MediMind AI

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INTRODUCTION

- Skin diseases affect millions globally and can lead to physical, emotional, and social challenges if left untreated.
- In many regions, especially rural areas, access to qualified dermatologists is limited, leading to delayed or incorrect treatment.
- MediMind AI is an intelligent, AI-powered dermatology assistant designed to assist in the early detection of common skin diseases (Acne, Eczema, And Melanoma).
- User-friendly interface, and multilingual voice/text interaction to enhance accessibility and reliability.

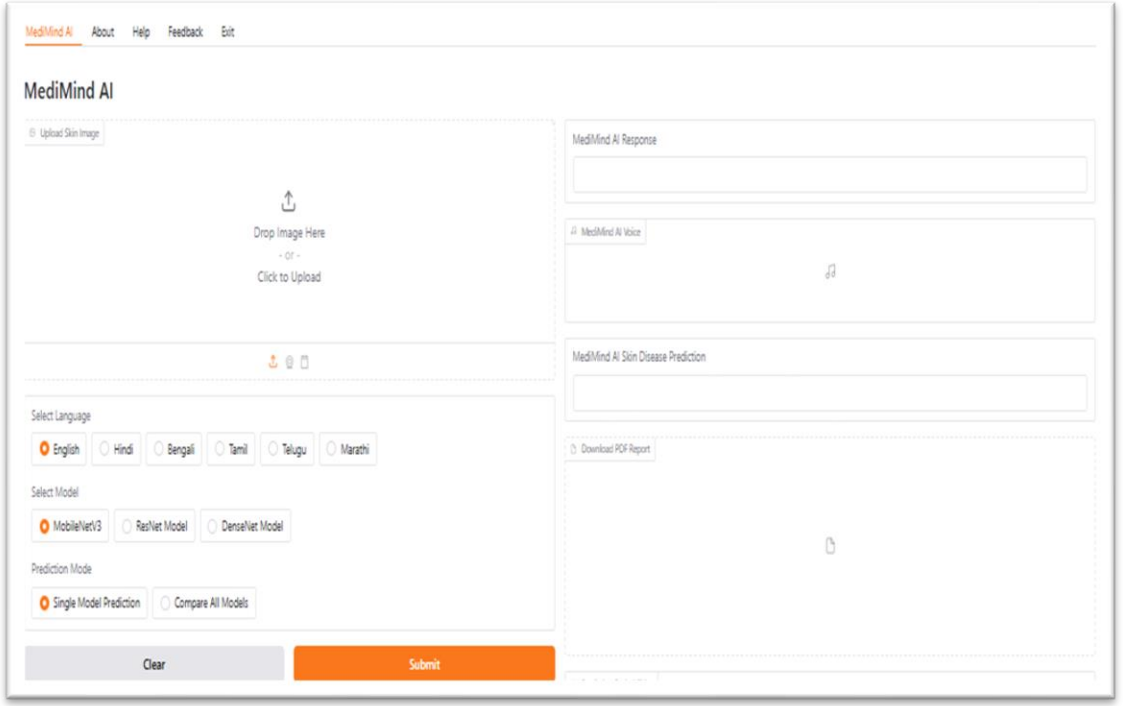

Figure 1 : MediMind AI Interface

OBJECTIVES

- To support multiple skin disease categories: Acne, Eczema, Melanoma, and Unknown (out-of-distribution cases).
- To enhance diagnostic accessibility through multilingual voice and text interaction.
- To integrate advanced features like Softmax thresholding, PDF report generation, and model comparison.
- To deploy the system with a user-friendly Gradio interface, making it practical for both patients and healthcare professionals

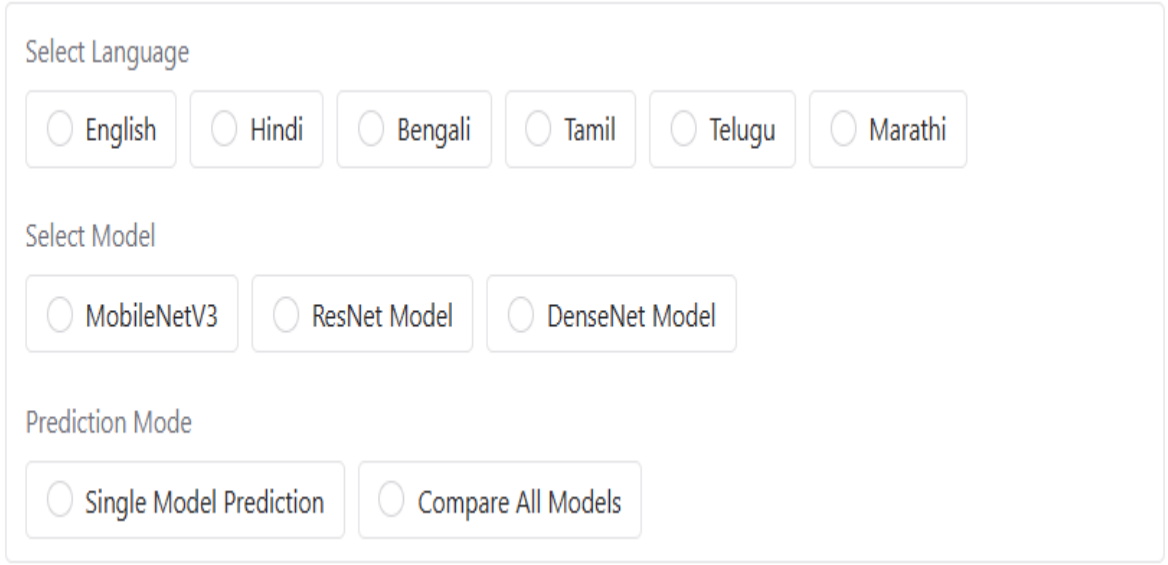

Figure 2 : Multilingual Language And Prediction Mode Suppose

RESEARCH GAPS

i. Most public datasets cover only a few skin disease categories, limiting model generalization and robustness.

ii. Lack of AI systems that integrate speech, image, and text modalities for more accurate and insightful diagnosis.

iii. Very few tools offer multilingual voice/text interaction, making them inaccessible to non-English speakers.

iv. PDF medical report generation, creates detailed medical reports for easy doctor review

Figure 3 : Research Gaps

LITERATURE REVIEW

Table No. 1 : Literature Review

SI. No.	Authors	Publication Year	Paper Title	Technology Used	Pros	Cons	Journal Name	Volume	Page No.	DOI
1.	Ahmed Alkuwaiti A ; Nazer K ; Al-Reedy	2023	A Review of the Role of Artificial Intelligence in Healthcare	AI in medical imaging, diagnostics, virtual patient care	Comprehensive overview of AI applications in healthcare	Discusses challenges in AI adoption	Frontiers in Digital Health	5	1-15	https://doi.org/10.3390/jpm13060951
2.	Shuroug A. Alowais, Sahar S. Alghamdi, Nada Alsuhebany, Tariq Alqahtani, Abdulrahman I. Alshaya	2023	Revolutionizing Healthcare: The Role of Artificial Intelligence in Clinical Practice	AI in disease diagnosis, treatment recommendations	Up-to-date overview of AI applications	Addresses challenges in AI adoption	BMC Medical Education	23	5-12	http://doi.org/10.1186/s12909-023-04698-z
3.	Junaid Bajwa, Usman Munir, Aditya Nori, Bryan Williams	2021	Artificial Intelligence in Healthcare: Transforming the Practice of Medicine	AI in clinical decision-making	Outlines breakthroughs in AI applications	Discusses roadmap for effective AI systems	npj Digital Medicine	4	3-8	https://doi.org/10.7861/fhj.2021-0095

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LITERATURE REVIEW

4.	Vidhya Rekha Umapathy 1, Suba Rajinikanth B 2, Rajkumar Densingh Samuel Raj 3, Sankalp Yadav 4	2023	Perspective of Artificial Intelligence in Disease Diagnosis: A Review	AI in medical diagnostics	Enhances accuracy and efficiency in diagnosis	Discusses limitations and challenges	Frontiers in Medicine	10	4-10	https://doi.org/10.7759/cureus.45684
5.	Junaid Bajwa, Usman Munir, Aditya Nori, Bryan Williams	2021	Artificial Intelligence in Healthcare: Transforming the Practice of Medicine	AI in clinical decision-making	Outlines breakthroughs in AI applications	Discusses roadmap for effective AI systems	npj Digital Medicine	4	3-8	https://doi.org/10.7861/fhj.2021-0095

METHODOLOGY

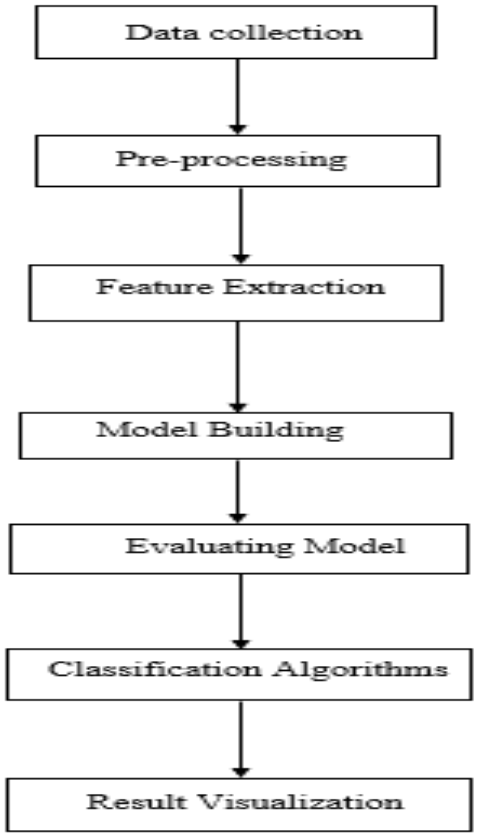

Figure 4 : Block Diagram of System for MediMind AI

METHODOLOGY

Block Diagram of System :

- Collect labeled skin disease images for four categories.
- Preprocess images by resizing, normalizing, and cleaning.
- Extract features using CNNs and train models (MobileNetV3, ResNet50, DenseNet121).
- Evaluate results and display predictions, Grad-CAM, and PDF reports.

METHODOLOGY

Models Used :

i. MobileNetV3:

- Lightweight and fast model for real-time apps
- Optimized for mobile and web deployment

ii. ResNet50:

- Deep model with residual connections
- Good balance of accuracy and speed

iii. DenseNet121 :

- A CNN architecture where each layer is densely connected to every other layer in a feed-forward fashion.
- Promotes feature reuse, reduces the number of parameters, and improves accuracy.

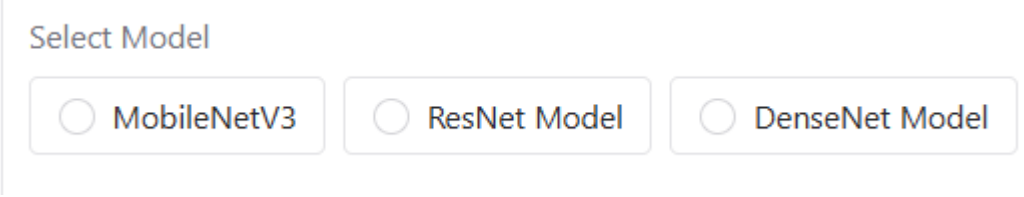

Figure 5 : Model Selection

METHODOLOGY

Image Samples :

Figure 6 : Melanoma Prediction

Figure 7: Acne Prediction

Figure 8 : Eczema Prediction

Figure 9 : Unknown Prediction

RESULTS AND ANALYSIS

Confusion Matrix

The Confusion Matrix is a powerful tool for evaluating the performance of a classification model. It shows how well the model distinguishes between different categories by comparing actual labels with predicted labels.

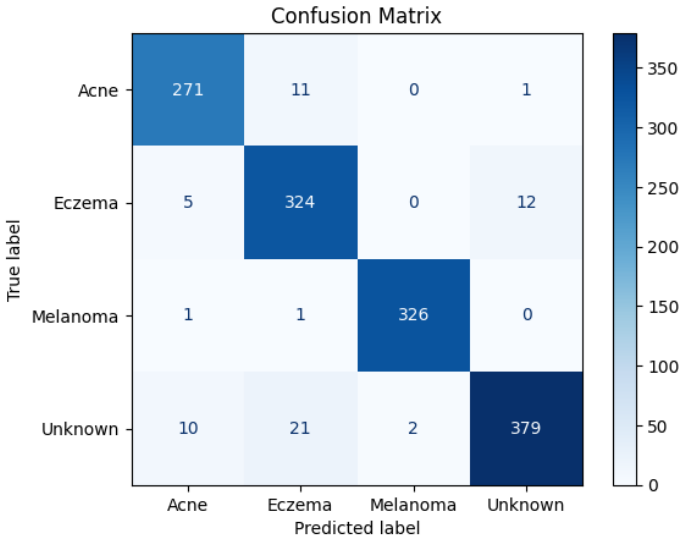

Figure 10 : ResNet50 Confusion Matrix

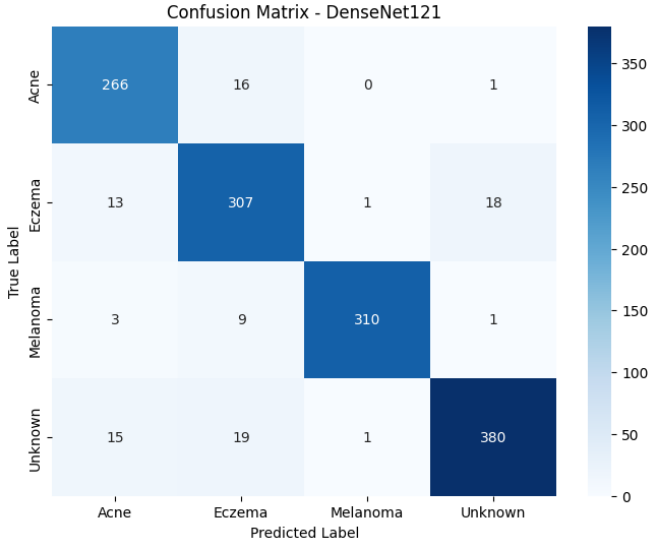

Figure 11 : DenseNet121 Confusion Matrix

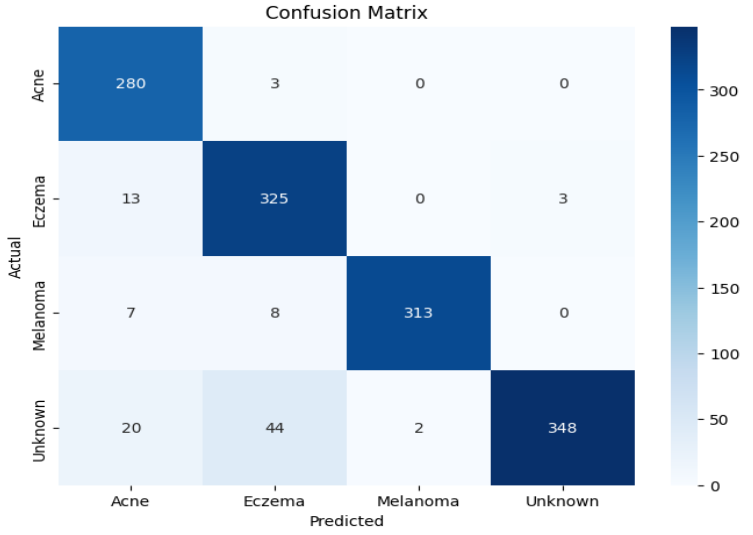

Figure 12 : MobileNetV3 Confusion Matrix

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RESULTS AND ANALYSIS

Table No. 1 : Model Comparison for MediMind AI

Model	Image Class	Predicted Class	Confidence Score	Prediction Accuracy	Remarks
MobileNetV3	Acne	Acne	99.99%	Correct	Accurately identified acne lesions
MobileNetV3	Eczema	Eczema	99.98%	Correct	Correctly detected dry and red patches
MobileNetV3	Melanoma	Melanoma	99.99%	Correct	Detected asymmetry and pigmentation
MobileNetV3	Unknown	Unknown	99.89%	Correct	Successfully handled out-of-distribution
ResNet50	Acne	Acne	99.97%	Correct	Detected acne clusters precisely
ResNet50	Eczema	Eczema	99.96%	Correct	Differentiated eczema effectively
ResNet50	Melanoma	Melanoma	99.98%	Correct	High confidence in melanoma detection
ResNet50	Unknown	Unknown	99.85%	Correct	Robust to unknown categories
DenseNet121	Acne	Acne	99.98%	Correct	Strong performance in acne identification
DenseNet121	Eczema	Eczema	88.20%	Correct	Accurate texture-based eczema detection
DenseNet121	Melanoma	Melanoma	99.90%	Correct	Reliable in detecting malignant lesions
DenseNet121	Unknown	Unknown	99.87%	Correct	Effectively filtered non-skin distractions

RESULTS AND ANALYSIS

Table No. 2 : Comparison of Existing System vs MediMind AI

S.No.	Metric	Existing System	MediMind AI		
			MobileNetV3	ResNet50	DenseNet121
1.	Precision	0.88	0.93	0.94	0.90
2.	Recall	0.85	0.93	0.94	0.90
3.	F1 Score	0.86	0.93	0.94	0.90

Table 2 shows that all three MediMind AI models outperform the existing baseline in Precision, Recall, and F1 Score. ResNet50 scored highest (0.94), followed by MobileNetV3 (0.93) and DenseNet121 (0.90), confirming the effectiveness of the proposed system.

RESULTS AND ANALYSIS

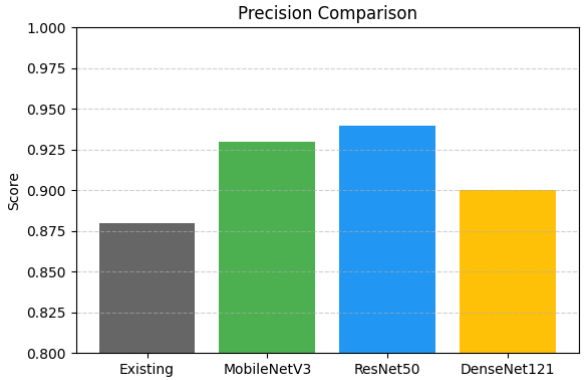

Figure 13 : Precision Comparison

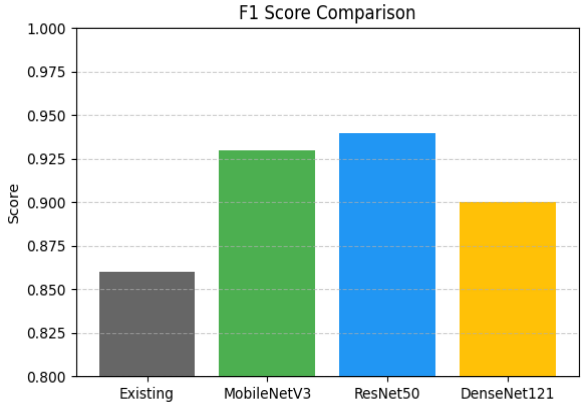

Figure 14 : F1 Score Comparison

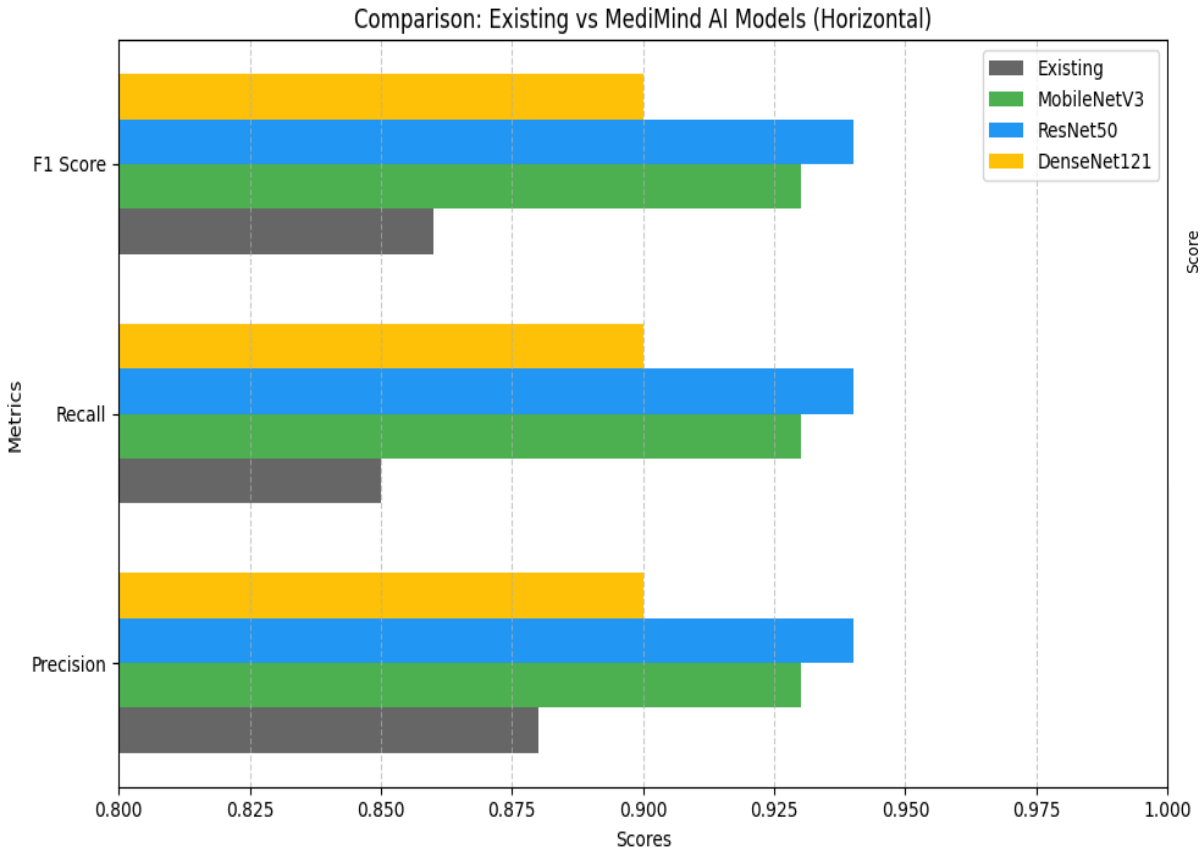

Figure 16 : Comparison : Existing VS MediMind AI

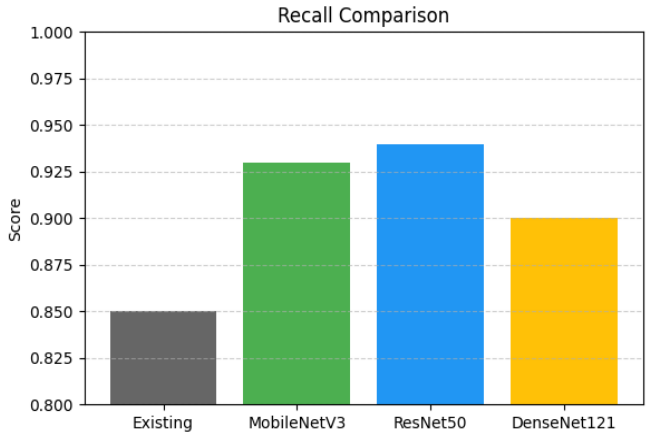

Figure 15 : Recall Comparison

CONCLUSION

MediMind AI successfully integrates speech, image, and text processing to aid skin disease diagnosis. Deep learning models like ResNet50, MobileNetV3, and DenseNet121 showed high accuracy in classifying Acne, Eczema, Melanoma, and Unknown cases. The Gradio-based interface enables real-time diagnosis with multilingual support and PDF reporting. The system demonstrates improved performance compared to traditional methods.

FUTURE SCOPE

Expand the model to include more skin disease categories for broader diagnosis. Include a doctor consultation feature or chatbot to connect users with medical professionals. Add a feature to monitor and compare skin condition progress over time using periodic image uploads. Allow users to save and share diagnostic results directly with hospitals or doctors via secure EHR systems.

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THANK YOU