TE Mini Project
Skin Disease Detection

Group no. 5

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Introduction

Skin cancer is one of the **most common cancer** in the United States and worldwide.

- **1 in 5 Americans** will develop skin cancer by the age of 70.
- **More than 2 people** die of skin cancer in the U.S. every hour.
- Having **5 or more sunburns** doubles your risk for melanoma.
- When detected early, the **5-year survival rate for melanoma is 99 percent**

➔ Skin diseases - common than other diseases - caused by a fungal infection, bacteria, allergy, or viruses, etc.

➔ Skin diseases are chronic, infectious, and sometimes may develop into skin cancer.

➔ If early diagnosed, can reduce their development and spread.

Domain Knowledge

- Deep learning
- ANNs
- CNN
- Transfer Learning
- ResNets

Problem definition

- Skin diseases have become a more common problem in human life. Most of these diseases are dangerous and harmful, particularly if not treated at an initial stage.
- The main risk of the disease can lead to skin cancer. Detecting the disease at an early stage can rescue the patients from Cancer
- The system would allow users to determine the skin diseases to provide treatments or advice to the patient by making use of images of skin infected with the disease and by obtaining information from the patient.

Review of literature

Sr no	Title of the paper	Methodologies used	Dataset with Performance measures	Drawbacks/Conclusion
1	Disease Classification based on Dermoscopic Skin Images Using Convolutional Neural Network in Teledermatology System IEEE Xplore 2020	Inception V3, MobileNet	MNIST HAM10000 - CNN -72% MobileNet- 58%	The model results from the learning process will be applied to a web classifier. The comparison of predictive accuracy shows that the web-classifier using the CNN Inception V3 model has an accuracy value of 72% while the web-classifier that uses the MobileNet v1 model has an accuracy value of 58%.
2	Automatic diagnosis of skin diseases using convolution neural network ELSEVIER 2020	AlexNet	Dermnet -72.1%	One of the key features of the proposed technique is the vast features generated by the convolutional layer of the network which is used by the final layers of the network for classification. This work can be extended to classify skin diseases into more classes.
3	Detection of Melanoma using Deep Learning Techniques IEEE Xplore 2020	Data Augmentation, Data Segmentation (UNET), Classification using Deep Network	ISBI 2017 dataset 84.2%	A two-stage model has been built for the classification of a skin lesion into melanoma and non-melanoma type. Results obtained for the segmentation stage using UNET are good enough for the targeted application. Good accuracy was obtained from the FCRN classification stage, but since the targeted application is for medical diagnosis of false negatives needed to be less. Therefore, increasing the recall factor had to be given more priority than increasing the overall accuracy.

Review of literature

4	Deep Learning in Skin Disease Image Recognition: A Review IEEE Access 2020	VGGNet, Inception, DenseNet	HAM10000 dataset- 80% to 89%	Few data may cause insufficient feature extraction, which will affect the diagnosis and recognition of lesions. Oneof the significant problems in skin disease image recognition is the difficulty in obtaining a large number of data sets due to the complications in medical image collection and the rare occurrence of individual diseases
5.	Discriminative Feature Learning for Skin Disease Classification Using Deep Convolutional Neural Network IEEE Access 2020	ResNet152, InceptionResNet-V2	Wuhan Union Hospital searched images and unified these images of 14 Classes.	Fine-tune all layers of ResNet152 and InceptionResNetV2 to address the problem of facial skin disease images. The performance of the proposed method can be improved by designing a dataset with the help of a dermatologist to visually organize the taxonomy.
6	Skin Lesion Classification using Convolutional Neural Network with Novel Regularizer IEEE Access 2017	CNN MODEL WITH NOVEL REGULARIZER	ISIC Archives- 86.35%	When the dimensionality is very high and the number of instances is very low, the use of these regularizations is pointless. Likewise, regularization algorithms also have several limitations: 1) It cannot be used for feature selection or feature reduction. 2) Choosing a suitable value of λ is difficult, as it is a continuous value and attempting a million times to select a single suitable value is computationally expensive and time-intensive.

Existing System

- The Existing systems consist of Image Classification systems which use machine learning models which do not provide great accuracy.
- The systems have also used CNN algorithms but are unable to give great accuracy.
- About the test case here, the existing system classify Malignant and Benign data but have less accuracy.

Proposed System

- In the proposed system we have developed a model using ResNet50.
- ResNet50 is a lightweight architecture.
- The ResNet50 model - 5 stages each with a convolution and Identity block.
- The system provides early skin disease detection solution by detecting the provided image as malignant or benign
- Resnet50 uses weights of ImageNet so it's easier to train. (transferred learning logic)

Feasibility Study & Scope of project

Technical Feasibility:

OS-Windows 7 or more

8GB or more RAM

Processor: i5 5th Gen or more

Programming Language: Python 3.8

Space: 5GB or more

Scope:

The system determines skin disease when provided a test image.

A GUI is used to take input image and display the results

Methodology

Dataset:

Data consist of images in 2 folders of train and test each having Malignant and Benign folders

Train:

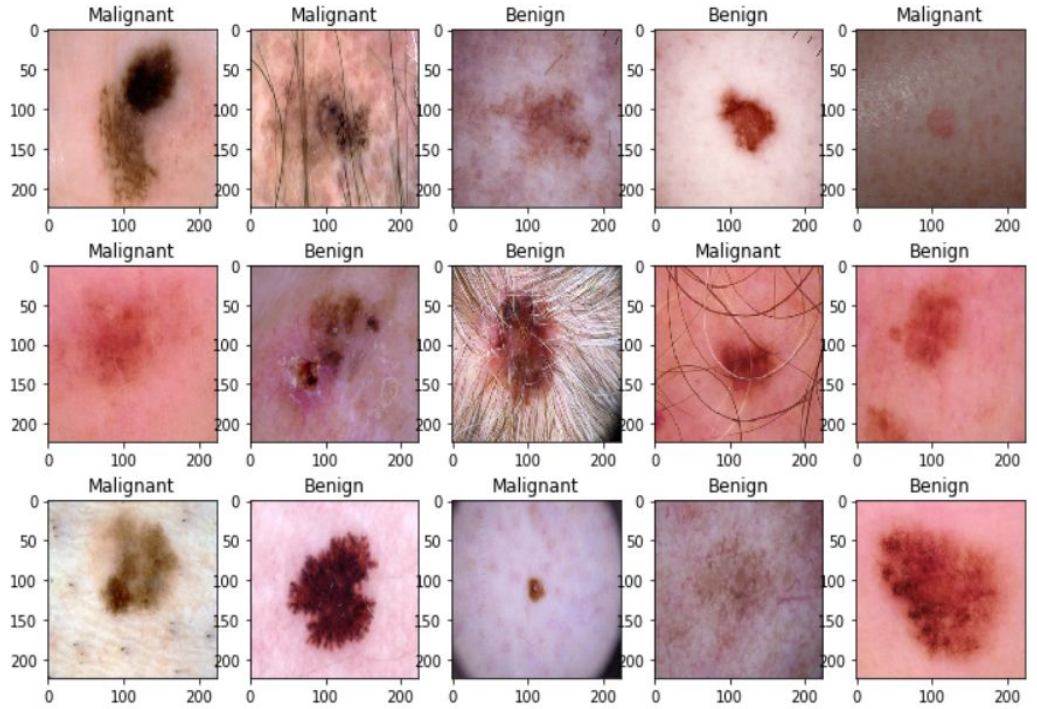
Malignant: 1440

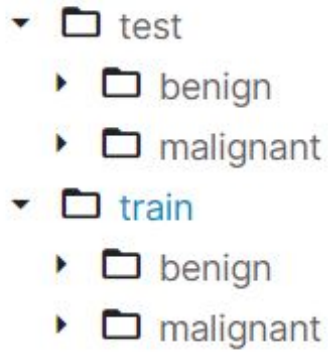
Benign: 1197

Test:

Malignant: 300

Benign: 360





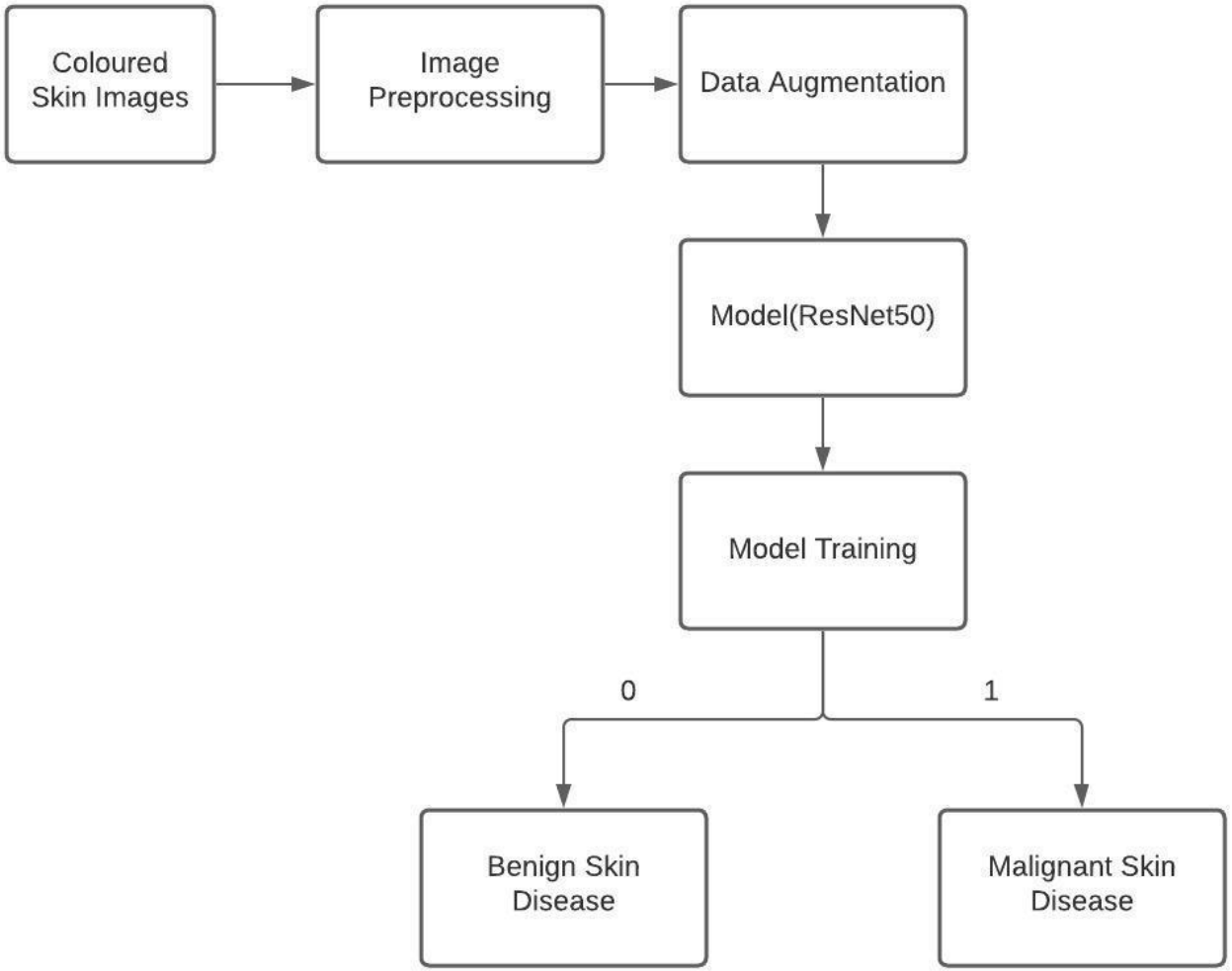
Methodology

- **Data Preprocessing:** Data preprocessing is the method to convert raw data into a well structured data which will be more useful for the model. In this project we have used image resizing.

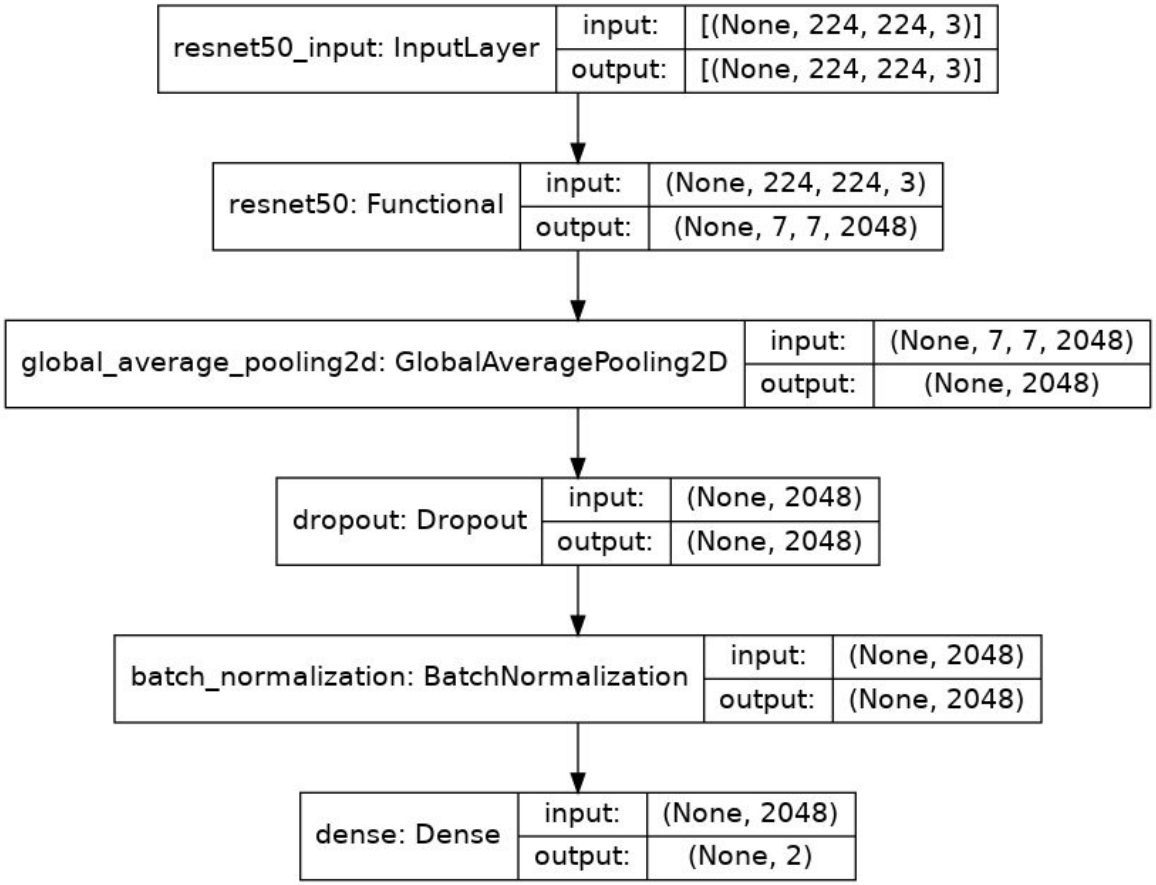
- **Data Augmentation:** to increase the size of inputs and to prevent overfitting.

- **ResNet Architecture:** The ResNet-50 model consists of 5 stages each with a convolution and Identity block. Each convolution block has 3 convolution layers and each identity block also has 3 convolution layers. The ResNet-50 has over 23 million trainable parameters.

Flowchart:


Coloured Skin Images
Image Preprocessing
Data Augmentation
Model(ResNet50)
Model Training
0
1
Benign Skin Disease
Malignant Skin Disease

Block Diagram:



Result and Discussion

Comparison of Accuracy:

Resnet50:

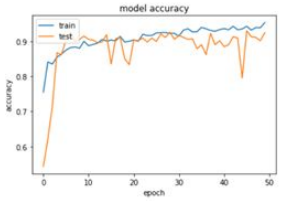


Fig 4.2

DenseNet

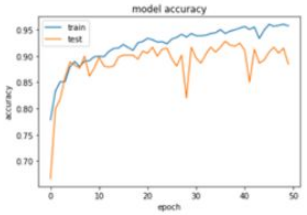


Fig 4.3

Inception V3:

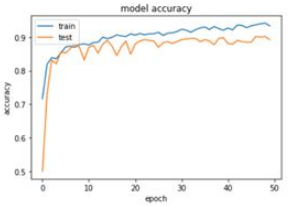


Fig 4.4

MobileNet:

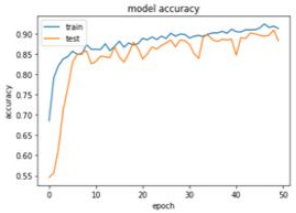


Fig 4.5

NasNet:

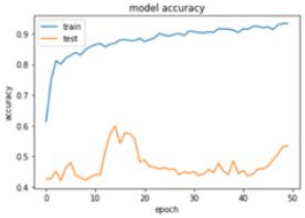


Fig 4.6

Comparison of Losses:

ResNet50:

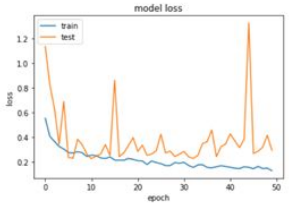


Fig 4.7

DenseNet:

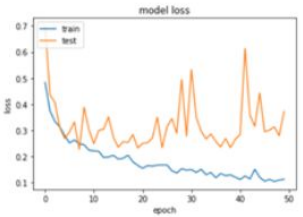


Fig 4.8

InceptionV3:

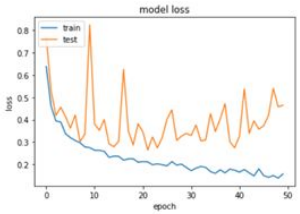


Fig 4.9

MobileNet:

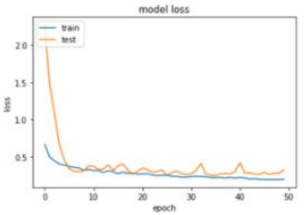


Fig 4.10

NasNet:

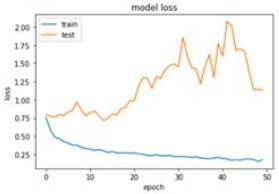
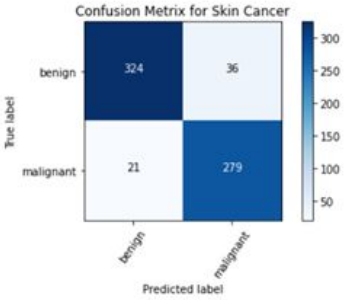
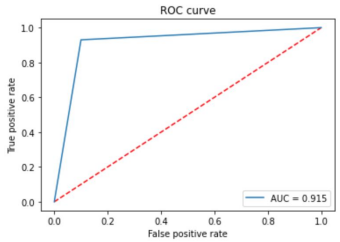


Fig 4.11

ResNet50
Confusion Matrix

and AUC-ROC curve





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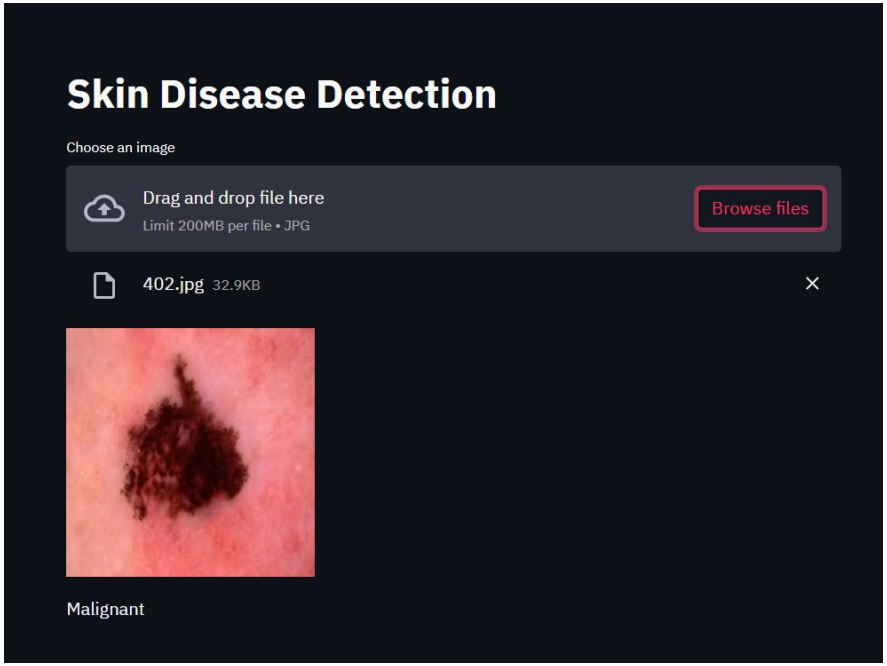
Comparison of Various Models on Data

Pre Trained Model	Accuracy	Precision	Recall	F1 Score	ROC-AUC
ResNet50	0.923	0.915	0.926	0.916	0.915
InceptionV3	0.901	0.891	0.908	0.893	0.897
MobileNet	0.897	0.894	0.892	0.891	0.894
DenseNet	0.905	0.901	0.891	0.904	0.899
NasNet	0.579	0.643	0.599	0.548	0.593

GUI with Results



Conclusions

- This Disease is detected Using ResNet base model Architecture and at early stages and help for better remediation. Preventing humans from getting prone to skin diseases
- The proposed architecture is evaluated on the malignant and benign images dataset which consist of fine images of areas of infection
- The overall accuracy of model is high and our aim is to build a multi-class classifier .

Future Scope

- Making of multiclass classifiers. (more than 5 disease classes specificity)
- Parallel Network Model with Patient Stat. Data
- The frontend - using latest cutting edge technological advancements like material design and trending design patterns which will help the dermatologists, skin clinics or appointed authority to easily maneuver the website.
- Check for details of patients who are suffering from the skin disease.
- Patient end, Doctor end separate GUI.

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Thank You!