

Abstract

Skin cancer is one of the most prevalent cancers in the U.S., and early detection dramatically improves patient outcomes. Our **Skin Cancer Classification (SCC)** desktop tool classifies skin lesion images with 85% accuracy on HAM10000. Built on EfficientNet with custom heads and augmentation, SCC combines deep learning and an intuitive GUI to streamline early screening.

Problem Statement

Delays in the early detection of malignant skin lesions lead to late diagnosis and poorer patient outcomes.

Model & Methods

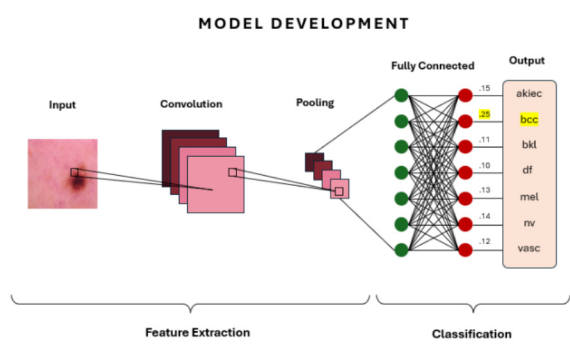


Fig 1: Model Architecture

- 1. **EfficientNetB0:** Pre-trained model
- 2. **Dropout:** Zeroing neurons to prevent overfitting
- 3. **Nonlinearity:** Learn complex patterns
- 4. **Warmup/Cosine:** Gradual and optimized learning
- 5. **CUDA Toolkit:** Utilizes GPU for training

References

- ❖ [HAM10000](#)
- ❖ [American Academy of Dermatology Association](#)
- ❖ [AIM](#)
- ❖ [Frontiers in Oncology](#)
- ❖ [IEEE International Conference](#)
- ❖ [Scientific Reports](#)
- ❖ [Computers in Biology and Medicine](#)
- ❖ [Diagnostics](#)
- ❖ [DOI Nature](#)

Gallery

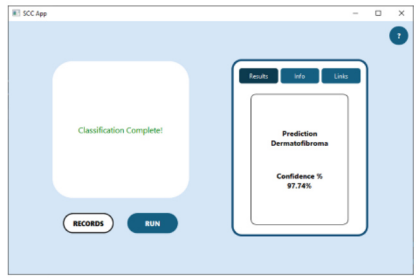


Fig 2: Classification Page

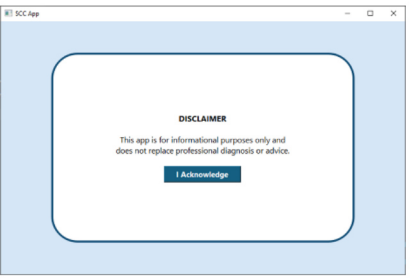


Fig 3: Disclaimer Page

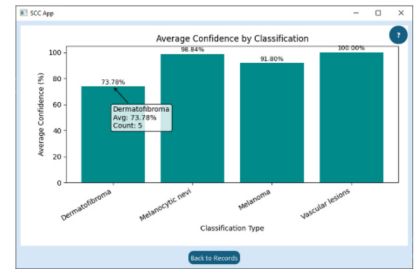


Fig 4: Records Stats Page

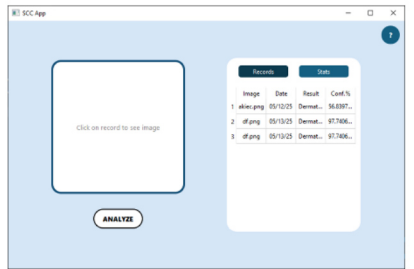


Fig 5: Records Page

Results & Evaluation

Type	V1	V2	V3
	Accuracy	Accuracy	Accuracy
Actinic Keratoses	0.31%	92.31%	81.54%
Basal Cell Carcinoma	0.00%	88.35%	80.58%
Benign Keratosis	22.29%	71.82%	81.36%
Dermatofibroma	0.00%	91.30%	95.65%
Melanoma	0.72%	74.89%	71.30%
Melanocytic nevi	73.78%	77.55%	91.42%
Vascular Lesions	11.27%	89.29%	92.86%
Overall Accuracy	15.48%	83.64%	84.96%

Fig 6: Model Metrics Per Class

Accuracy	Precision	Recall	F1-Score
Percentage of correctly classified images	Predicted positive instances that are correct	Positive instances correctly classified	Balance between precision and recall
83%	80%	85%	82%
$\frac{TP + TN}{TP + TN + FP + FN}$	$\frac{TP}{TP + FP}$	$\frac{TP}{TP + FN}$	$2 * \frac{Precision * Recall}{Precision + Recall}$

Fig 7: Model V3 Metrics

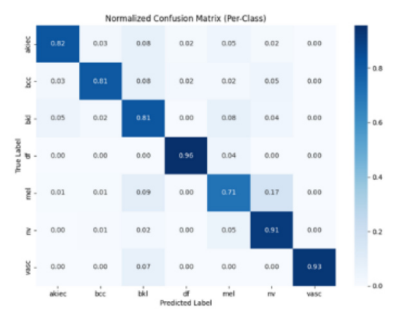


Fig 8: Model V3 Confusion Matrix

Conclusion

SCC provides early skin cancer detection at 85% accuracy via a desktop app. Next steps: improving accuracy to 90% and expanded detection across various skin tones.