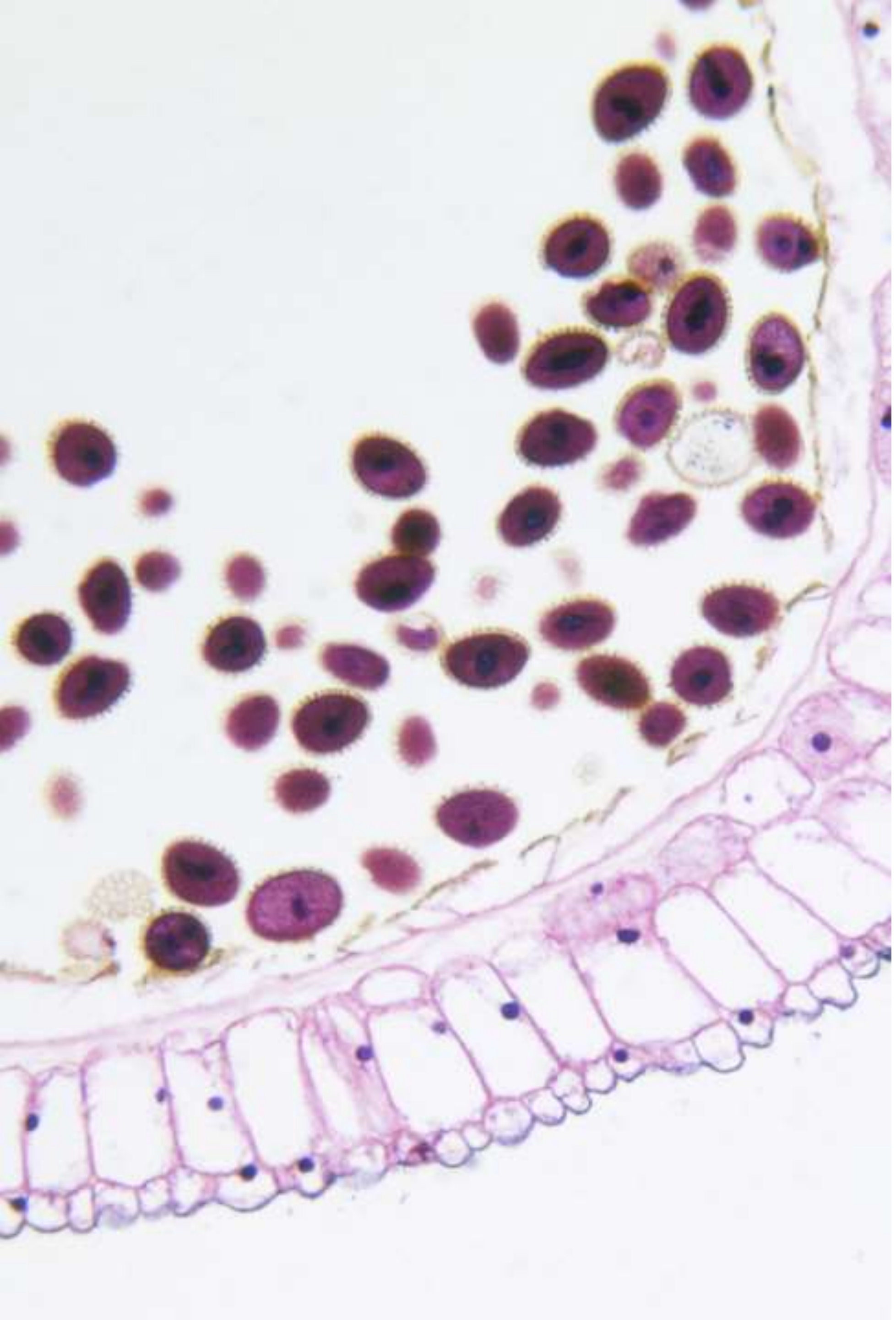

Skin Lesion Classifications using Deep Learning

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OUTLINE

- Introduction & Motivation
- Background
- Literature Review
- Research Gap
- Base Paper Explanation
- Conclusion
- References

INTRODUCTION & MOTIVATION

- Skin Cancer is the most common and potentially life-threatening type of cancers.
- In 2019, It was diagnosed in about 5.6 million individuals.
- It affects 2.5 million people annually in countries such as Australia, New Zealand, South Africa and the US
- The estimated 5-year survival rate is over 95% for early stage diagnosis
- The estimated survival rate is below 20% for late stage detection.

BACKGROUND

- Skin has three layers : The epidermis, The dermis, The Hypodermis
- Skin Cancer is the abnormal growth of cells in the dermis or epidermis that has the ability to spread to certain parts of the human body
- Skin lesions are broadly classified into Malignant and Benign.
- **Benign Skin lesions** :
  - Actinic keratoses.
  - Benign keratosis-like lesions.
  - Dermatofibroma.
  - Melanocytic nevi
  - Vascular lesions.
- **Malignant skin lesions** :
  - Non-melanoma Skin Cancer
  - Melanoma Skin Cancer

LITERATURE REVIEW

Sr No	Title of the paper	Author	Year of publication	Dataset used	Methods used	Accuracy	Research Gap
1	DEEP LEARNING FOR SKIN CANCER DIAGNOSIS WITH HIERARCHICAL ARCHITECTURES	Catarina Barata, Jorge S. Marques.	2019 (IEEE)	ISIC 2017	HIERARCHICAL CNN	87.6%	Validation of results on a larger dataset that comprises more classes of non-melanocytic lesions is required.
2.	SKIN LESION CLASSIFICATION USING HYBRID DEEP NEURAL NETWORKS	Amirreza Mahbod, Gerald Schaefer, Chunliang Wang, Rupert Ecker, Isabella Ellinger.	2019 (IEEE)	International Skin Imaging Collaboration 2016, 2017	Convolutional Neural Networks (CNNs)	90.69 %	Extending the model to incorporate more advanced pre-trained models such as DenseNets could improved classification performance

LITERATURE REVIEW

Sr No	Title of the paper	Author	Year of publication	Dataset used	Methods used	Accuracy	Research Gap
3.	Skin Lesion Classification using Deep Learning and Image Processing	Atharva Jibhakate, Pranav Parnerkar, Sahil Mondal, Vastav Bharambe, Shamla Mantri	2021 (IEEE)	Skin Cancer MNIST: HAM10000	ConvolutionalNeural Networks (CNNs), Transfer learning	99%	Novelness is minimised as the authors have relied more on the transfer learning approach and used pretrained architectures.
4.	Attention Residual Learning for Skin Lesion Classification	Jianpeng Zhang, Yutong Xie, Yong Xia, Chunhua Shen	2019 (IEEE)	ISIC-skin 2017	Attention Residual Learning	91.7%	Lesions are classified only into two types cancerous and non-cancerous

LITERATURE REVIEW

Sr No	Title of the paper	Author	Year of publication	Datasets used	Methods used	Accuracy	Research Gap
5.	FCN-Based DenseNet Framework for Automated Detection and Classification of Skin Lesions in Dermoscopy Images	ADEKANMI A. ADEGUN, SERESTINA VIRIRI	2020 (IEEE)	HAM10000	Fully Convolution Network (FCN)	98%	The encoder-decoder network has less accuracy compared to integrated with the CRF model
6	Skin lesion classification using GAN based data augmentation	Haroon Rashid, M Asjid Tanveer, Hassan Aqeel Khan	2019 (IEEE)	International Skin Imaging Collaboration 2018	Generative Adversarial Networks (GANs)	86%	Architecture can be more customized for data generation and classification lesions is required.

LITERATURE REVIEW

Sr No	Title of the paper	Author	Year of publication	Datasets used	Methods used	Accuracy	Research Gap
7.	Skin lesion classification with ensembles of deep convolutional neural networks	B Harangi	2018 - Elsevier	ISBI 2017	deep convolutional neural networks	89.1%	The proposed CNN framework need extension using additional CNN networks and customization for actual usage.
8	Deep Learning for Two-Step Classification of Malignant Pigmented Skin Lesions	Sertan Kaymak, Parvaneh Esmaili, Ali Serener	2018 (IEEE)	2018 ISIC	Two-step Deep Learning	84%	Architecture was not able to fully differentiate between non-melanocytic malignant and benign skin lesion images

LITERATURE REVIEW

Sr No	Title of the paper	Author	Year of publication	Datasets used	Methods used	Accuracy	Research Gap
9.	The Development of a Skin Cancer Classification System for Pigmented Skin Lesions Using Deep Learning	Shunichi Jinnai, Naoya Yamazaki, Yuichiro Hirano, Yohei Sugawara, Yuichiro Ohe, Ryuji Hamamoto	2020 - *Biomolecules*	Dataset was created from scratch	FRCNN	86.2%	Architecture was facing difficulty identifying from low-resolution images, due to its weak capacity to identify local texture
10	Skin Lesion Segmentation and Classification using Traditional Classifiers with Hand-Crafted Features	Russell C. Hardie, Redha Ali, Manawaduge Supun De Silva, Temesguen Messay Kebede	2018 (ISIC)	2018 ISIC dataset	Support Vector Machine	70%	The classifier Performance can be improved with more images

RESEARCH GAP

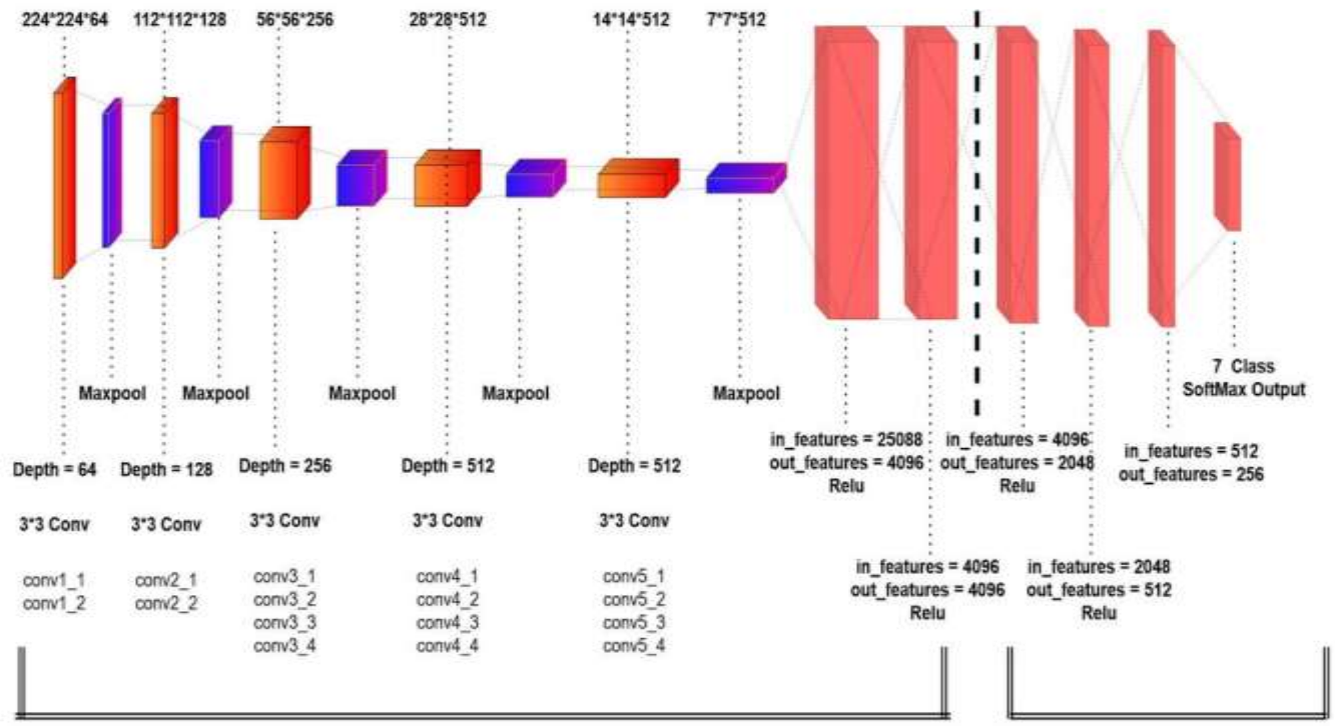
- Extending the model to incorporate more advanced pre-trained models such as DenseNets could improved classification performance
- Novelness is minimised as the authors have relied more on the transfer learning approach and used pretrained architectures.
- The classifier performance can be improved with more number images
- Lesions are classified only into two types cancerous and non-cancerous
- The encoder-decoder network has less accuracy compared to integrated with the CRF model

RESEARCH GAP

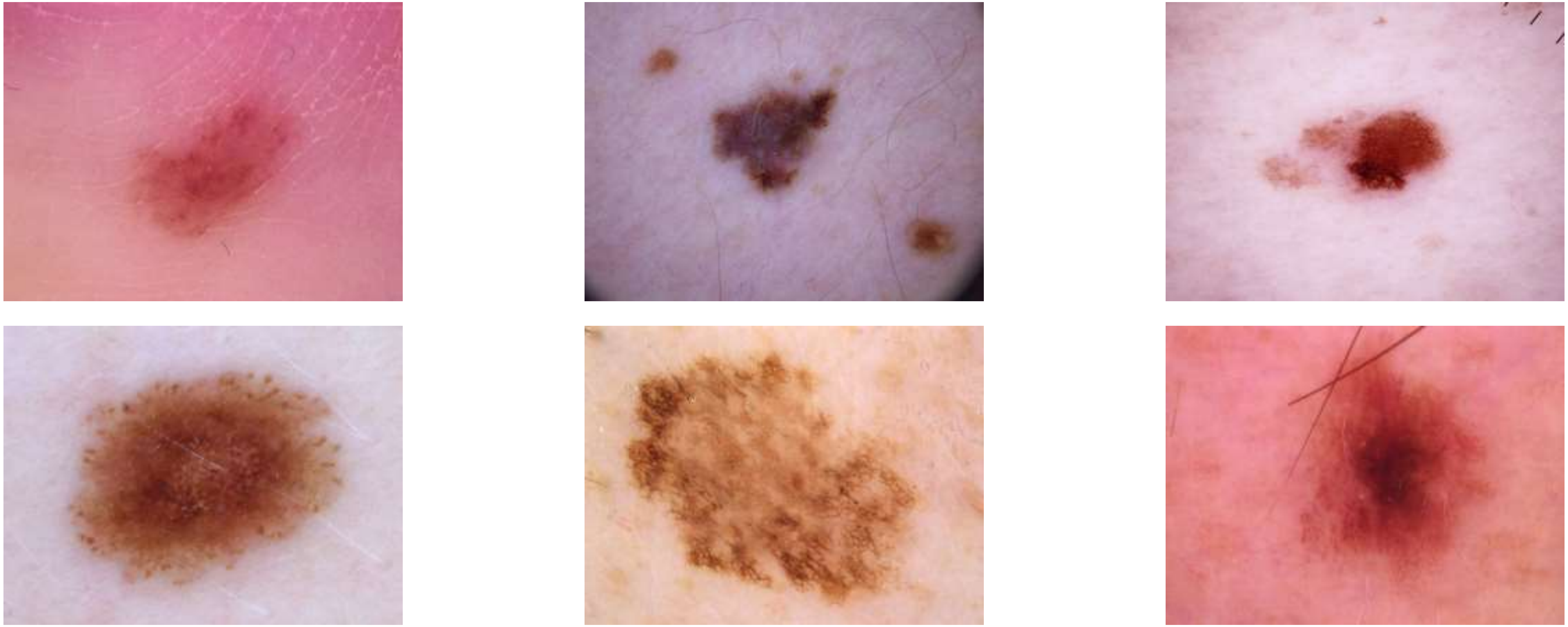
- Validation of results on a larger dataset that comprises more classes of non-melanocytic lesions is required.
- The proposed CNN framework need extension using additional CNN netwo rks and customization for actual usage.
- Architecture was not able to fully differentiate between non-melanocytic malignant and benign skin lesion images
- Architecture was facing difficulty identifying from low-resolution images, due to its weak capacity to identify local texture
- The classifier Performance can be improved with more images

BASE PAPER DETAILS

- **Paper Name :** Skin Lesion Classification using Deep Learning and Image Processing.
- **Published in :** 2020 3rd International Conference on Intelligent Sustainable Systems (ICISS)
- **Dataset :** Skin Cancer MNIST: HAM10000.
- **Network Architecture :**



BASE PAPER DETAILS : DATASET SAMPLES



BASE PAPER DETAILS

5. Implementation steps

Pre-processing

- Firstly eliminate duplicates (images having the same lesion id) from the dataset.
- splitting the dataset into training and validation sets.
- A factor of 0.1 for transfer learning models and a factor of 0.2 for the CNN model
- Normalization of images.
- Lastly, the images in the training set are augmented by rotating and flipping them horizontally and vertically

BASE PAPER DETAILS

5. Implementation steps

Modelling - VGG19

- Number of convolutional layers are sixteen fully connected are three.
- The size of the convolutional kernel is 3x3 and the input size is 224x224x3.
- utilise max-pooling for down sampling and modify the linear unit (ReLU) as the activation function.
- Max-pooling is utilized for down sampling and modify the linear unit (ReLU) as the activation function.

BASE PAPER DETAILS

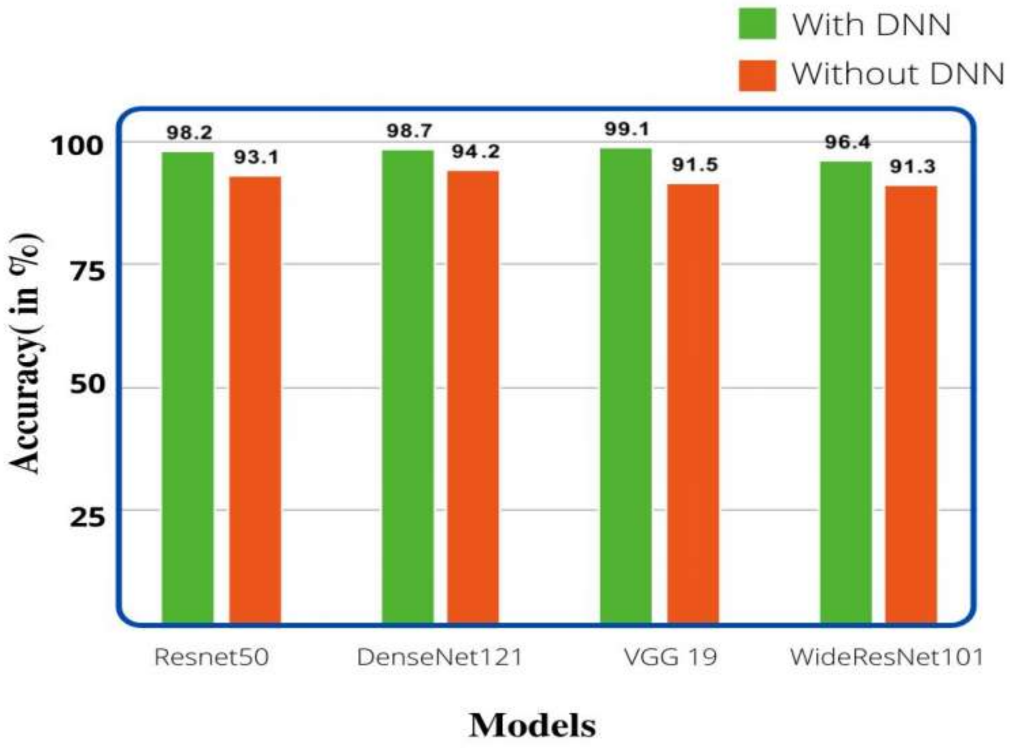
5. Implementation steps

Modelling - DNN

- Deep neural network is comprised of a sequential block having four linear layers.
- First three were activated using ReLU function
- Output Layer is activated with Softmax Layer.
- Output Softmax layer has seven different classes.

Base Paper Results

- **Classification Result :**



CONCLUSION

1. The power of deep neural networks in the classifying dermatoscopic images of seven major skin lesions, which if used in the real world, can provide diagnosis which potentially could be life-saving.
2. After analysing all the 5 models, the most promising result was obtained using VGG-19 Network which delivered best accuracy
3. Using these modified networks, better visual diagnostic precision is obtained as compared to an expert or clinician.
4. The ease of implementation clearly exhibits the potential of these models being used in dermatoscopic systems and modern smartphones in the near future.

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THANK YOU