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REVA Academy for Corporate Excellence (RACE)

Identify Malign moles on Skin using CNN

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MBA in Business Analytics

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Introduction

Background

- Melanoma is one of the world's fastest-growing cancers and deadly type of skin cancer
- Melanoma occurs when melanocytes (the cells that give the skin its tan or brown color) start to grow out of control.
- It is more dangerous because it’s more likely to spread to other parts of the body if not detected early.

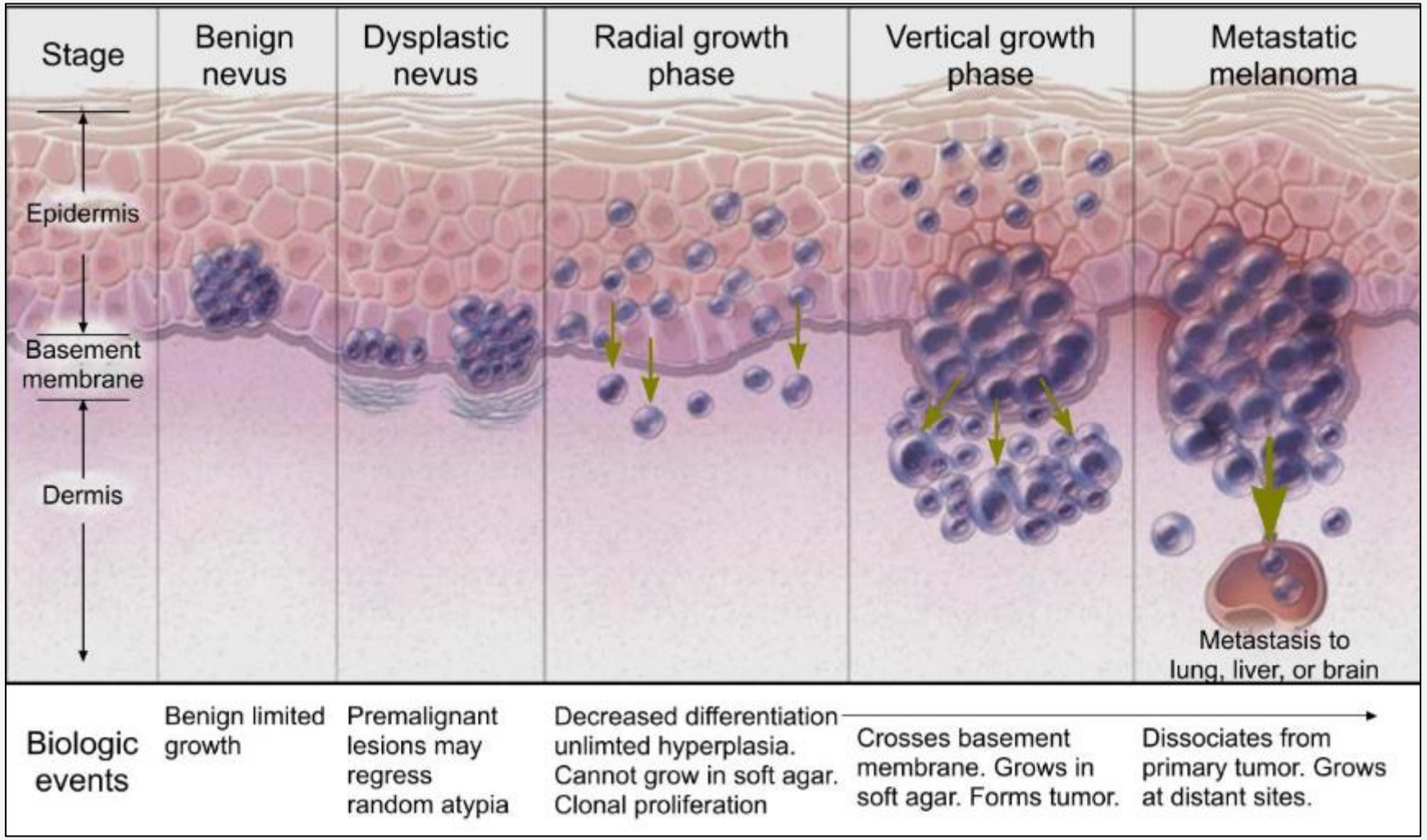
Current status

- Moles are often ignored by patients as normal mole unless it’s start itching or bleeding
- Dermatologist’s follow ABCDE(Asymmetrical, Border, Color, Diameter, Evolution) rule to diagnose mole
- Some Physicians advise biopsy which is painful and very late in getting results

Why This Study

- This study is necessitated covering samples from two different sources ISIC and Med-node
- Previous Studies have been made using either of samples

Introduction



Literature Review

Seminal works

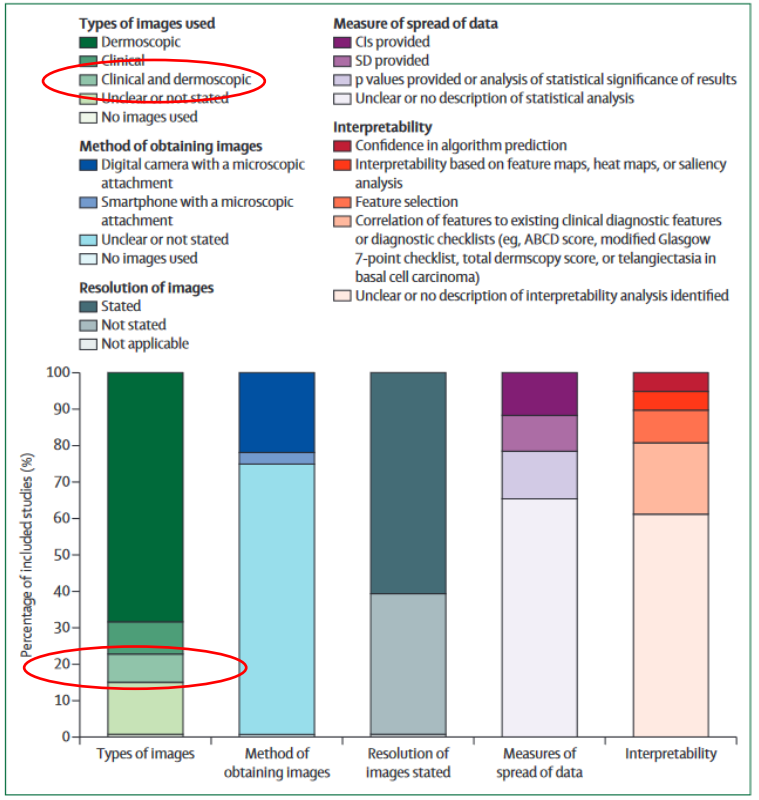
Good amount of research has been done using deep learning features able to detect and classify into two classes melanoma or nevi. The accuracy achieved in one of the study is 76% and have used the ISBI 2016 dataset (Gutman et al., 2016).

Summary

Significant studies have been carried and have been summarized in below table on various metrics

	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Area under the receiver operating characteristic curve	Accuracy*	F1-score†
Melanoma (197 studies provided outcome measures for melanoma alone, 2000–21)							
Mean (95% CI)	0·842 (0·816–0·868)	0·891 (0·871–0·910)	0·814 (0·769–0·859)	0·929 (0·909–0·949)	0·898 (0·882–0·915)	89·5% (88·2–90·8%)	0·807 (0·732–0·882)
Median (IQR)	0·894 (0·792–0·950)	0·920 (0·850–0·965)	0·846 (0·720–0·955)	0·930 (0·900–0·960)	0·910 (0·849–0·950)	91·3% (86·0–95·0%)	0·850 (0·748–0·960)
Range	0·13–1·00	0·36–1·00	0·280–1·000	0·86–1·00	0·71–1·00	59·7–100%	0·280–0·975
Number of studies	146	127	49	17	64	141	24

Research Gap - Very minimal study combining both Clinical and Dermoscopic images



Problem Statement

Business Problem

1. An easy method at a faster rate in identifying the melanoma from the images produced from either smartphone or dermoscopic device
2. Highly-trained specialists are required to accurately diagnose Melanoma early which is a very big challenge due to the shortage of experts.

Analytics Solution

1. Extensive use of Smart phones makes easy to click skin images than using dermoscopy device
2. Use both clinical and dermoscopic images, classify malignant Melanoma and benign using CNN.

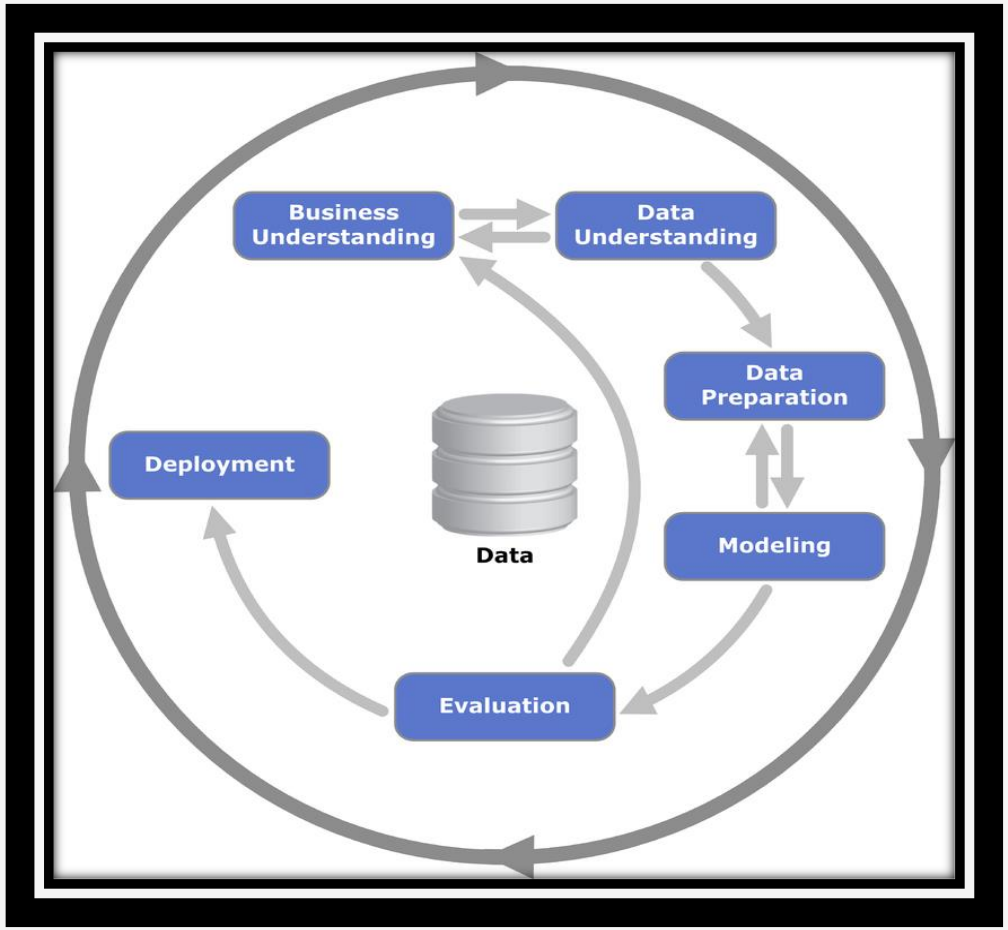
Project Objectives

1. The Model using CNN shall be able to process and classify both clinical and dermoscopic images.
2. Use CNN to classify malignant Melanoma and benign.

Expected Outcome

1. Using Smart Phones or Dermocopy device Physicians can detect the Melanoma
2. Neural network enabled decision system that can detect skin cancer easily and speedily could help in saving more lives at a low cost

Project Methodology



- The CRISP-DM framework has been used here for the study in this project.
- It is a process model which explains approaches in data mining. It is the most widely used model in analytics

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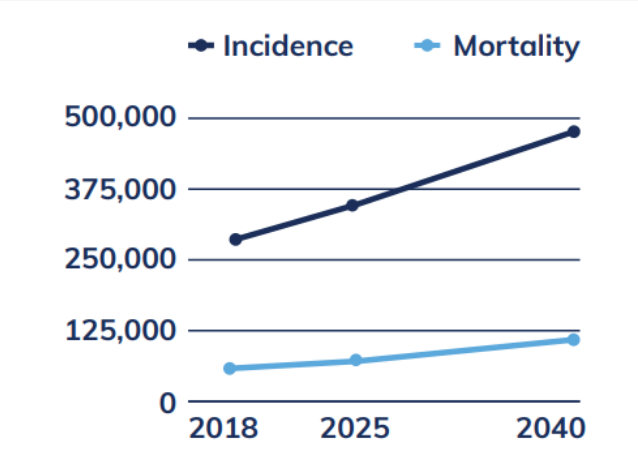
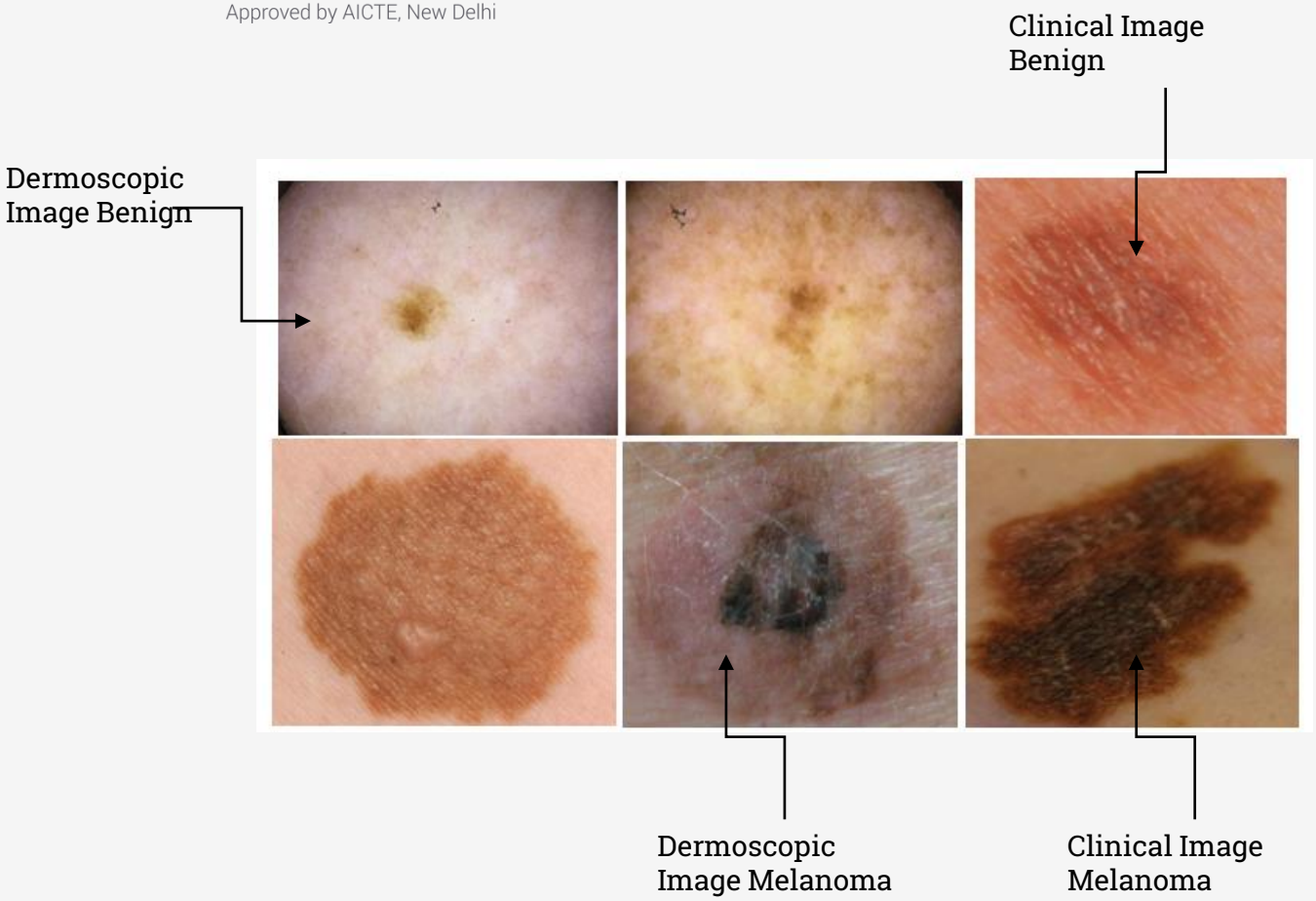
Business Understanding



- Data source - (Global Coalition for Melanoma Patient Advocacy & Euro Melanoma, 2020)

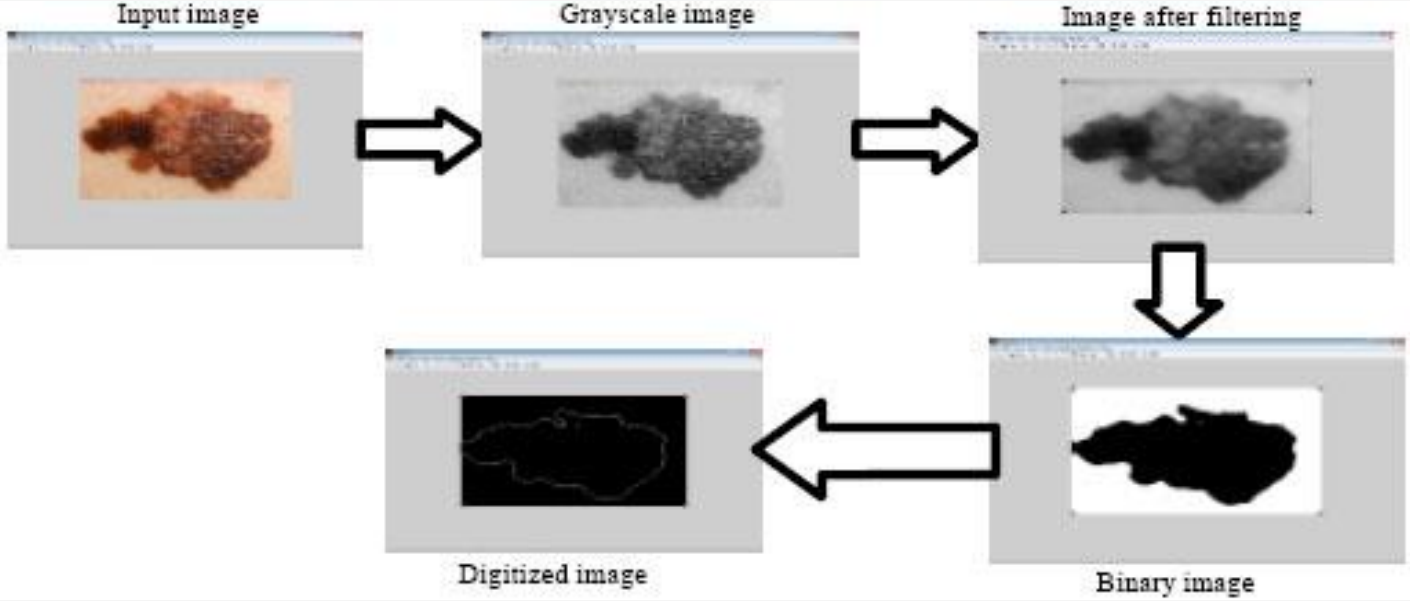
	Useful	Harmful
Internal	**Strength** • Melanoma skin cancer cases worldwide is expected to rise by 18% to 340,271 • From 2015 to 2019 Mortality rate decreased by 4% each year due to early detection • AI/ML can detect Melanoma • Avg .cost per melanoma detected was $32,594	**Weakness** • Dedicated team to work on End to End solution • Product testing
External	**Opportunities** • Growing AI, ML interest in clinical diagnostics • Extend the learning to other Skin cancers • Scale to the Needs of Asian countries • Mortality rate expected to increase 20% by 2040	**Threat** • May need high investments in proving accuracy • Acceptance of Melanoma skin cancer studies by Hospitals • Anticipate little support from Physicians

Data Understanding



- 170 - Med-Node Clinical Images -70 images of melanoma and 100 images labeled as nevus and benign are used in this study
- Digital images sourced from the International Skin Imaging Collaboration (ISIC) between 2018 and 2019 – 50 Images
- The image dimensions range from 201 x 257 to 3177 x 1333 pixels
- The shapes of nevi's were oval, round, dome-shaped were part of the data set.
- The images were largely free from hair

Data Preparation



Used image data generator to apply random transformations

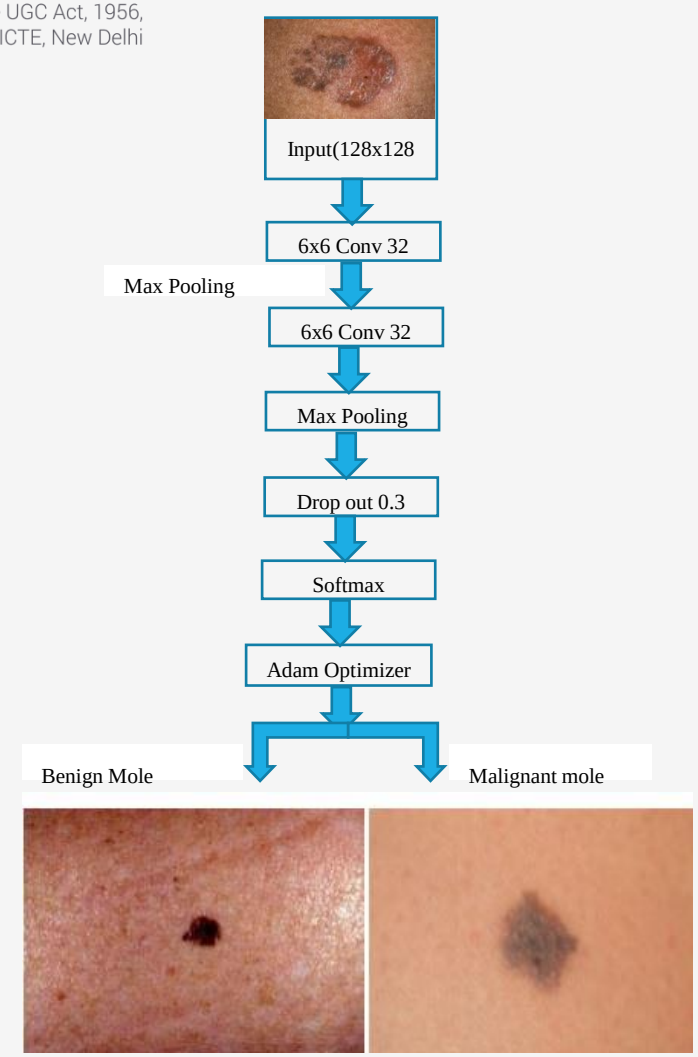
Model will be more robust as it trains on images that are slightly distorted, helps to prevent the model from learning noise in the data

The images are resized for better compute efficiency in handling bigger size of images,

Grayscale images are generated from original images that are easier for the CPU to process.

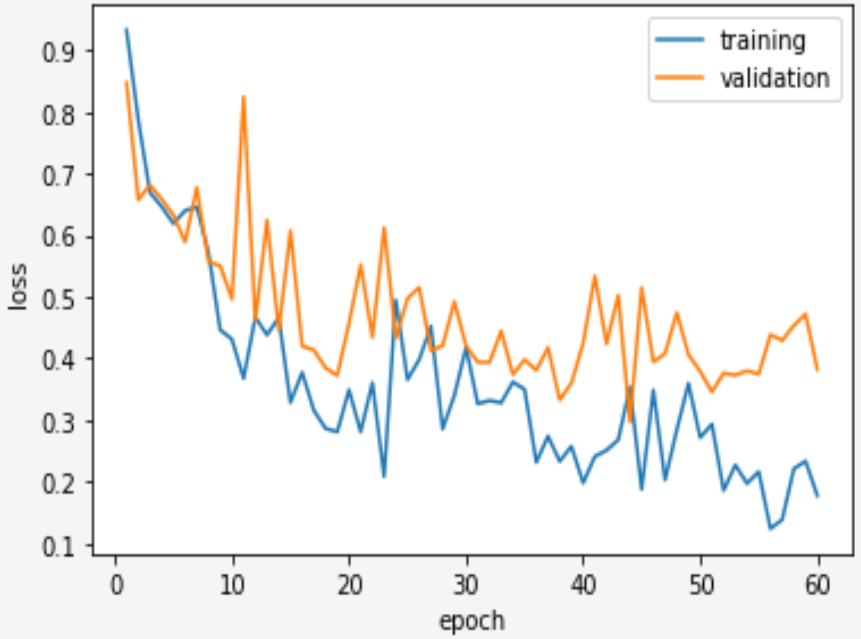
Binary classification is employed to select classes 1(Melanoma) and 0 Benign.

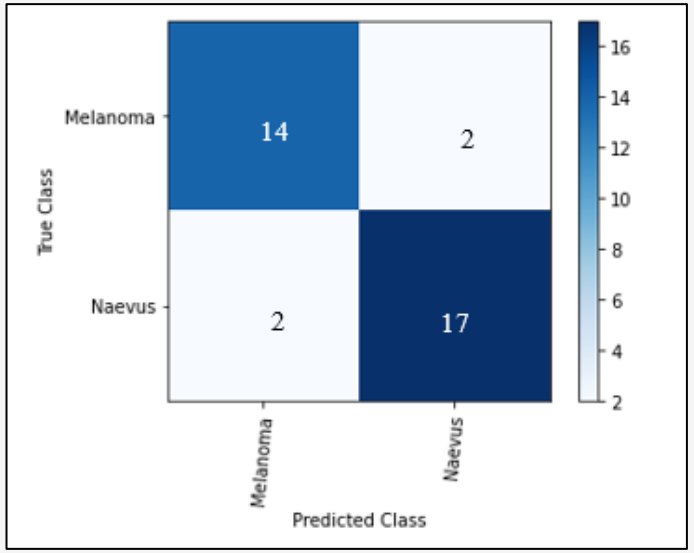
Modeling



- The resolution of skin images is changed to 128 × 128 pixels as an input of the CNN model
- The image is convoluted using 6 × 6 filters on each hidden layer with the number of output channels on each layer is 32.
- At each layer used Max pooling. The result of Maxpooling reduces the size of the image
- The flatten process will change image features from 3 dimensions to 1 dimension.
- The softmax activation function will be used to classify the condition of skin image into two classes benign and melanoma

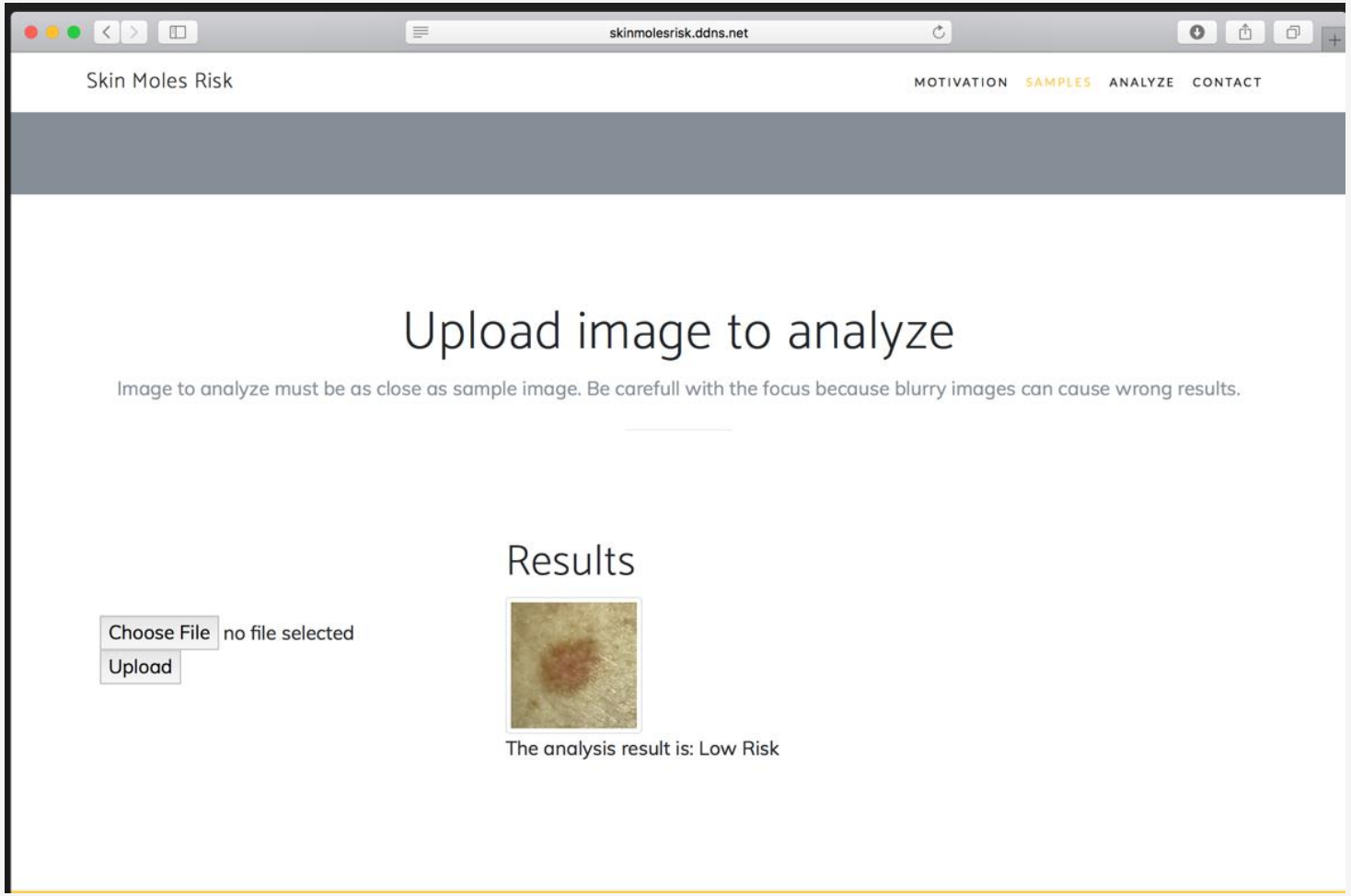
Model Evaluation





- Model has run for 60 epochs with training loss at 0.177 and accuracy at 0.94.
- The model is able to learn until the 60th epoch with validation loss reducing from 0.45 to 0.38 and Validation accuracy at 0.88
- Validation loss is at 38%, the confusion matrix has very less false positives which are labeled as melanoma instead of nevus.
- Model is able to detect the true positive better.

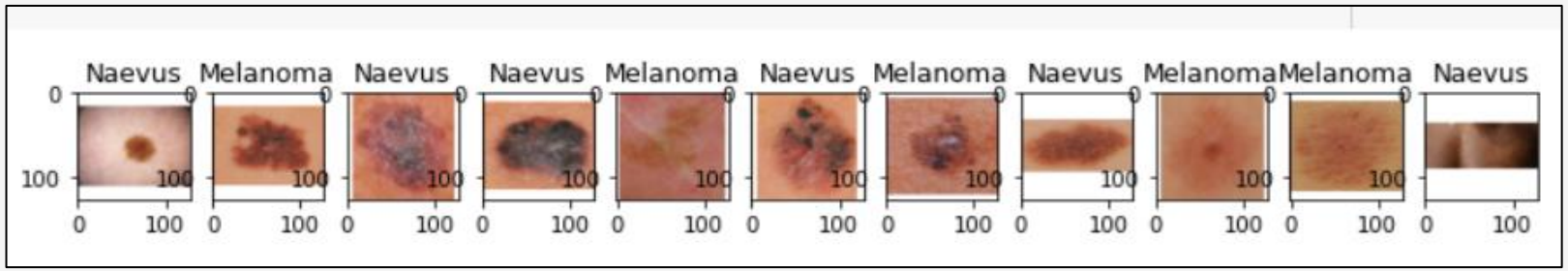
Model Deployment



UI –in-progress not functional Expected to complete by Oct'22

Results and Insights

Model Prediction class



Results Tabulation	Specificity	Sensitivity	Precision	Negative Predictive Value	Model Accuracy
Results from this Study	0.89	0.87	0.87	0.89	0.88
Results from Literature Review	0.89	0.894		0.93	0.91

- Model can detect patients 0.89 correctly without disease
- With Sensitivity at 0.87 model can detect patients with the disease
- Precision , the model can also detect 0.87 as positive among all the positives
- NPV , the model can detect only 0.89 among all the negatives
- Model accuracy is around 88% has scope to improve further

Conclusion and Future Work

The proposed model achieved performance at par with other literature review studies.

- Model accuracy is around 88% has scope to improve further
- Using both clinical and dermoscopic images the model has provided positive signs to use on any given mole images

Future Scope

- This study was limited to analyze malignant melanoma and benign moles future study would like to categorize melanomas into multiple severity levels.
- Include data from Asian countries. Currently, the data used is from western countries
- Further would like to deploy end to end model starting from capturing images in digital cameras and a UI to process and produce the results of detection within minutes with higher accuracy.

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Annexure

Additional Information | Plagiarism score

Identify Malenoma moles on Skin using CNN

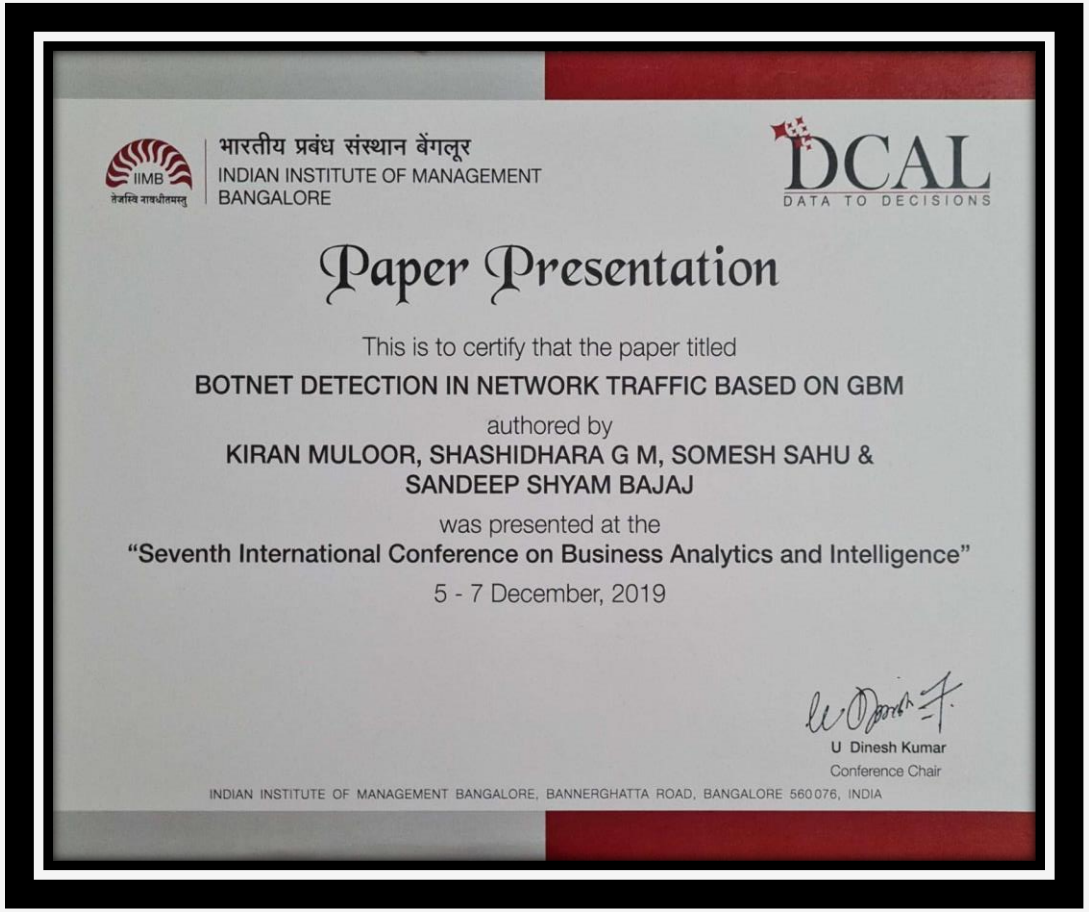
ORIGINALITY REPORT

15%	10%	11%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

Annexure

Publications | Conferences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Paper Presentation

This is to certify that the paper titled

BOTNET DETECTION IN NETWORK TRAFFIC BASED ON GBM

authored by

KIRAN MULOOR, SHASHIDHARA G M, SOMESH SAHU &
SANDEEP SHYAM BAJAJ

was presented at the

"Seventh International Conference on Business Analytics and Intelligence"

5 - 7 December, 2019

U Dinesh Kumar
Conference Chair

INDIAN INSTITUTE OF MANAGEMENT BANGALORE, BANNERGHATTA ROAD, BANGALORE 560076, INDIA

Network Traffic based on GBM - Paper presented in Seventh International Conference on Business Analytics & Intelligence (BAICONF2019) - Conducted by IIM, Bangalore

Sahu, S. K., Muloor, K., M, S. G., & Bajaj, S. S. (2021). Botnet Detection in Network Traffic Based on GBM. *Issn 2321 3361 © 2021 Ijesc*, *11*(08), 28621–28624. https://ijesc.org/upload/661eab6aab246957b4dbdb6106b6768a.Botnet Detection in Network Traffic Based on GBM (1).pdf

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