Classification of Skin Lesion: Benign or Malignant

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Project Overview

- Focus: Deep learning for skin lesion classification
- Dataset: ISIC 2016 challenge dataset
- Goal: Distinguish between benign and malignant lesions
- Approach: Comparison of various CNN architectures

Central Problem and Objectives

- Enhance early detection of skin cancer
- Compare performance of different CNN architectures
- Evaluate impact of data augmentation
- Assess potential for clinical application

2. Methodology: Deep Learning Approach

- Models Tested: ResNet18, VGG16, InceptionV3, ResNet50, EfficientNet-B0
- Transfer Learning: All models pre-trained on ImageNet
- Data Preprocessing: Resizing, normalization
- Data Augmentation: Applied to one version of ResNet50
- Evaluation Metrics: Accuracy, F1-score, ROC-AUC, Precision, Recall
- Challenge: Class imbalance addressed using weighted loss function

3. Model Performance Comparison

Models	F1-Score	ROC-AUC	Accuracy
ResNet18	0.7984	0.7369	0.7848
VGG16	0.7867	0.7549	0.7849
InceptionV3	0.7463	0.7712	0.7183
ResNet50	0.8515	0.8638	0.8593
EfficientNetB0	0.6169	0.7812	0.5816

4. ResNet50: Impact of Data Augmentation

- Comparison of ResNet50 with and without data augmentation:

Model	F1-Score	ROC-AUC	Accuracy
ResNet50(without Augmentation	0.8515	0.8638	0.8593
ResNet50 with Augmentation	0.7073	0.7279	0.6806

- Key Finding: Data augmentation unexpectedly decreased performance.
- Possible reasons: Overfitting to augmented data, loss of key features.
- Best Model: ResNet50 without Augmentation is the best.

5. Best Model Demonstration

- Implementation: Google Colab notebook
- Model: ResNet50 (best performing)
- Deployment Method: Pickle file for efficient loading
- Input: Dermoscopic image of skin lesion
- Output: Classification as Benign or Malignant

6.Conclusions and implications

Key Takeaways:

- 1. Deep learning shows promise in skin lesion classification
- 2. Transfer learning is effective for medical image analysis
- 3. ResNet50 architecture performed best for this task
- 4. Data augmentation requires careful consideration in medical imaging

Implications:

- Potential to assist dermatologists in diagnosis
- May improve early detection rates of skin cancer
- Demonstrates the value of AI in medical imaging

7.Future Directions

Next steps to advance this research:

- 1. Expand to multi-class classification (various skin condition types)
- 2. Explore explainable AI techniques for model interpretability
- 3. Conduct clinical integration studies to validate real-world performance
- 4. Develop more diverse and representative datasets
- 5. Investigate advanced architectures (e.g., Vision Transformers)
- Goal: Create a robust, clinically-validated AI system for skin lesion classification

Thank You

- Thank you for your attention.

- Questions are Welcome.

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