AI is emerging in dermatology for image-based diagnosis and teledermatology.

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ChatGPT-4o Proves Effective in Accurately Diagnosing Dermoscopic Images of Benign and Malignant Skin Conditions

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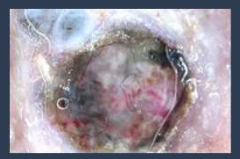
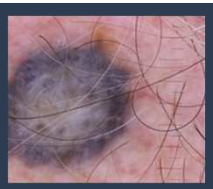
Introduction

- Background: AI is emerging in dermatology for image-based diagnosis and teledermatology, where pattern recognition is essential.
- Problem: Accuracy and bias remain concerns, especially across different skin tones. [1]
- Significance: Validated AI can improve early detection and reduce care disparities.[2]
- Objective: Evaluate ChatGPT-4o's ability to classify benign and malignant skin lesions using dermoscopic images across skin phototypes I-III, and assess accuracy, consistency, and potential clinical utility for dermatology and telehealth.
- ChatGPT-4o (OpenAI) is a multimodal generative pre-trained transformer model with over 189 million weekly users.[3]

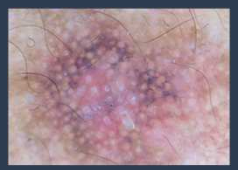
Figure 1: Four common types of Skin lesions Dermatologists assess



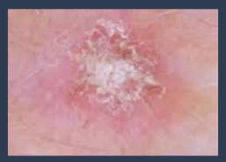
Melanoma



Blue Nevus



Actinic Keratosis



Cutaneous SCC

Methodology

- Ten skin lesions were selected for the diagnostic process: basal cell carcinoma (BCC), melanoma, invasive squamous cell carcinoma (SCC), actinic keratosis, cherry angioma (CA), solar lentigo, seborrheic keratosis, blue nevus (BN), dermatofibroma , and lichen planus.
- For each, 15 dermoscopic images from FST I-III were sourced from DermNet and Dermoscopedia, (N=150 images). Various morphologies (e.g., pigmented and nodular BCCs) were included to evaluate accuracy.
- Images were processed through ChatGPT-4o (Prompt: generate five ranked differential diagnoses from most to least likely.)
- Ratios of correctly identified images were calculated for each lesion category, focusing on both correct first identification and correct identification within the top five differential.
- Sensitivity, specificity, and accuracy were computed based on the model's top diagnosis.

Table 1: Ratios and Percentages of Correct Identification Per Lesional Dermoscopy Image

Lesion Type	Ratio of Correct 1st Identification	% Correct 1st Identification	Ratio In Top 5 Differential	% In Top 5 Differential
Basal Cell Carcinoma	11/15	73%	15/15	100%
Melanoma	15/15	100%	15/15	100%
Squamous Cell Carcinoma, Invasive	11/15	73%	15/15	100%
Actinic Keratosis	14/15	93%	15/15	100%
Cherry Angioma	8/15	53%	10/15	67%
Solar Lentigo	12/15	80%	15/15	100%
Seborrheic Keratosis	11/15	73%	15/15	100%
Blue Nevus	6/15	40%	14/15	93%
Dermatofibroma	14/15	93%	15/15	100%
Lichen Planus	15/15	100%	15/15	100%
Total	117/150	78%	144/150	96%

Results

- ChatGPT-4o correctly diagnosed 117/150 (78%) images at 1st attempt, and 144/150 (96%) within the top 5 differential diagnoses (Table 1).
- Melanoma was correctly identified on initial identification (15/15, 100% sensitivity, 91.1% specificity, 91.99% accuracy) (Table 2). **BCC and SCC** were both diagnosed upon first attempt in 11/15 cases (73% sensitivity), improving to 100% correct identification among the top 5 differentials.
- Correct initial identification was lowest for BN (6/15, 40% sensitivity) and CA (8/15, 53% sensitivity). Identification of both lesions showed significant improvement upon assessment of the top 5 differentials, (93% and 100%, respectively).
- Diagnostic accuracy exceeding 90% was achieved across all fifteen conditions (Tables 1 and Table 2).

Table 2: Sensitivity, Specificity, and Accuracy of Correct First Identification Per Lesional Dermoscopy Image

Lesion Type	Sensitivity	Specificity	Accuracy
Basal Cell Carcinoma	73%	97.03%	94.63%
Melanoma	100%	91.11%	91.99%
Squamous Cell Carcinoma, Invasive	73%	100%	97.33%
Actinic Keratosis	93%	100%	99.33%
Cherry Angioma	53%	100%	95.33%
Solar Lentigo	80%	98.50%	96.65%
Seborrheic Keratosis	73%	100%	97.33%
Blue Nevus	40%	100%	94.00%
Dermatofibroma	93%	100%	99.33%
Lichen Planus	100%	100%	100%

Conclusion

- ChatGPT-4o indicates promising diagnostic capabilities in accurately identifying various benign and malignant skin lesions in light skin using dermoscopic images.[4]
- Limitations include: small sample size, reliance on dermoscopy databases lacking consistent histopathology verification, and inclusion of a limited range of skin phototypes (I-VI).
- Nonetheless, this research provides valuable insights into the future diagnostic potential of ChatGPT-4o as a widely accessible tool in dermatology, beneficial for both educational purposes and clinical support.
- Further research should prioritize the inclusion of a diverse range of skin phototypes and larger sample sizes to comprehensively validate this AI model for dermatologic diagnosis.

References

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