Melanoma Detection Using Regular Convolutional Neural Networks

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Project Overview: Melanoma Detection Using CNNs

MELANOMA OVERVIEW

PROJECT GOALS

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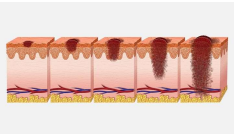
Melanoma: Key Facts and Diagnosis Challenges

- Melanoma is a **cancer** that starts in skin pigment cells.
- It's one of the deadliest skin cancers, causing **75% of skin cancer deaths** (American Family Physician, 2000).
- **Early detection** significantly improves survival rates.
- Diagnosing melanoma is complex, with **dermatologist accuracy between 75% and 85%** (BMC Medical. 2014).



Stages of Melanoma

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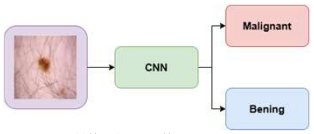
Project Objective

- **IMPLEMENT THE METHODOLOGY** FROM THE REFERENCED PAPER.
- THEN **OPTIMIZE AND TEST** MODIFICATIONS TO IMPROVE PERFORMANCE METRICS SUCH AS ACCURACY, SENSITIVITY, AND SPECIFICITY.



CNN Model Workflow for Melanoma Detection

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Dataset Overview

DATASET DISTRIBUTION

DATASET SPLIT

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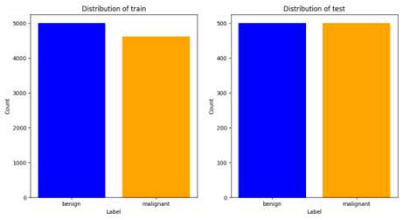
Dataset distribution

TRAINING SET: 9.632 BALANCED IMAGES

TEST SET: 1.024 BALANCED IMAGES



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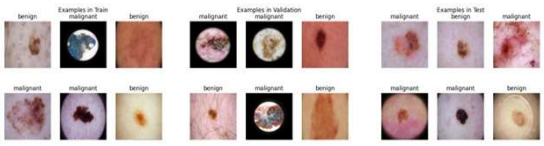
Dataset split

- **TRAINING SPLIT**: 80% (7680 IMAGES)
- **VALIDATION SPLIT**: 20% (1952 IMAGES)
- **TEST SET**: INDEPENDENT DATASET FOR EVALUATION (1024 IMAGES)



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Implementation details

MODEL OVERVIEW

MODEL COMPARISONS

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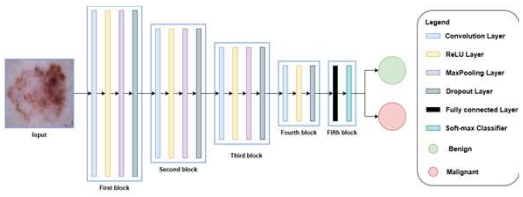
Model Architecture: CNN from Paper



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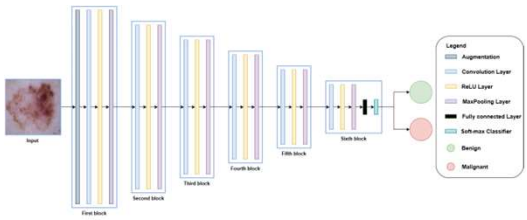
Model Architecture: Our CNN



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Comparison of Paper Model vs. Our Model

PAPER MODEL

- 5 Blocks
- 5 Convolutional Layers (ReLU)
- 3 Pooling Layers
- 4 Dropout Layers
- 1 Fully Connected Layer
- 1 SoftMax Classifier

OUR MODEL

- 6 Blocks
- 6 Convolotional Layers (ReLU)
- 6 Pooling Layers
- 0 Dropout Layers
- 1 Fully Connected Layer
- 1 SoftMax Classifier

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Results Overview

PERFORMANCE COMPARISONS

DEMONSTRATION

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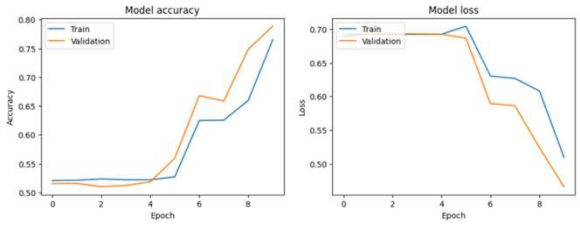
Training Performance – Paper Model



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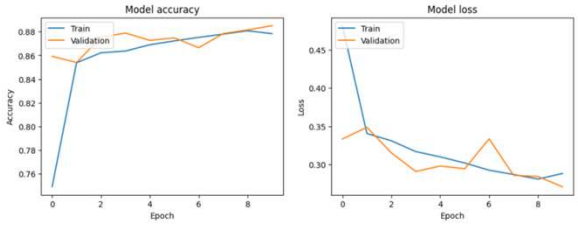
Training Performance – Our Model



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Prediction Comparison

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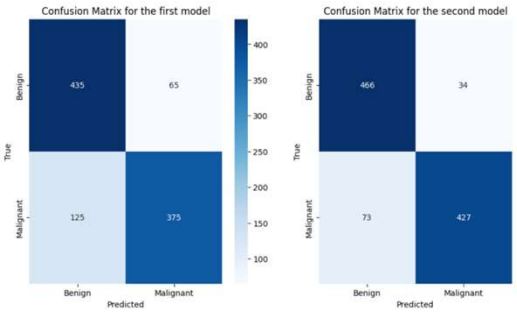

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Results Summary

Metric	Paper Model with original dataset	Paper Model with our dataset	Our Model with our dataset
Train Accuracy	85%	82,97%	91%
Test Accuracy	81,6%	81%	89,8%
True Positives Rate	14,9%	75%	85,4%
True Negatives Rate	98%	87%	93,2%
F1 Score	25%	79,7%	88,8

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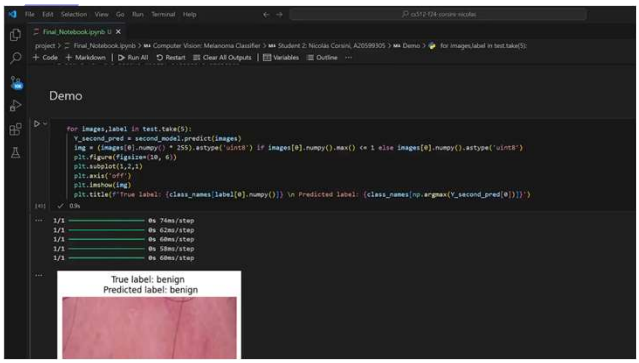

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References

- Jerant, Anthony F.; Johnson, Jennifer T.; Demastes Sheridan, Catherine; Caffrey, Timothy J. "Early Detection and Treatment of Skin Cancer.", American Family Physician . 7/15/2000, Vol. 62 Issue 2, p357. 16p. 8.
- Lin LiEmail author, Qizhi Zhang, Yihua Ding, Huabei Jiang, Bruce H Thiers and James Z Wang, "Automatic diagnosis of melanoma using machine learning methods on a spectroscopic system",BMC Medical Imaging,13 October 2014.

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