

A General-Purpose Multimodal Foundation Model for Dermatology

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Background and Motivation

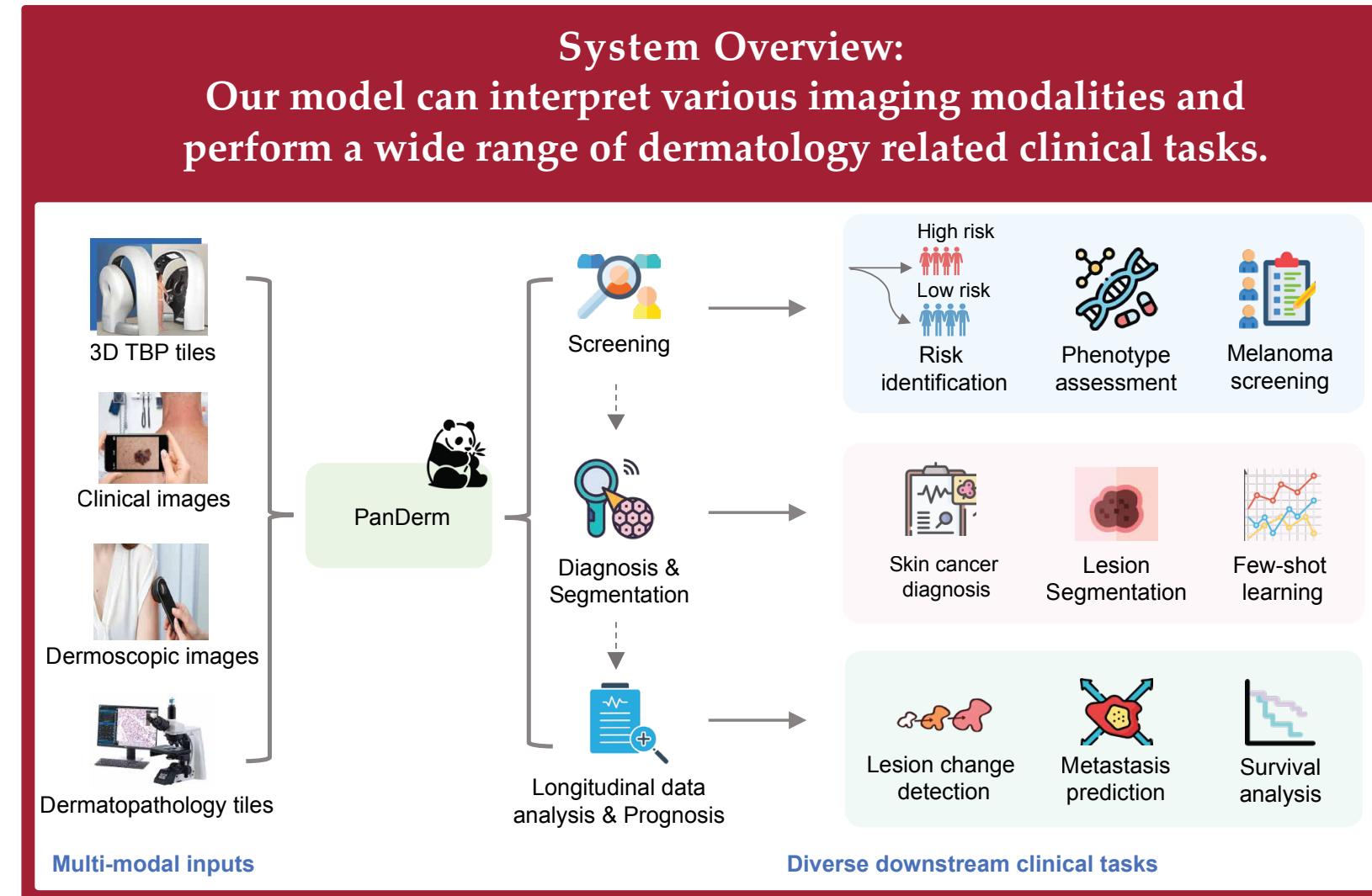
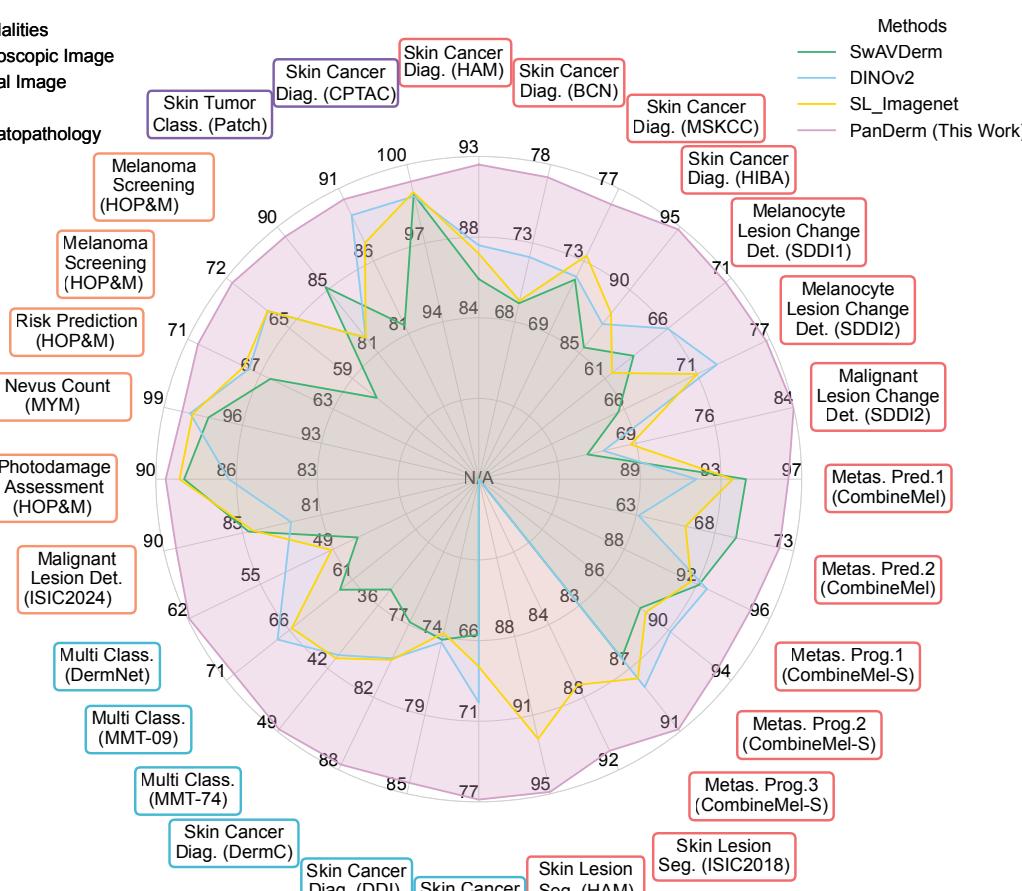
There is a pressing need to fully harness the potential of AI in diagnosing and managing skin diseases. While AI shows promise in specific tasks like melanoma detection, current models cannot integrate multiple imaging modalities or match the comprehensive diagnostic workflow used in clinical practice. Thus, there is a critical need for foundation models that can support holistic, patient-centered dermatological care.

Our Solution

- We introduce PanDerm, the first multimodal foundation model for dermatology that can interpret 4 imaging modalities and supports diverse clinical tasks, such as skin cancer screening, diagnosis, prognosis, phenotype detection, and segmentation.
- The model is pretrained on 2 million dermatological images from 11 international institutions, representing the largest and most diverse dataset in dermatology to date.

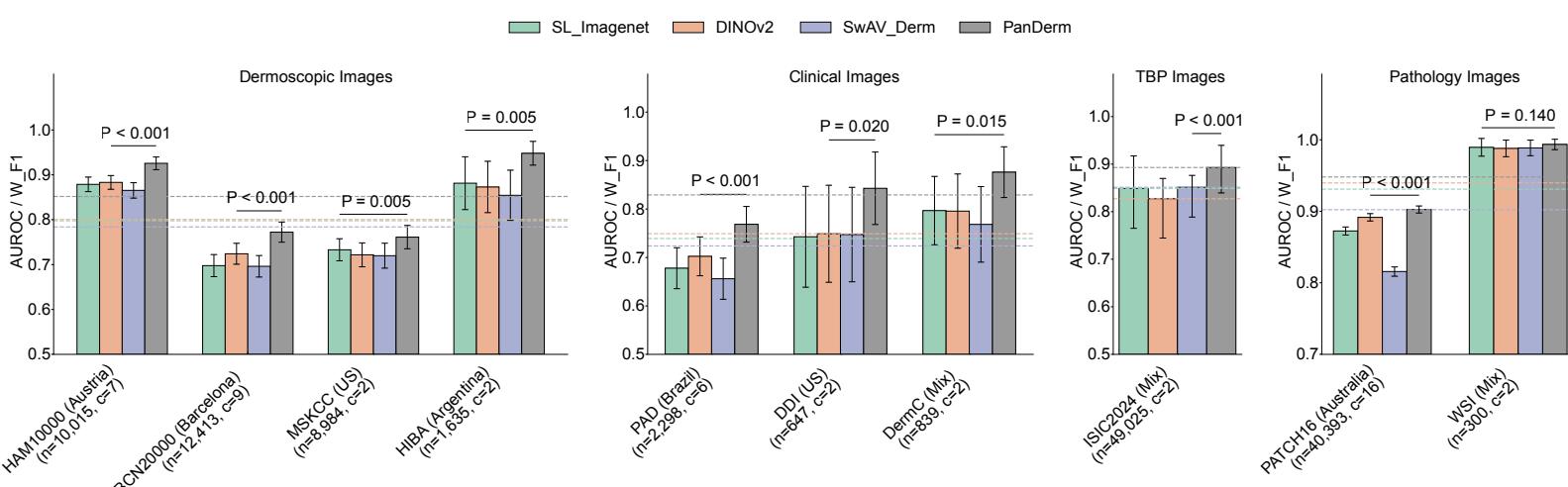
Result I: Overall Capacity

PanDerm, as a general-purpose dermatology foundation model, outperforming all modality-specific or task-specific models on 28 diverse dermatological datasets across 4 modalities, including dermoscopic, clinical, TBP, and Dermatopathology images.



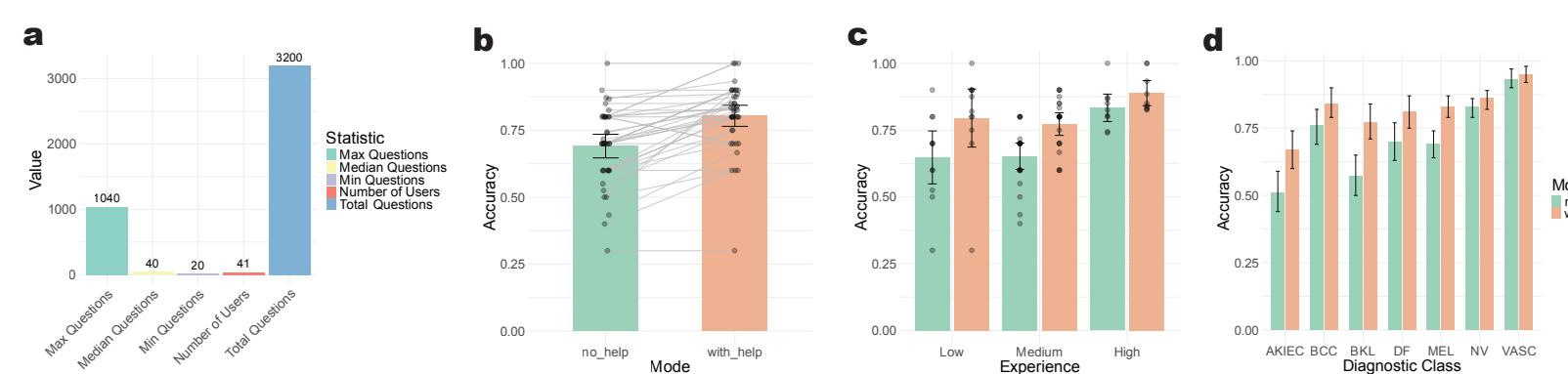
Result II: Diagnosis Accuracy

PanDerm generalizes well in skin cancer diagnosis across diverse populations, imaging modalities, and varying diagnostic difficulty levels.



Result III: Human-AI collaboration for Improved Diagnosis

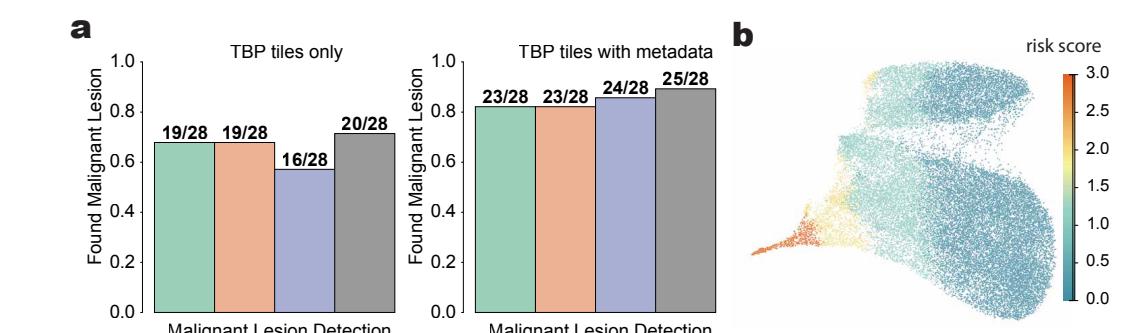
In collaboration with 41 clinicians of diverse experience levels, PanDerm significantly improved diagnostic accuracy for 7-class pigmented skin lesion classification (0.69 → 0.83 in Accuracy; P < 0.001).



Result IV: Suspicious Lesion Screening

Evaluated on 196,933 lesion tiles captured from 3D total body photography from 480 patients in Australia.

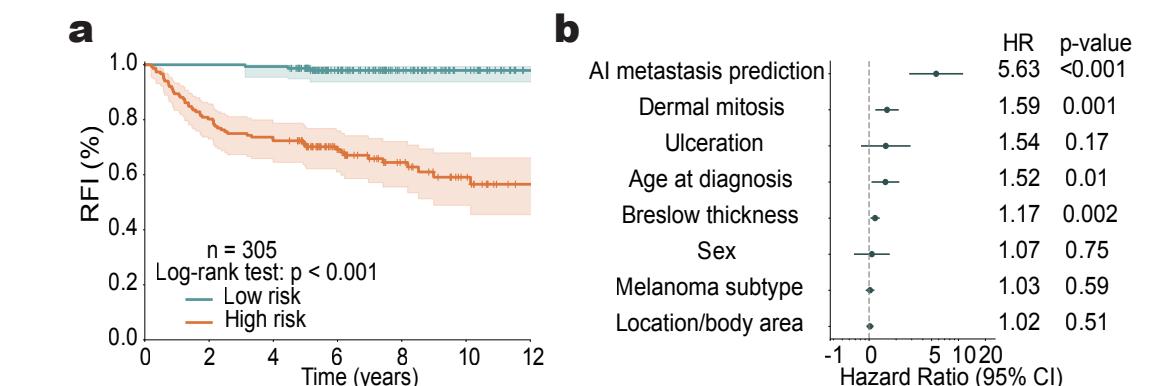
- PanDerm enables total body skin lesion screening, correctly diagnosing 79 out of 80 patients for early melanoma detection.
- PanDerm's risk stratification distribution in UMAP plot can aid clinicians in lesion screening prioritization.



Result V: Prognostic Value

Evaluated on 680 dermoscopic images of invasive melanoma from 370 patients in an international multicenter cohort.

- PanDerm's metastasis prediction score significantly stratifies patients into high and low-risk groups (log-rank test, $P < 0.001$).
- PanDerm's metastasis prediction is the strongest predictor of recurrence-free interval, outperforming all clinical variables.



More information

