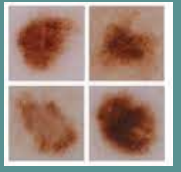

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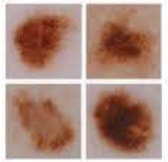
Melanoma Diagnosis using Deep Learning Techniques on Dermatoscopic Images

G.Deeshma lavanya-181FA04143
V.Sai Koushik-181FA04179
T.Lakshman Sai-181FA04328

Under the Guidance of:
Mr. S Deva Kumar



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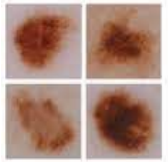
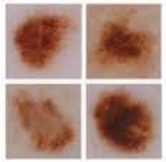
Contents



Objective

- To develop an automated model which has the capability of identifying the probability of detection of melanoma using Deep Learning and classify the lesions based on Dermatoscopic Images.

- Melanoma has become more widespread over the past 30 years and early detection is a major factor in reducing mortality rates associated with this type of skin cancer. Therefore, having access to an automatic, reliable system that is able to detect the presence of melanoma via a dermatoscopic image of lesions and/or skin pigmentation can be a very useful tool in the area of medical diagnosis



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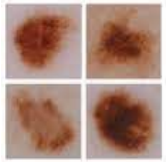
Literature Survey:

S.No	Name of the paper published	Dataset used	Model used
1	Skin Lesion Analysis towards Melanoma Detection Using Deep Learning Network	ISIC 2017	FCRN
2	A comparative study of deep learning architectures on melanoma detection	ISIC 2018	ResNet 50
3	Melanoma detection by analysis of clinical images using convolutional neural network	MED-NODE	VGG16
4	Towards Automated Melanoma Detection with Deep Learning: Data Purification and Augmentation	ISIC 2017	AlexNet
5	Evaluation of Melanoma Diagnosis using Deep Features	PH2	VGG19 & Logistic Regression



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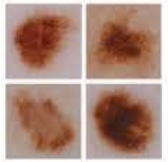
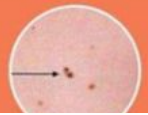
Problem Statement

- Skin cancer is the most common type of cancer. It occurs due to the abnormal growth of skin cells, usually on the areas exposed to sunlight. There are three major types of skin cancer — basal cell carcinoma, squamous cell carcinoma, and melanoma. Melanoma, specifically, is responsible for 75% of skin cancer deaths, despite being the least common skin cancer.
- Melanoma is a deadly disease, but if caught early, most melanomas can be cured with minor surgery.
- We shall identify melanoma from the patient's diagnosis records and images of their skin lesion by applying several Deep learning algorithms to classify the lesion as benign or malignant.

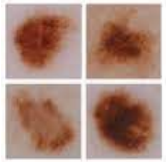


The ABCDE's of Detecting Melanoma

To catch melanoma at its earliest, most treatable stage, conduct a head-to-toe skin self-examination once a month to check for suspicious moles

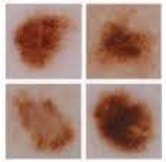
ASYMMETRY		The two halves of the mole do not match.
BORDERS		The edges are irregular or uneven (scalloped, blurred or notched).
COLOR		Mupltiple or changing shades of brown, tan, black, red, blue, or pink are present.
DIAMETER		Usually, but not always, larger that 6mm.
EVOLUTION		Changing in appearance, such as size, shape, or color and/or changes in symptoms, such as bleeding,

Using these signs, the deep learning algorithm classifies skin lesions as benign or malignant.



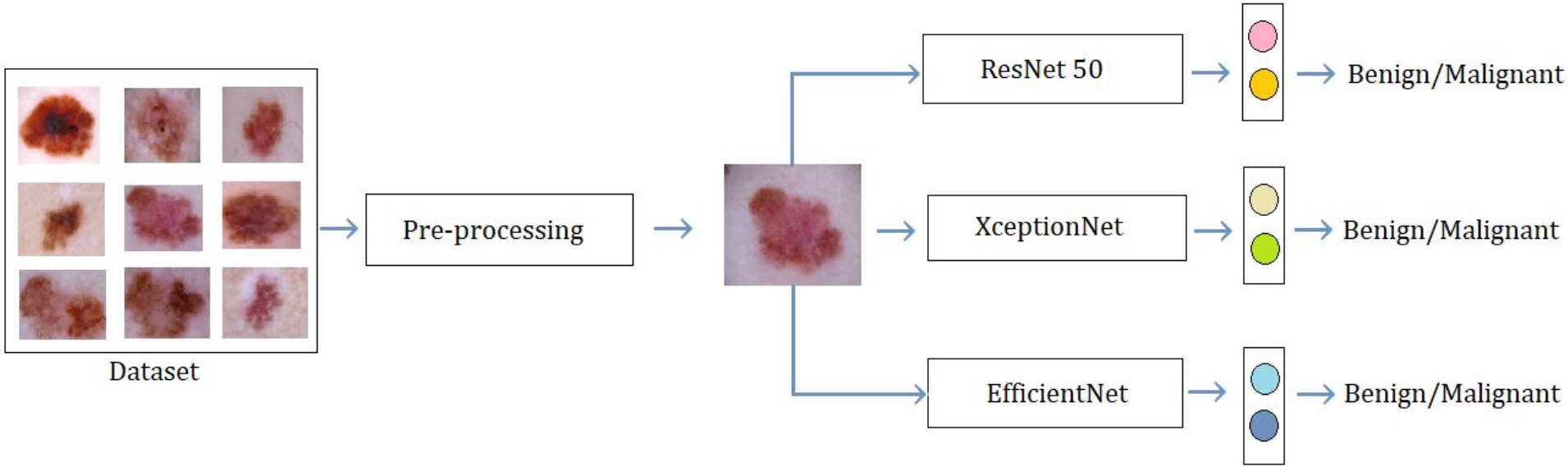
About the dataset: SIIM-ISIC Melanoma Classification

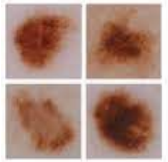
- stands for " Society for Imaging Informatics in Medicine- International Skin Imaging Collaboration "
- The dataset contains 33,126 dermoscopic training images of unique benign and malignant skin lesions from over 2,000 patients.
- Each image is associated with one of these individuals using a unique patient identifier. All malignant diagnoses have been confirmed via histopathology, and benign diagnoses have been confirmed using either expert agreement, longitudinal follow-up, or histopathology.



- We take the patient's details and skin lesion images and then apply the deep learning algorithm to detect whether or not the person suffers from cancer.
- Melanoma signs include:
    - A large brownish spot with darker speckles
    - A mole that changes in color, size or feel or that bleeds
    - A small lesion with an irregular border and portions that appear red, pink, white, blue or blue-black
    - A painful lesion that itches or burns
    - Dark lesions on your palms, soles, fingertips or toes, or on mucous membranes lining your mouth, nose, etc.

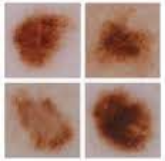
Proposed Method





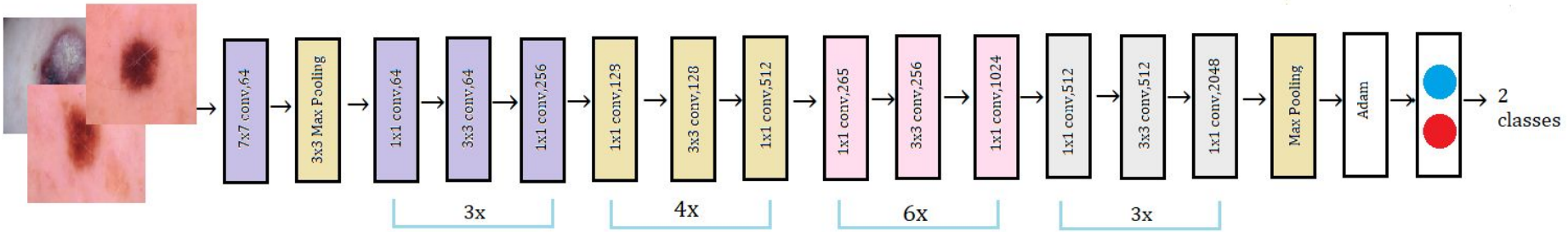
Proposed Models

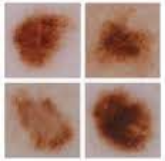
- ResNet 50
- XceptionNet
- EfficientNet



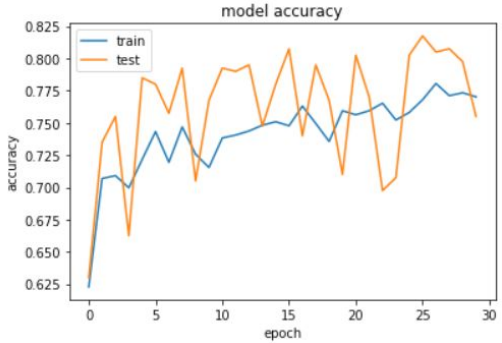
ResNet-50

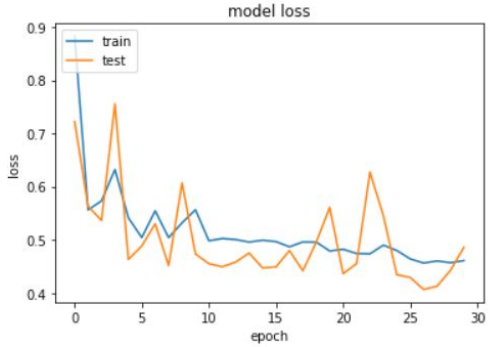
- ResNet-50 is **a convolutional neural network that is 50 layers deep**. You can load a pre-trained version of the network trained on more than a million images from the ImageNet database . The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals.





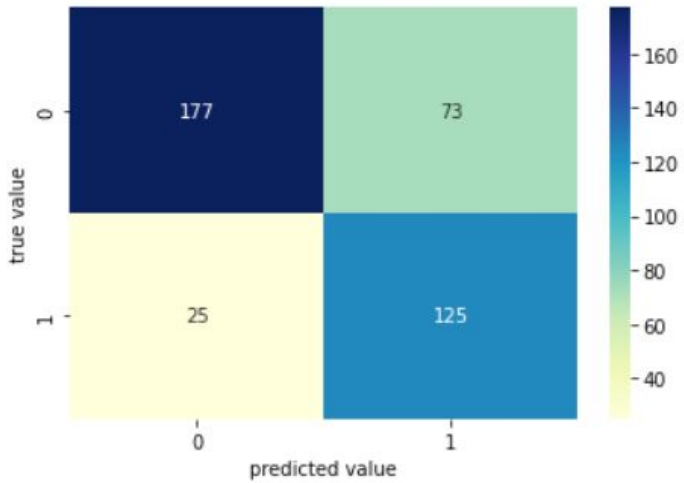
Output:



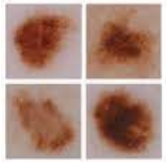


Training Accuracy : 77.65%
Validation Accuracy: 75.50%

Training loss : 0.457778
Validation loss: 0.485903

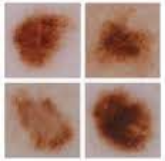


Confusion Matrix

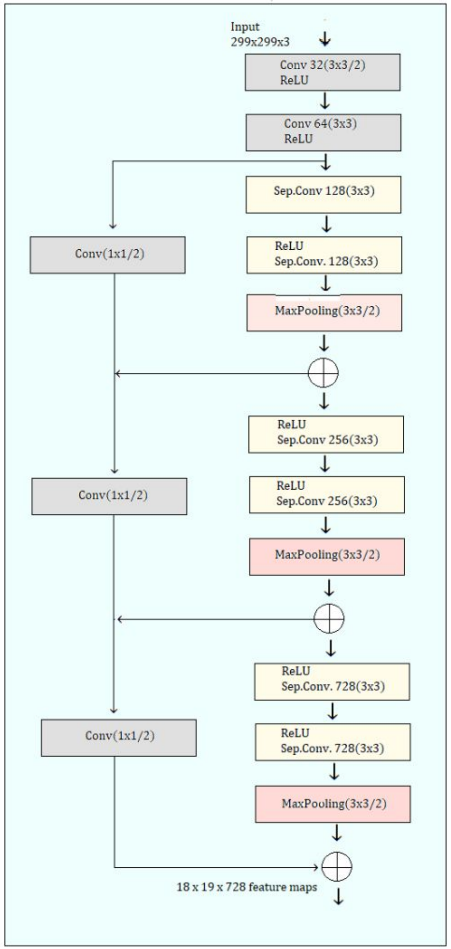


Xception Net

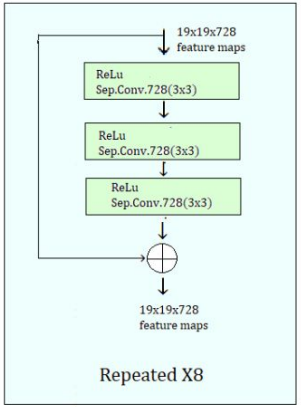
- Xception is a **deep convolutional neural network architecture that involves Depthwise Separable Convolutions**. Xception is also known as “extreme” version of an Inception module
- Xception is a convolutional neural network that is 71 layers deep. You can load a pre-trained version of the network trained on more than a million images from the ImageNet database . The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 299-by-299



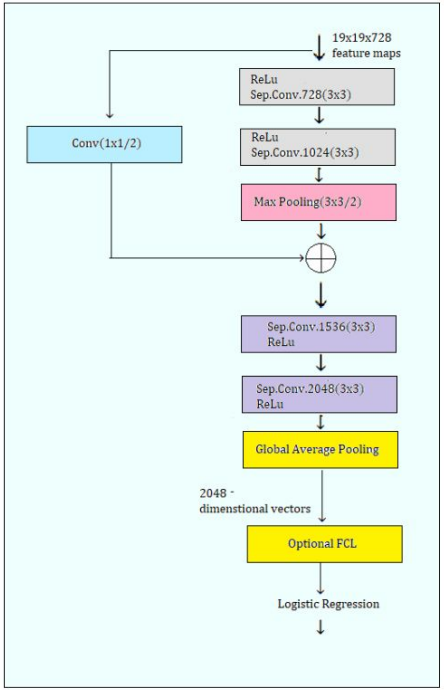
Entry Flow

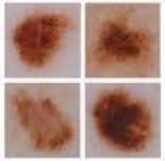


Middle Flow



Exit Flow





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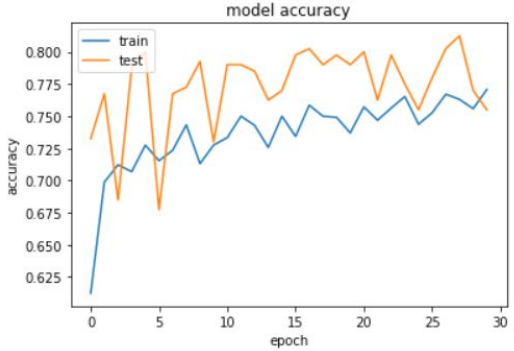
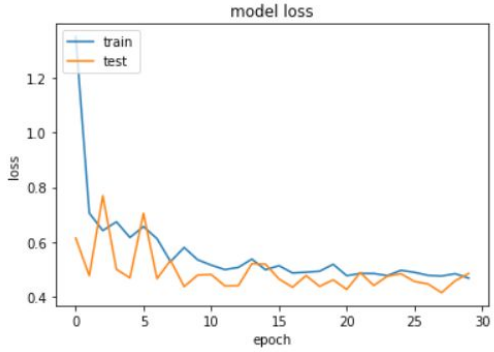
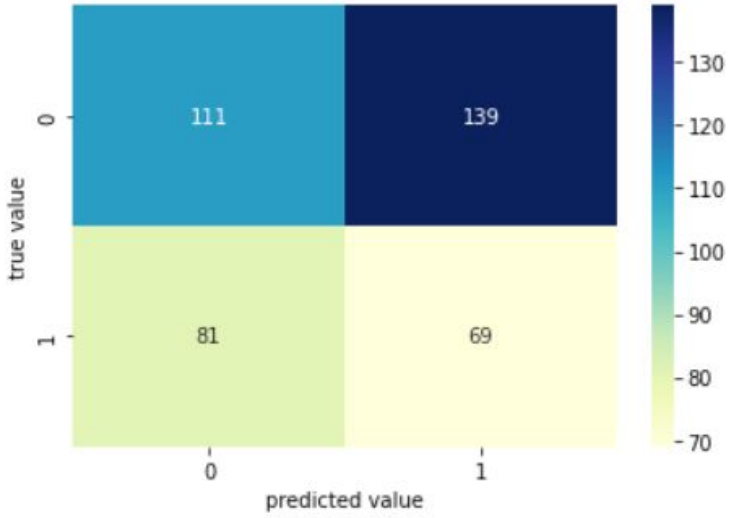
Output:



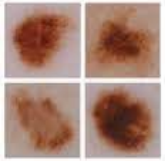


Training Accuracy : 77.28%
Validation Accuracy: 76.97%

Training loss : 0.441629
Validation loss: 0.432598

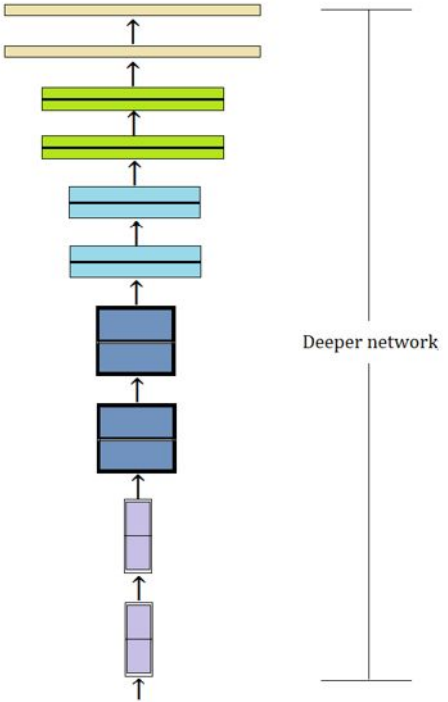


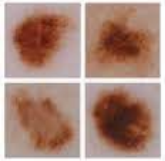
Confusion Matrix



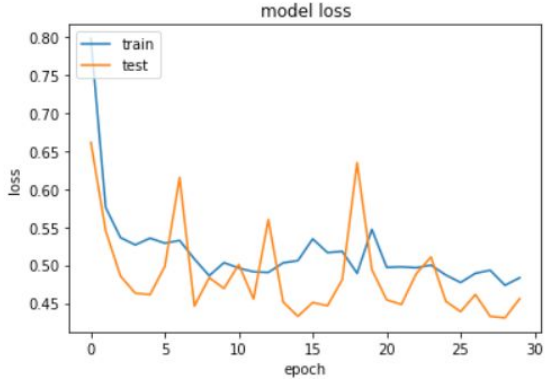
EfficientNet

- EfficientNet is **a convolutional neural network architecture and scaling method that uniformly scales all dimensions of depth/width/resolution using a compound coefficient**. EfficientNet scaling method uniformly scales network width, depth, and resolution with a set of fixed scaling coefficients

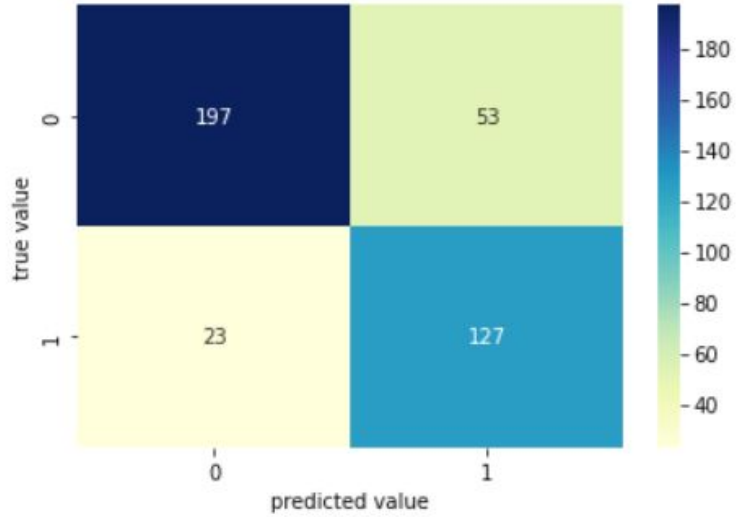




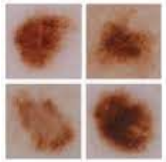
Output:




```
Training Accuracy  : 77.38%      Training loss  : 0.465619
Validation Accuracy: 81.00%      Validation loss: 0.456058
```



Confusion Matrix



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Results

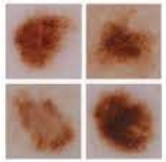
- Among the 3 models that were proposed, we found that EfficientNet has better accuracy than ResNet 50 and XceptionNet.

	precision	recall	f1-score	support
0	0.88	0.71	0.78	250
1	0.63	0.83	0.72	150
accuracy			0.76	400
macro avg	0.75	0.77	0.75	400
weighted avg	0.78	0.76	0.76	400

ResNet 50

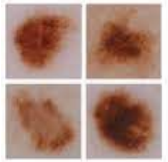
	precision	recall	f1-score	support
0	0.81	0.76	0.78	360
1	0.73	0.78	0.76	300
accuracy			0.77	660
macro avg	0.77	0.77	0.77	660
weighted avg	0.77	0.77	0.77	660

XceptionNet



	precision	recall	f1-score	support
0	0.90	0.79	0.84	250
1	0.71	0.85	0.77	150
accuracy			0.81	400
macro avg	0.80	0.82	0.80	400
weighted avg	0.82	0.81	0.81	400

EfficientNet



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- https://www.mathworks.com/help/deeplearning/ref/resnet50.html;jsessionid=9343d9dd6edd4fd4703ce92a21f6#:~:text=ResNet%2D50%20is%20a%20convolutional,%2C%20pencil%2C%20and%20many%20animals.
- https://keras.io/api/applications/efficientnet/#:~:text=EfficientNetB4%20function&text=Instantiates%20the%20EfficientNetB4%20architecture.&text=Networks%20(ICML%202019)-,This%20function%20returns%20a%20Keras%20image%20classification%20model%2C%20optionally%20loaded,this%20page%20for%20detailed%20examples.
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thank you