Related Work

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Submission Date : 10.07.2025

Table: Comparison Machine Learning and Deep Learning Models for Melanoma Skin Cancer Detection

Reference No	Publishing Year	Dataset	Method	Best Model	Worst Model	Accuracy	Limitations	Category
1	17 March 2022	Small version of ISIC 2018	Deep learning (transfer learning with ResNet50, DenseNet121, MobileNet) and ensemble stacking of machine learning models (SVM, RF, GBM, KNN, Logistic Regression)	Ensemble of ResNet50, DenseNet121, and MobileNet	KNN	Best: 92% (Ensemble of 3 DL models), Worst: 82% (KNN)	Small dataset size, imbalanced original data, image occlusions like hair or rulers affecting model performance.	Supervised Learning
2	2025	Kaggle: Skin Cancer Malignant vs Benign (3,297 images)	EfficientNetV2L for feature extraction + LightGBM	EfficientNetV2L-LGBM (Ensemble)	ViT, VGG16	Best: 99.90% (test), Worst: ~89.7%	Focused only on image datasets; not designed for numerical or time-series data applications.	Supervised Learning
3	2023	ISIC dataset (600 images used)	Preprocessing (noise/hair removal, grayscale), Feature extraction (GLCM), Classification (SVM)	SVM (GLCM + shape & color features)	SVM (shape-only features)	Best: 83%, Worst: 59%	Lacked dark-skinned images in dataset; needs diverse skin tones for improved future applicability.	Supervised Learning
4	2023	ISIC "siim-isic-melanoma-classification"	Hybrid: VGG16 for feature extraction + XGBoost & LightGBM for classification	VGG16 + XGBoost	VGG16 + LightGBM	Best: 99.1%, Worst: 97.2%	Limited scalability	Supervised learning

5	2025	ISIC 2016(1270+ images), ISIC2018/HAM 10000(11,520+ images) PH2(200+ images) MED-NODE(165+images) DERMOFIT(1300+ images)	CNN(AlexNet, VGG16, ResNet) SVM, KNN(texture, color)	Pre-trained ResNet + Inception-ResNet-v2	KNN	Best: 97.5%, Worst: 68.57%	Lack of diverse skin data	Supervised Learning
6	2024	ISIC2017 + HAM10000 0 (2000)	Deep learning Preprocessing(Noise removing while preserving edge details via Bilateral Filtering) Segmentation(u Net for fine grained details), Classification, Hyperparameter Optimization)	ASCDC-CSOD	Mobile Net + KELM	Best: 98.44%, Worst: 69.05%	Impacting real time processing, challenging in balancing sensitivity	Supervised Learning
7	2023	PH2, ISBI, ISIC(21,659 images)	Fusion AlexNet, VGG16 deep learning	AlexNet, VGG16	LDA, CNN	Best: 99%, Worst: 85.4%	Insufficient of rare images, lack of dark skin datasets, small lesion sixes hinder detection	Semi-Supervised Learning

8	2024	ISIC, PH2, DermIS, MED-NODE, DermQuest, HAM10000 0 (11000 images)	Feature extraction, Classification, distance based classification	Hybrid Adaboost-SVM, Fast Fourier Transform	SVM,Statistic metrics	Best: 98%, Worst: 52%	Poor scalability for large datasets, sensitive to noise, scaling issues	Supervised Learning
9	2023	The HAM10000 dataset	images, extracting and selecting features, then classifying with a CNN.	Proposed method (VGG19 +HFE)	HOG	Best 99.85% Worst 90.73%	Its dependence on preprocessing, which may not completely remove noise, impacting classification accuracy.	Supervised Learning
10	2025	ISIC 2020	(N-DCNN) with preprocessing segmentation, and classification for melanoma vs. benign skin lesion detection.	N-DCNN	ResNet 18	Best 93.4% Worst 81.2%	Imbalanced data; needs labeled data; high training compute; generalization risk	Supervised Learning
11	2024	Kaggle (HAM1000 0 dataset)	Deep Learning Models: Light Weight Convolutional Neural Network (LWCNN), GoogleNet, ResNet-18, MobileNet-v2. Transfer	LWNet (proposed lightweight CNN).	MobileNet-v2.	Best 97.30% (train), 88.43% (test). Worst 96.32% (train), 86.74% (test).	Computational complexity with high-resolution images. Dependency on preprocessing (image enhancement) for optimal	Supervised Learning

			Learning: Utilized pretrained models (GoogleNet, ResNet-18, MobileNet-v2) for feature extraction.				performance. Limited generalizability to datasets with different distributions or smaller samples.	
12	2023	ISIC Archive: Over 20,000 dermoscopy images	Feature Extraction: ABCD (Asymmetry, Border, Color, Dimension), GLCM (Gray-Level Co-occurrence Matrix), LBP (Local Binary Patterns). Deep Learning: CNN (ResBCU-Net, DenseNet201, GoogLeNet Inception-v3). Machine Learning: SVM, Decision Tree, K-NN. Optimization: Hybrid frameworks (e.g., Stokes-decomposition with AI models). Preprocessing: Data augmentation (GANs), resizing,	ResBCU-Net (CNN-based with Residual blocks, Batch Normalization, Bi-directional ConvLSTM).	Naive Bayes classifier	Best 97.7% Worst 75.295%	Data Quality: Unbalanced, noisy, and limited labeled datasets (e.g., rare diseases). Generalizability: Performance varies across datasets (e.g., ISIC vs. PH2). Interpretability: Lack of explainability in deep learning models. Computational Cost: High resource demands for training complex models like GANs.	Supervised Learning

			normalization.					

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