those patients will be given therapy earlier as a result. This may alter the course of events. Patients who are diagnosed with skin cancer in its early stages have considerably better survival odds. As a result, less drugs and other treatments will be used. This may cut down on waste. This is also beneficial for the environment and the financial situation of the patient. We want to increase the survival rate of skin cancer patients while simultaneously reducing the negative effects on the environment. And that's exactly what our project accomplishes. Consequently, the environmental effect of our project.

5.3 Ethical Aspects

Our initiative aims to make skin cancer detection more effective and quicker in the medical industry. More and more patients will benefit as a consequence, ultimately saving more lives. Because the likelihood of survival will rise the earlier the cancer is discovered. Additionally, it will benefit the patient's psychological and economic conditions. The sooner the patient recovers, the less money will need to be spent, and the quicker the patient may resume working. The patients will be able to receive precise results thanks to our project. Testing errors can occasionally have severe results. Since improper care might result in several consequences. It sometimes also causes a number of disorders. From it, very serious financial issues may develop. We utilized public domain datasets to finish our study. It was taken from Kaggle. And the information contained in the datasets was likewise gathered with permission.

Additionally, we intend to gather real-time data from medical facilities like hospitals. These figures are going to be more precise. The precision of our study will rise when more precise datasets are used. Because of this, we can provide patients better methods for spotting skin cancer, which will benefit them more. As a result, everything of our labor is morally acceptable.

5.4 Sustainability Plan

Deep learning algorithms are being used in our study to find tumors and cancer. Making use of Deep Learning technology Our study can assist doctors in identifying tumors, determining the extent of tumors, and determining the true state of patients. Our study focuses on both the detection and classification of tumors. Our research will enhance the process of identifying skin cancer from skin digital photos by employing several types of algorithms. Our study will enable the doctor to distinguish between patients with different stages of tumor occurrence with ease. If the doctor is aware of the tumor's stage, they can treat it effectively. In order to sustain this research, we will gather additional information from other databases. We'll visit the hospital as well to speak with the staff and patients. Knowing that we will have a better chance of obtaining accurate information if we can speak with them directly. it could be a better source of information than the online one.

The information we gathered from hospitals and other healthcare institutions will then be combined with datasets available from internet sources. As a consequence, skin cancer detection will become more accurate, and we will be able to identify it more quickly and precisely than previously. of which many lives can be saved. Our initiative will be viable if we can save people by detecting skin cancer more accurately than before and when we can assist the physicians and the patients with the therapy.

CHAPTER 6

Summary, Conclusion, Recommendation and Implication for Future

6.1 Summary of the Study

After the end we are going to detect the cancer by using some CNN model. Specially if we are talk about vg-16 model which actually give us satisfy level accuracy. 1st we input a image which is obviously related to the skin cancer then our work tell the type of cancer. Almost 7 popular cancer types we work here. We also use confusion matrix at this for getting the accurate accuracy to our work.

6.2 Consolations

Our work is mainly Skin cancer detection. So, skin cancer images are still mostly diagnosed visually by   analyzing. whatever, for detecting the skin diseases we need to requires advanced computational models as well as high classification accuracy. For that we use vgg-19, VGG-16 Mobile ner ,Xception net model in unbalanced proportions extracted from HMM10000+ dataset. The proposed model achieves an accuracy of 87.4% on test sets and 83% on validation sets. The designing of a deep learning model depend we also use here confusion matrix,auc-predic score Metrix   not only on providing high accuracy on a given dataset, we try to provide a computationally efficient model to be run on low-power devices as well as smart phone or other device.

6.3 Implication for further study

Our target is that, here actually we use several types of models. In the future, we will use deep learning algorithms for getting high accuracy and performance will be applied as histopathological examination tool to improve human skin health.

As well as we use software attention layer for getting the high accuracy after comparing the multiple models. We are also using the segmentation part is here in future. So far we just try to detect the cancer and after detecting we just tell the cancer type but in future we will segment the cancer type.

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