ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670

Melanoma Detection using Convolutional Neural Networks

P. Rupa[1]; Dr. K. S. Raja Shekhar[2] and P. Bhanu Prakash[3]
Student[1]; Assistant Professor Department of ECE[2]; Assistant Professor Department of EEE[3]
Dr. YSR University college of Engineering and Technology, ANU, Guntur, India.

Abstract:- In humans, most severe and common type cancer is skin cancer. Skin cancers are basically 3 types: basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and Melanoma. Among these Melanoma is dangerous skin cancer. Melanoma is classified as two types: Benign Melanoma and Malignant Melanoma. If Melanoma can be identified in early stages it can be cured easily. The conventional method for detecting Melanoma is very painful. In this study deep learning techniques like CNN is used to detect Melanoma. CNN consists of convolutional layers, pooling layers and fully connected layers. Both training and testing of images can be done using CNN. ISIC Archive 2017 dataset is given to the network. By comparing different number of epochs and batch size, accuracy is noted. Highest accuracy 88.89% is achieved at 45 epoch count and batch size 2.

Keywords:- *Melanoma, Benign, Malignant, ISIC Archive Dataset 2017, CNN.*

I. INTRODUCTION

Skin is uncovered part body since it covers entire body parts. So, diseases and infections occurs more to the skin. Around 3.5 million people detect skin cancer every year across the globe. Among all types of skin cancers melanoma is dangerous skin cancer. Only microscopic images helps dermatologists in diagnosing skin disease. Now computer based cancer diagnosis is more efficient than the conventional method. Environmental conditions like UV radiations, atmospheric pollution are reasons for the cause of skin cancer. Malignant Melanoma is more dangerous than the benign melanoma.

II. LITERATURE REVIEW

Aya Abu Ali and Hasan AI-Marzouqi [2] proposed a frame work based on LightNet. Dataset used here is International symposium on Biomedical Imaging (ISBI) 2016 challenge. It consists of 900 training images and 380 testing images. Training dataset consists of 727 benign and 173 malignant images. Testing dataset consists of 305 benign and 75 malignant images. Original size of images varies from 1022*767 to 4288*2848 pixels.

E. Nasr-Esfahani, S. Samavi, et.al, [1] proposed a system equipped with Graphical Processing Unit (GPU). The system consists of two steps pre-processing and CNN. Input images are resized to 188*188. 9 images are rotated by 0, 90, 180, 270 then 36 synthesized images are formed by cropping and rotation. With this 170 images were increased to 6120 original and synthesized images.

Aurobindo Gupta, Sanjeev Thakur and Ajay Rana [3], proposed a methodology consists of Image-Acquisition, Image Pre-processing, Image Augmentation, Feature Extraction and Image Classification. ISIC 2018-2019 dataset is used with training images 10015 and 25333, but these dataset consists not only melanoma 7 types of skin cancers.

Abhinav Sagar, J Dheeba [4], proposed 3 pre-trained models: inception v3, inception ResNet v2 and ResNet 152. In all these 3 cases input images were resized to 224*224. Optimizer Adam is used. ResNet 152 gives better accuracy among all those.

Hasan Abed Hasan, Abdullahi Abdu Ibrahim [5], proposed ResNet50, VGG16, InceptionV3, VGG19, Xception, MobileNetV2, MobileNet to find better model for skin cancer detection. ISIC dataset with 3300 images is used. 2640 images for training and 660 for testing. Images are resized to 224*224. Least accuracy 54.54% obtained for MobileNetV2 is and highest accuracy 85.30% obtained for Xception.

Le Thu Thao, Nguyen Hong Quang [8], used ISIC 2017 dataset with 2000 training and 600 testing images. CNN, VGG16 with transfer learning are used. Input images are resized to 224*224. CNN is trained with 20 epochs and 20 batch size where VGG16 is trained with 20 epochs and 15 batch size. Average accuracy of 81.06% is obtained for the proposed method.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670

III. PROPOSED METHODOLOGY

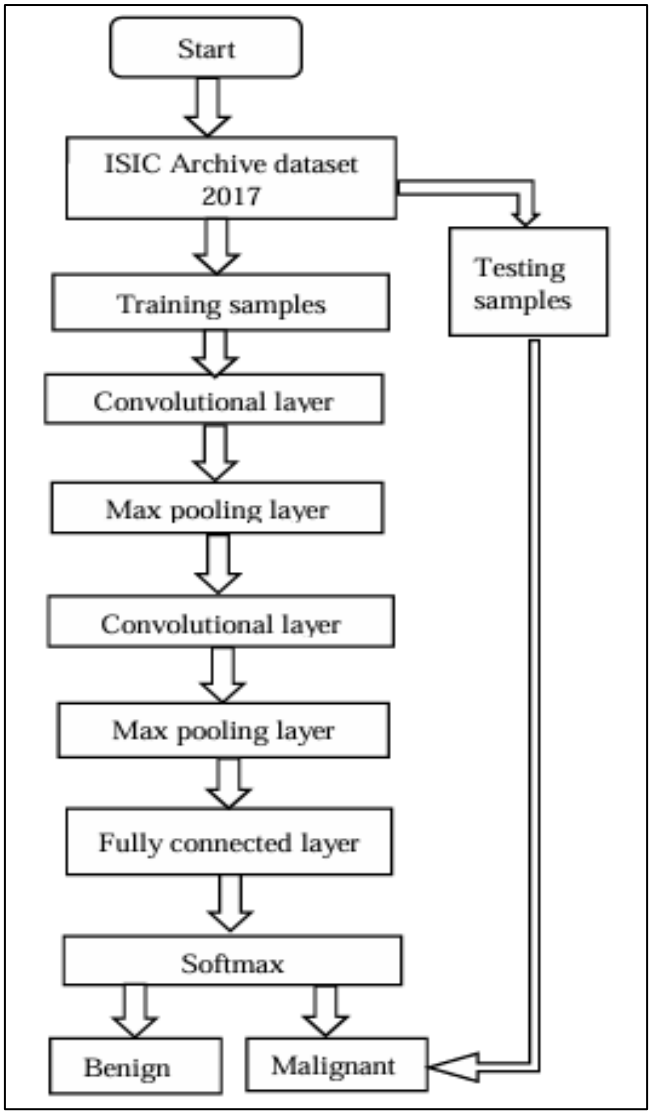


Fig 1 Flow Chart for Proposed Methodology

ISIC Archive 2017 dataset is considered for detection of melanoma Consists of 2000 training images and 600 testing images, consists of both ground truth images and metadata. Image resolution range from 64*64 to 1024*628. Training and testing dataset is in JPEG format and ground truth images is in PNG format. ISIC dataset consists not only melanoma images, 7 types skin cancer images exists.

For CNN images were resized to 100*100. CNN model used here is 2CNN and 1Maxpool layer. First CNN layer with 32 convolutional layers connected with a size of 3*3 and the developed channel size is 396*644. Second CNN layer with 64 convolutional layers were connected in the similar manner. Max-pooling layer is connected to the CNN layers with the size of 2*2. The dropout layer is connected to obtain highest training accuracy. After the dropout layer the results were connected to fully connected layer which is linked with softmax layer. Here sigmoid activation function is used for binary classification act as softmax layer. Different number epochs and batch sizes are proposed. At time of 45 epochs and batch size 2, highest accuracy of 89% is obtained.

IV. EXPERIMENTAL RESULTS

- *By using Number of Epochs are 90 and Batch Size is 1, 74.07% Accuracy and 1.3303 loss is Obtained.*

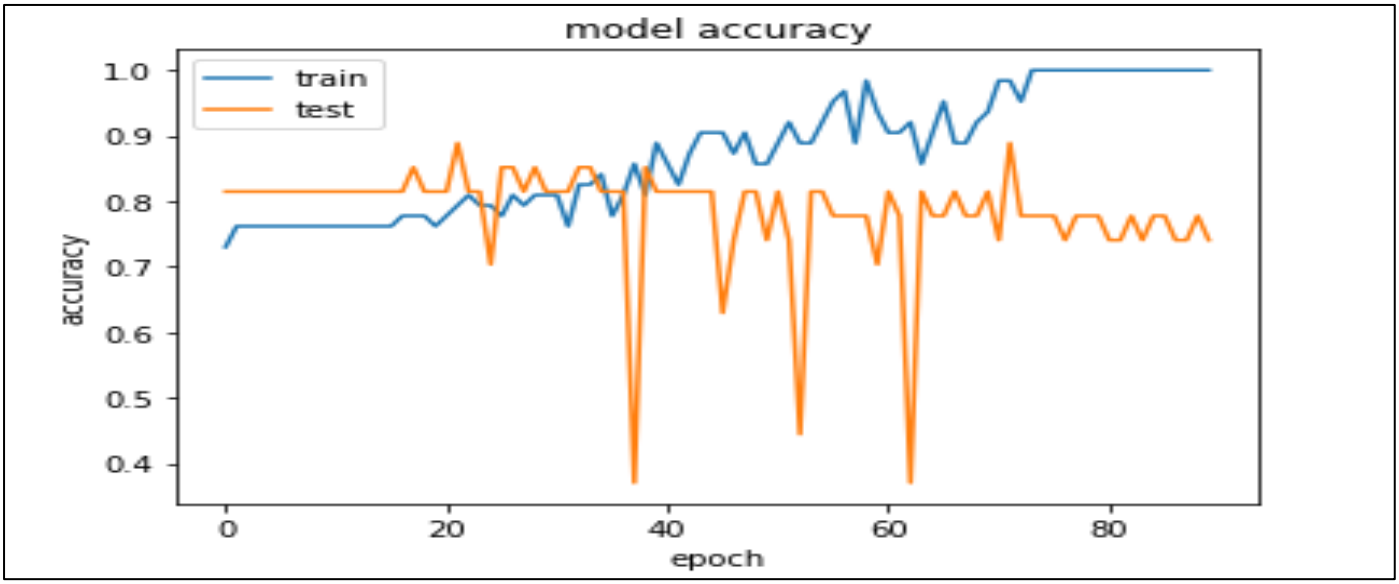
	precision	recall	f1-score	support
0	0.25	0.20	0.22	5
1	0.83	0.86	0.84	22
accuracy			0.74	27
macro avg	0.54	0.53	0.53	27
weighted avg	0.72	0.74	0.73	27

```
[[ 1  4]
 [ 3 19]]
```

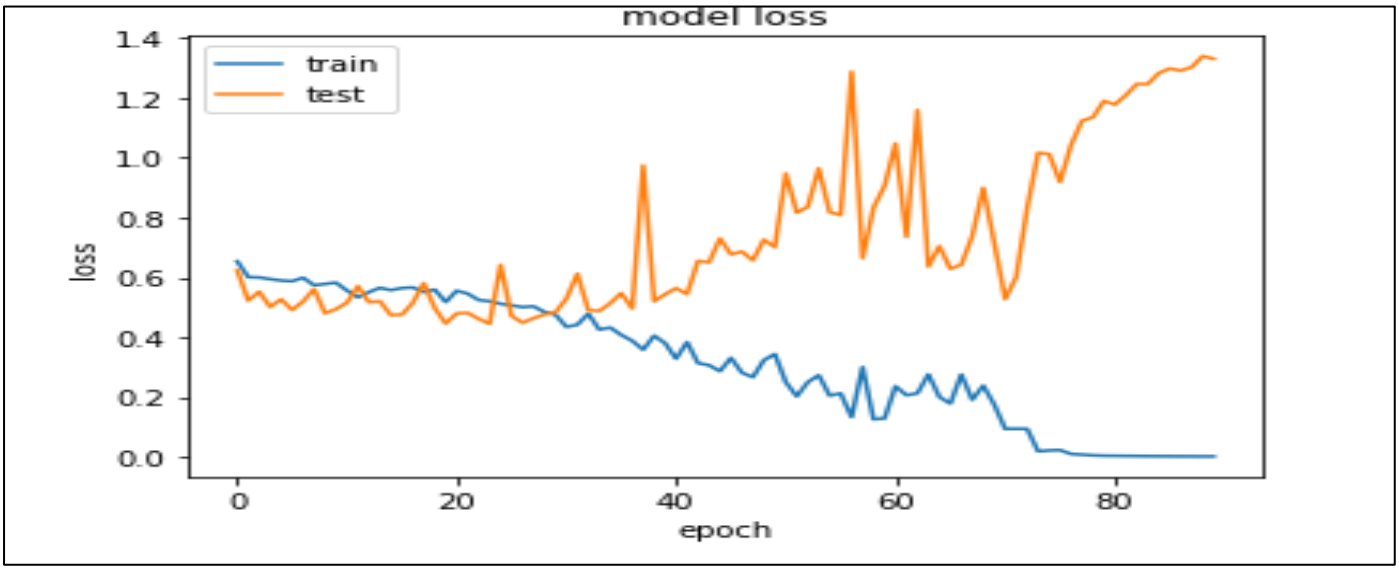
Fig 2 Result for Epochs-90 and Batch Size-1

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670

- *The Accuracy and Loss Graphs for Fig 3 is given by*



Graph 1 Accuracy Graph for Fig2



Graph 2 Loss Graph for Fig2

➢ *For Epochs 45 and Batch Size 2, 88.89% Accuracy and 0.4551 Loss is Obtained.*

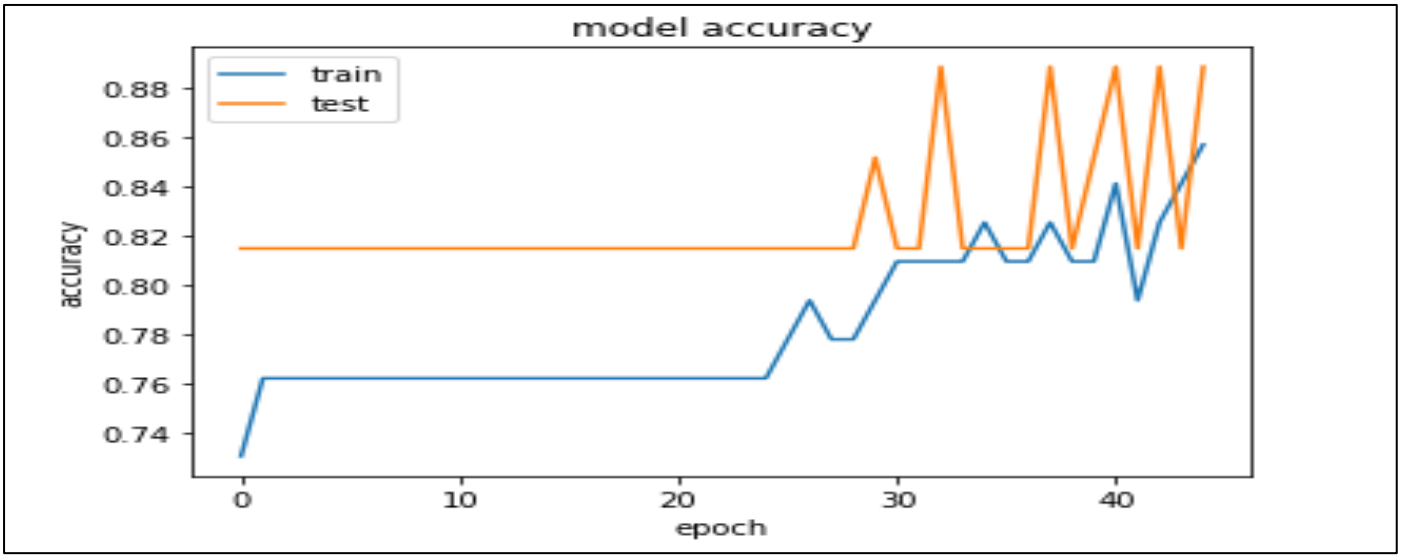
	precision	recall	f1-score	support
0	1.00	0.40	0.57	5
1	0.88	1.00	0.94	22
accuracy			0.89	27
macro avg	0.94	0.70	0.75	27
weighted avg	0.90	0.89	0.87	27

```
[[ 2  3]
 [ 0 22]]
```

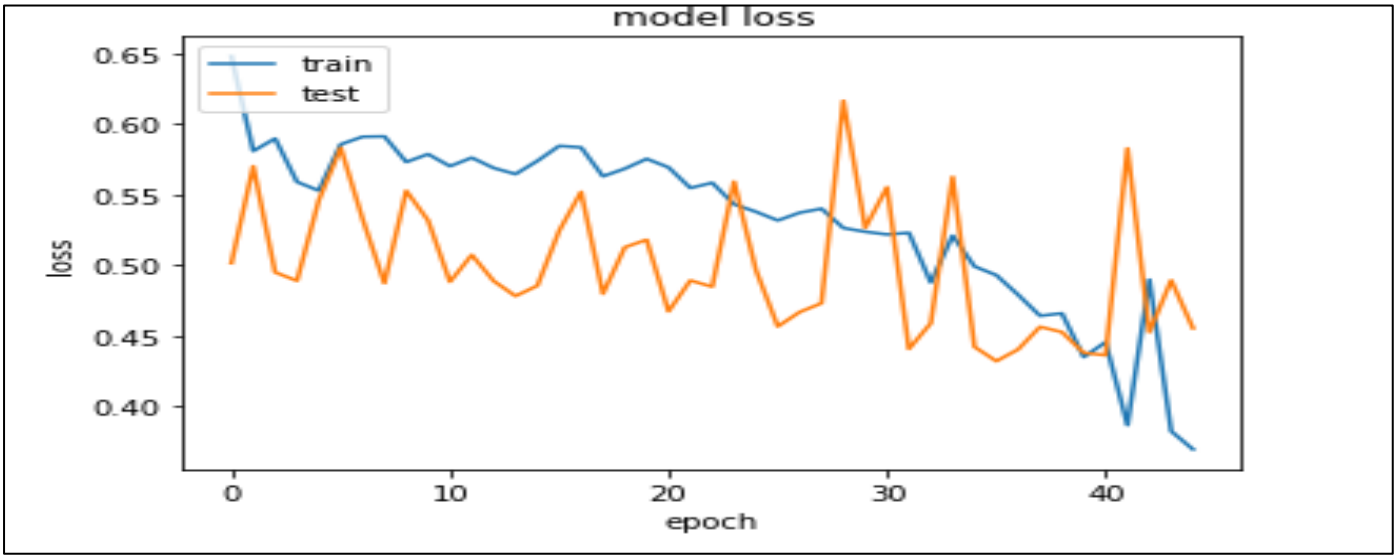
Fig 3 Result for Epochs-45 and Batch Size-2

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670

- *Accuracy and Loss Graphs were given by*



Graph 3 Accuracy Graph for Fig 3



Graph 4 Loss Graph for Fig 3

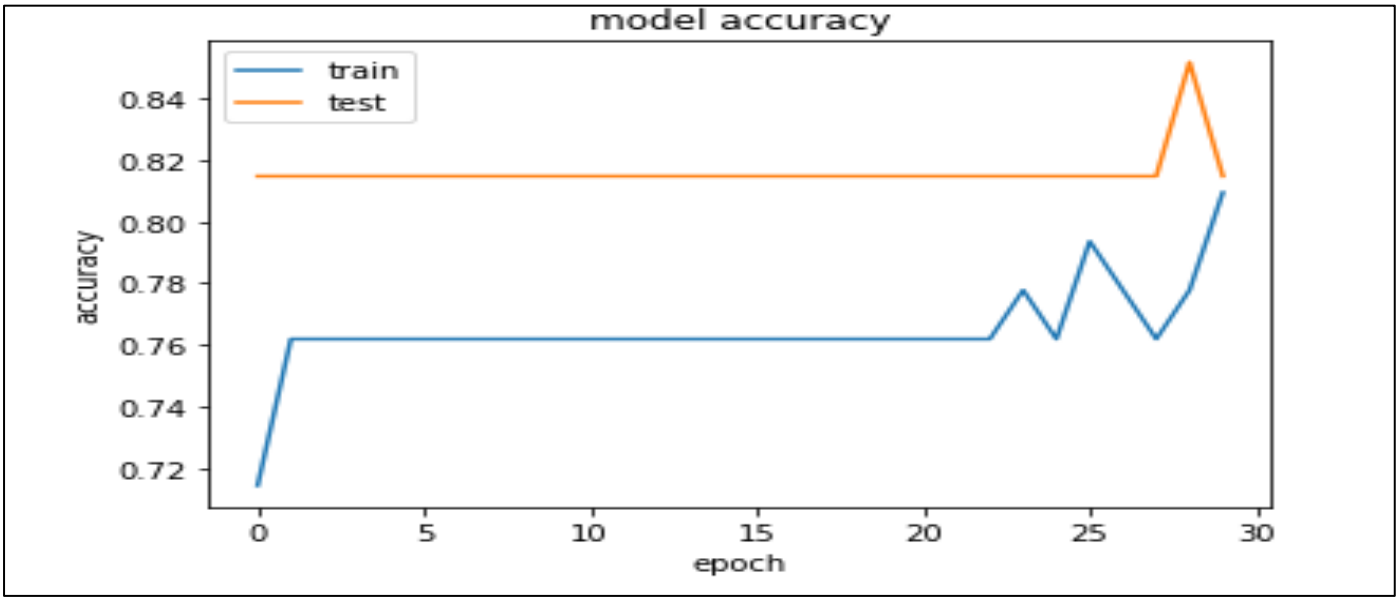
➢ *For Epochs 30 and Batch Size 3, 81.48% Accuracy and 0.4637 Loss is Obtained.*

	precision	recall	f1-score	support
0	0.00	0.00	0.00	5
1	0.81	1.00	0.90	22
accuracy			0.81	27
macro avg	0.41	0.50	0.45	27
weighted avg	0.66	0.81	0.73	27

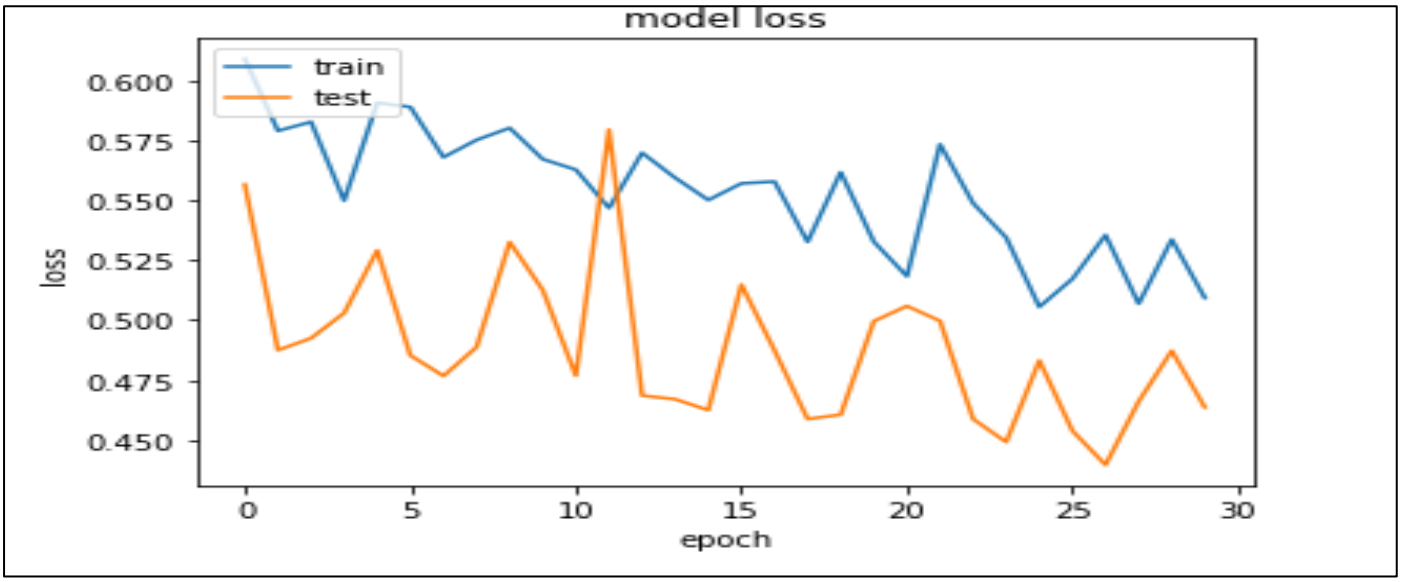
```
[[ 0  5]
 [ 0 22]]
```

Fig 4 Result for Epochs-30 and Batch Size-3

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670



Graph 5 Accuracy Graph for Fig 4



Graph 6 Loss Graph for Fig 4

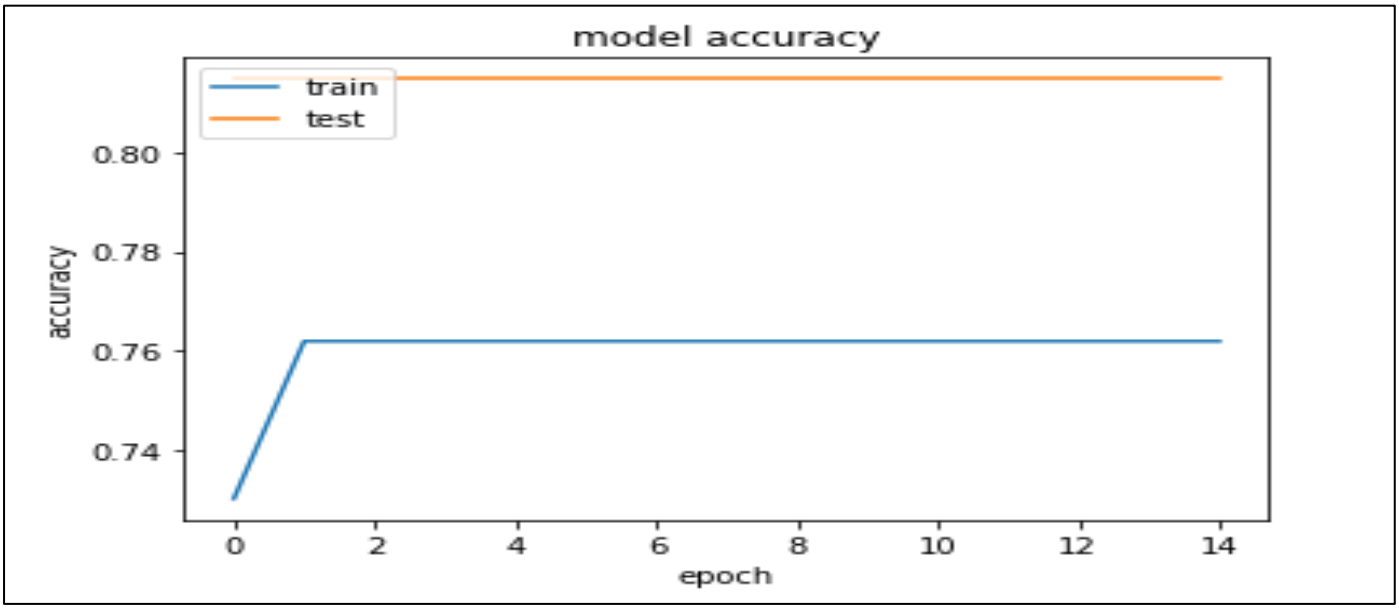
- *For Epochs 15 and Batch Size 6, 81.48% Accuracy and 0.5165 Loss is Obtained.*

	precision	recall	f1-score	support
0	0.00	0.00	0.00	5
1	0.81	1.00	0.90	22
accuracy			0.81	27
macro avg	0.41	0.50	0.45	27
weighted avg	0.66	0.81	0.73	27

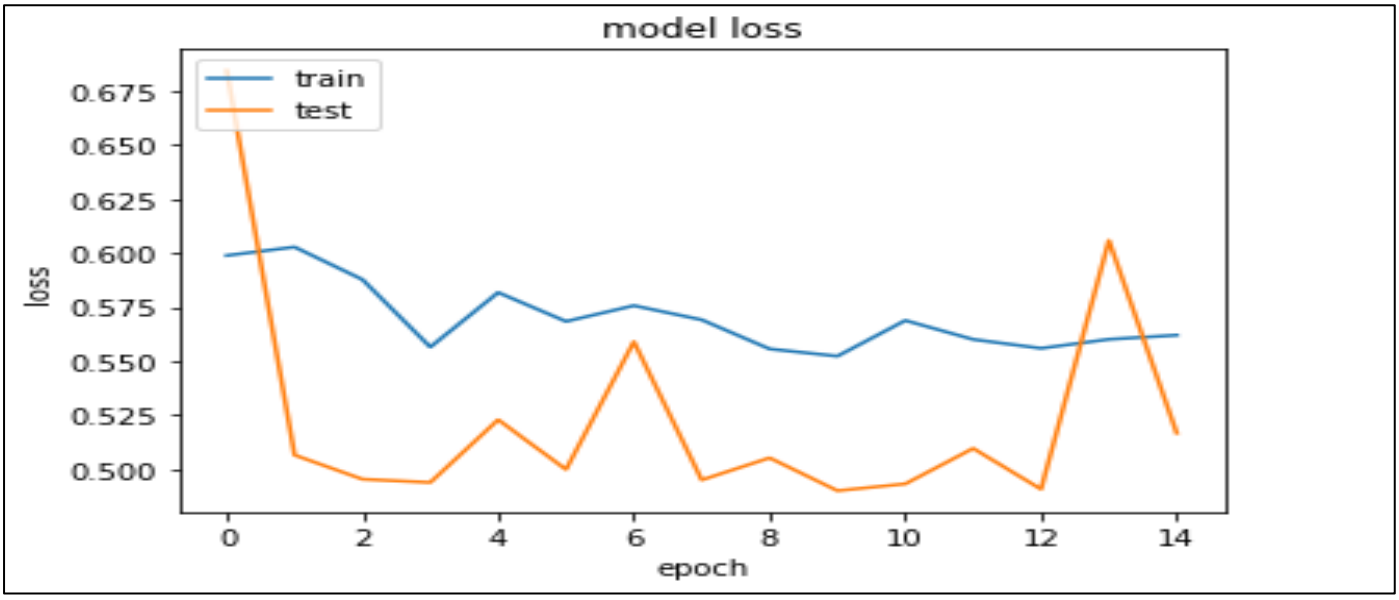
```
[[ 0  5]
 [ 0 22]]
```

Fig 5 Result for Epochs-15 and Batch Size-6

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670



Graph 7 Accuracy Graph for Fig 5



Graph 8 Loss Graph for Fig 5

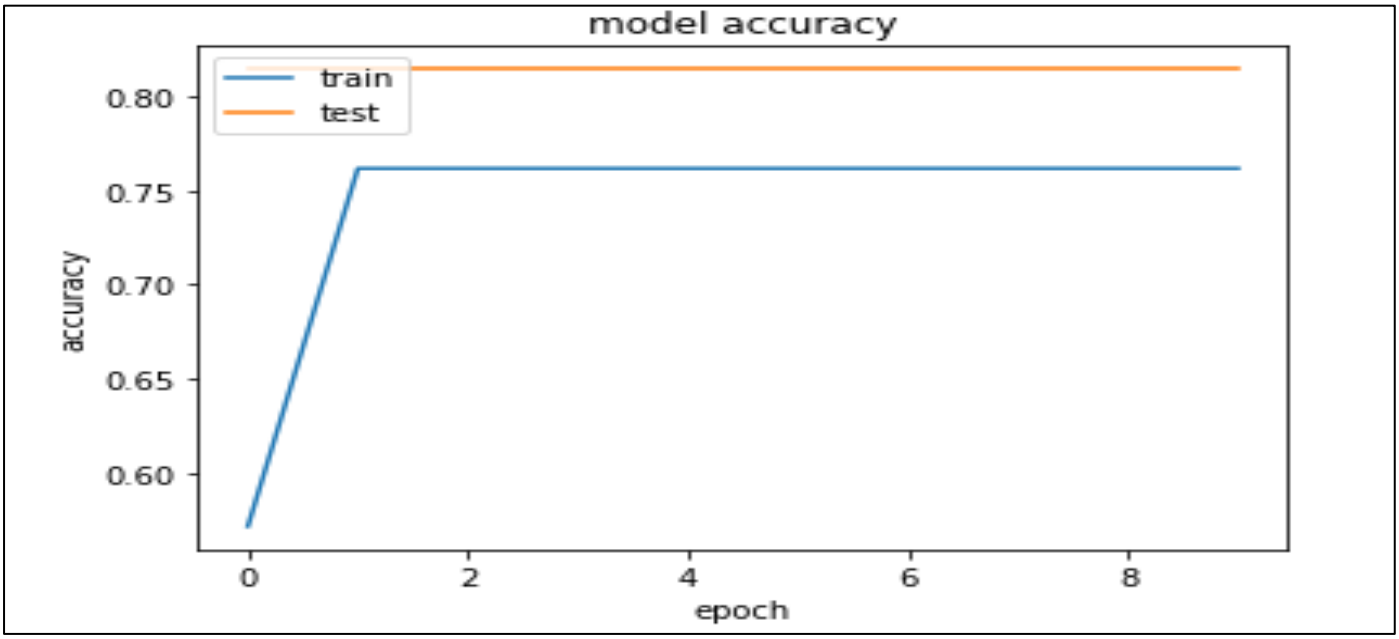
- *For Epochs 10 and Batch Size 9, 81.48% Accuracy and 0.4973 Loss is Obtained.*

	precision	recall	f1-score	support
0	0.00	0.00	0.00	5
1	0.81	1.00	0.90	22
accuracy			0.81	27
macro avg	0.41	0.50	0.45	27
weighted avg	0.66	0.81	0.73	27

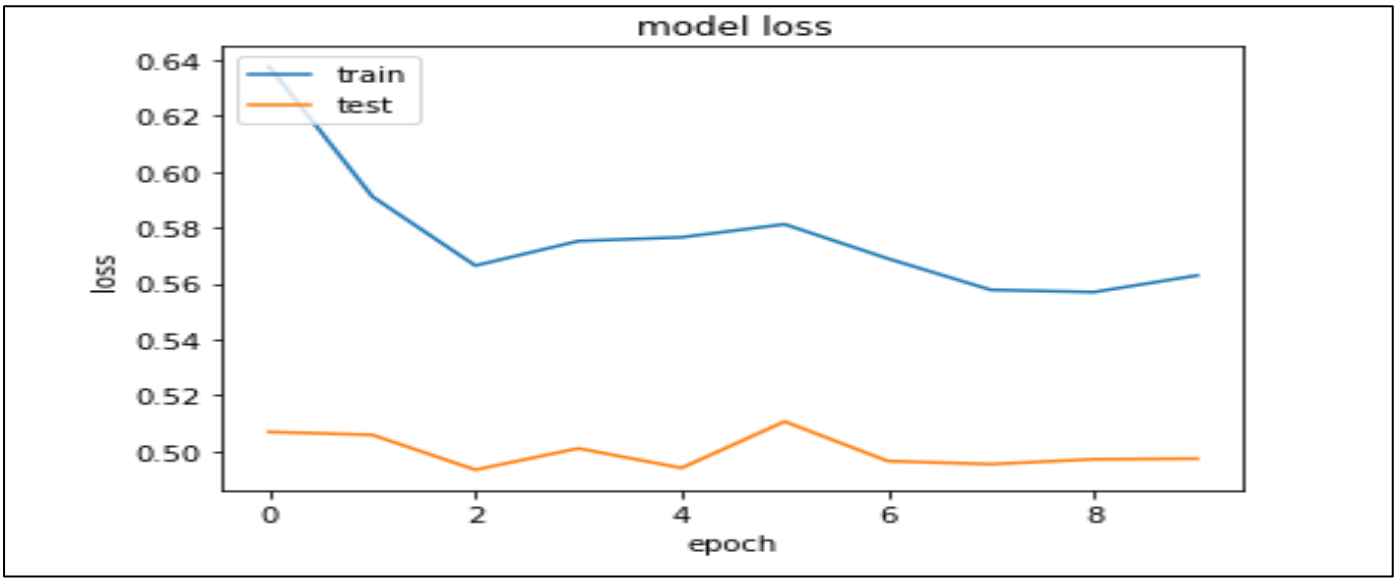
```
[[ 0  5]
 [ 0 22]]
```

Fig 6 Result for Epochs-10 and Batch Size-9

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670



Graph 9 Accuracy Graph for Fig 6



Graph 10 Loss Graph for Fig 6

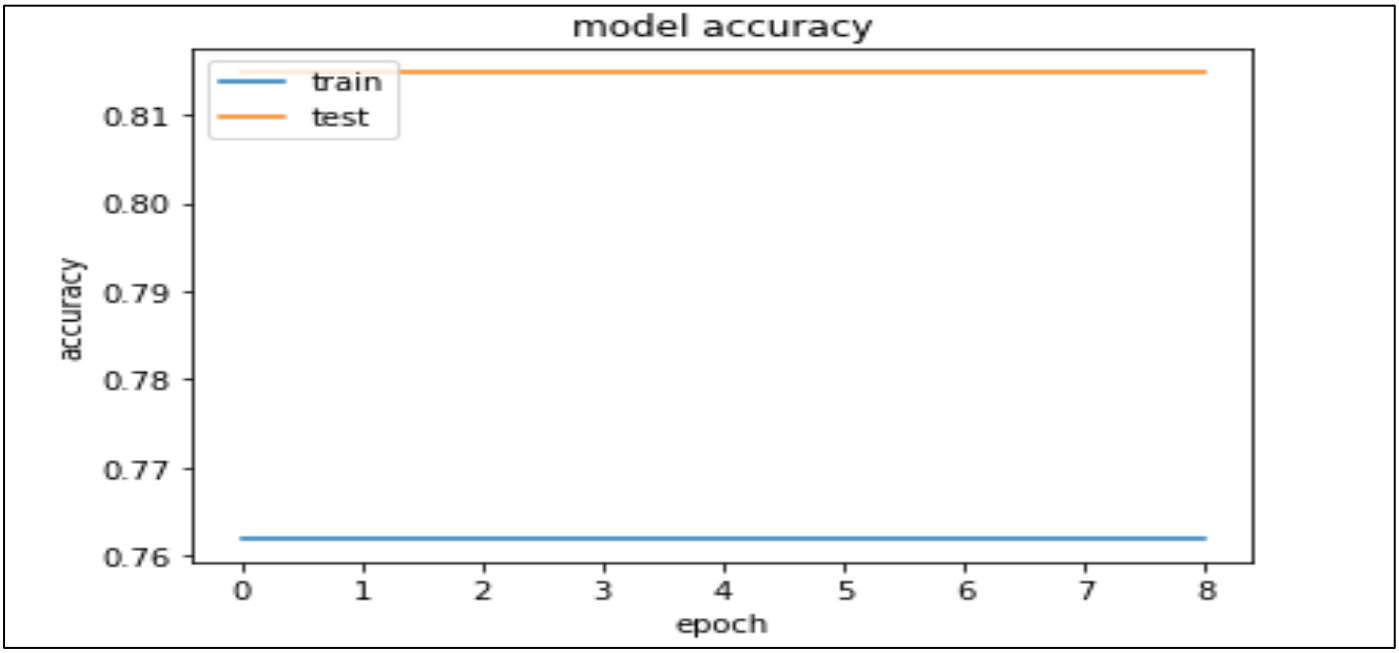
- *For Epochs 9 and Batch Size 10, 81.48% Accuracy and 0.5761 Loss is Obtained.*

	precision	recall	f1-score	support
0	0.00	0.00	0.00	5
1	0.81	1.00	0.90	22
accuracy			0.81	27
macro avg	0.41	0.50	0.45	27
weighted avg	0.66	0.81	0.73	27

```
[[ 0  5]
 [ 0 22]]
```

Fig 7 Result for Epochs-9 and Batch Size-10

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670



Graph 11 Accuracy Graph for Fig 7

Graph 12 Loss Graph for Fig 7

- *The Tabular form for Accuracy and Loss values for Different Epochs and Batch Size is given by*

Table 1 Accuracy and Loss values for Different Epochs and Batch Sizes

S. No	Epochs	Batch size	Accuracy (%)	Loss
1.	90	1	74.04%	1.3303
2.	45	2	88.89%	0.4551
3.	30	3	81.48%	0.4637
4.	15	6	81.48%	0.5165
5.	10	9	81.48%	0.4973
6.	9	10	81.48%	0.5761

V. CONCLUSION

Aim of this work is to know about where accuracy improved by using different sets of epochs and batch size using CNN. 88.89% accuracy achived by using ISIC Archive 2017 dataset for 45 epochs and batch size 3.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24AUG1670

REFERENCES

[1]. E. Nasr-Esfahani, S. Samavi, et.al, "Melanoma detection by analysis of clinical images using convolutional neural network" in 2016 IEEE conference. https://ieeexplore.ieee.org/document/7590963/references#references

[2]. Aya Abu Ali, Hasan Al-Marzouqi, "Melanoma detection using regular convolutional neural networks" in IEEE conference 2017. https://ieeexplore.ieee.org/document/8252041

[3]. Aurobindo Gupta, Sanjeev Thakur and Ajay Rana, "Study of Melanoma Detection and Classification Techniques" in 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) Amity University, Noida, India. June 4-5, 2020. https://ieeexplore.ieee.org/document/9197820

[4]. Abhinav Sagar, J Dheeba, "Convolutional Neural Networks for Classifying Melanoma Images" in may23, 2020. https://doi.org/10.1101/2020.05.22.110973

[5]. Hasan Abed Hasan, Abdullahi Abdu Ibrahim, "Hybrid Detection Techniques for Skin Cancer Images" in IEEE in 20thjune, 2020. https://ieeexplore.ieee.org/document/9254492

[6]. Ahmad Naeem, et.al, "Malignant Melanoma Classification Using Deep Learning: Datasets, Performance Measurements, Challenges and Opportunities" in IEEE access 2017. https://ieeexplore.ieee.org/document/9113301

[7]. Md. FazleRasul , Nahin Kumar Dey and M.M.A. Hashem, "A Comparative Study of Neural Network Architectures for Lesion Segmentation and Melanoma Detection" in 5th june ,2020 https://ieeexplore.ieee.org/document/9230969

[8]. Le Thu Thao, Nguyen Hong Quang, "Automatic skin lesion analysis towards melanoma detection" in IEEE 2017. https://ieeexplore.ieee.org/document/8233570

[9]. Adira Romero Lopez, Xavier Giro-i-Nieto, et.al, "Skin lesion classification from dermoscopic images using deep learning techniquies" in 17th february 2017. https://ieeexplore.ieee.org/abstract/document/7893267

[10]. Biswarup Ganguly, et.al, "A Deep learning Framework for Eye Melanoma Detection employing Convolutional Neural Network", in IEEE explore 1stjune 2020. https://ieeexplore.ieee.org/document/9001858