CNNs, Darknet, and YOLO

Results and Overview of skin-ga5ww Dataset

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December 28, 2025

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1 Dataset Overview

The study utilizes a large-scale dermatological dataset, focusing on the binary classification of malignant pathologies: Basal Cell Carcinoma and Melanoma.

1.1 Data Distribution and Augmentation

While the source library contains 7,206 original unique images, the training version utilized for this model consists of **17,294 total images**. This is the result of a 3× offline augmentation applied to the training set to prevent overfitting and improve generalization.

1.2 Dataset Statistics

The class distribution across training, validation, and testing splits is detailed in Table 1.

Table 1: Distribution of Dataset Split by Pathology

Class	Train	Valid	Test	Total
Basal Cell Carcinoma	7,527	717	358	8,602
Melanoma	7,605	725	362	8,692
Total Images	**15,132**	**1,442**	**720**	**17,294**

1.3 Preprocessing and Augmentation

To ensure the `yolo11n-cls` model is robust, image processing was applied within Roboflow.

- **Resolution Scaling:** Resized to 224 × 224 pixels.
- **Color Space:** Maintained in the RGB spectrum.
- **Augmentation:** Random Zoom-Crop (0% to 20%).

2 Model Selection: YOLO11n-cls

The study employs the **YOLO11n-cls** variant. A defining feature of this architecture is the **C2PSA (Channel-to-Pixel Self-Attention)** module.

In skin cancer classification, the spatial relationship between irregular borders and color variegation is key. The C2PSA module allows the model to capture these global dependencies, ensuring the classification head weighs features from the entire lesion area.

3 Training Results

The model demonstrated rapid convergence over 20 epochs.

Table 2: Validation Performance Summary

Metric	**Value**
Top-1 Accuracy	1.0 (100%)
Top-5 Accuracy	1.0 (100%)
Computational Complexity	3.3 GFLOPs
Optimizer	AdamW(lr=0.001667)

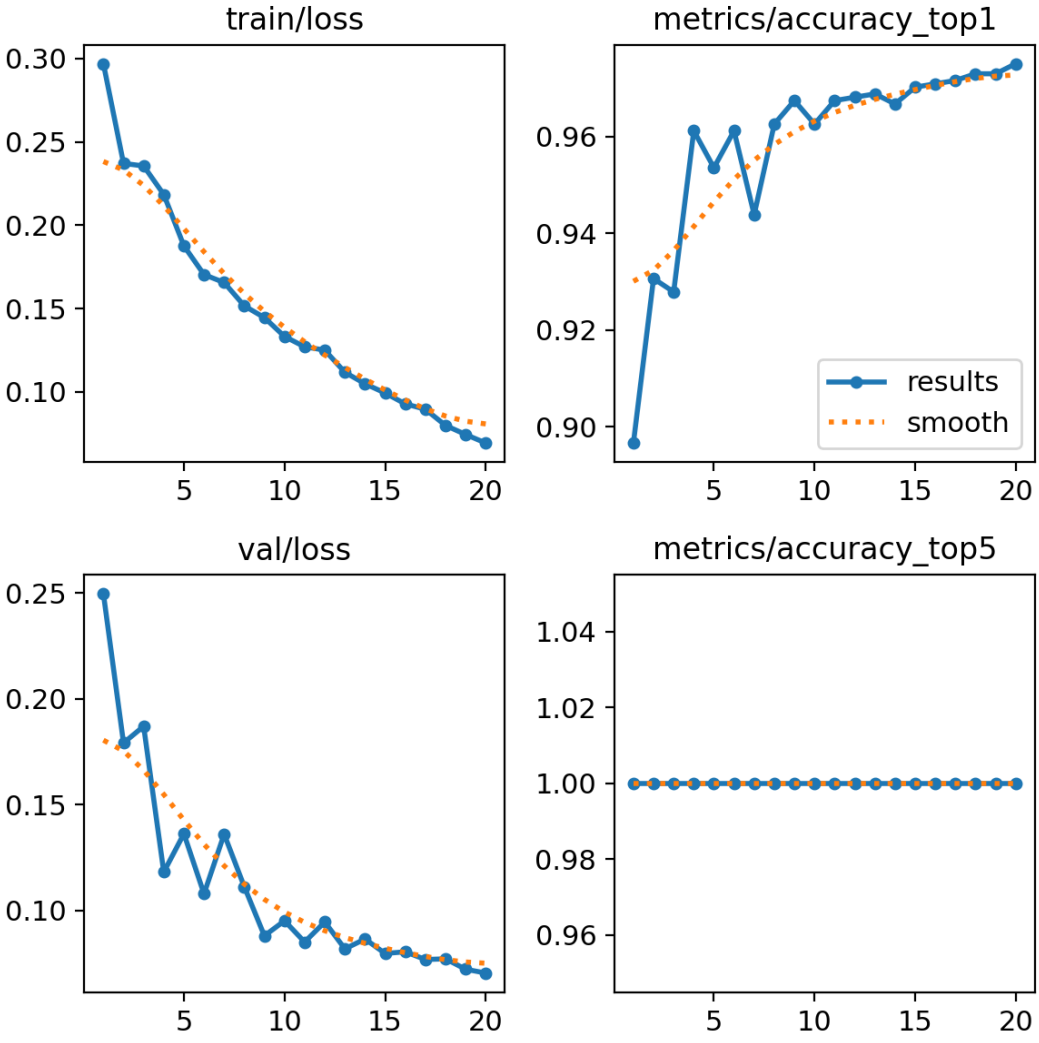
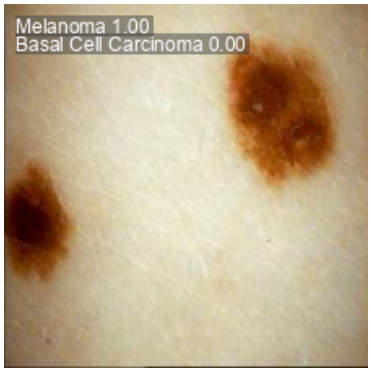


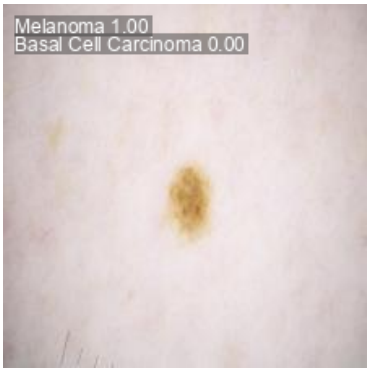
Figure 1: Training and Validation Loss/Accuracy curves over 20 epochs.

4 Inference and Sample Predictions

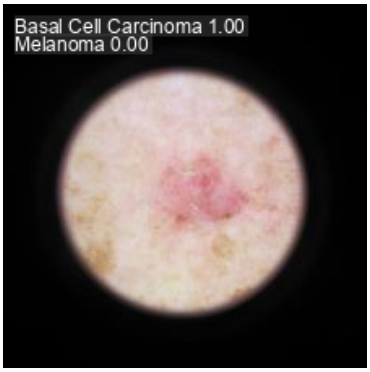
Inference was performed on random test images. The model identified the pathology in all cases with a confidence score of **1.00**.



(a) Melanoma (1.00)



(b) Melanoma (1.00)



(c) BCC (1.00)

Figure 2: Visual verification of inference results.

5 Observations

1. **Accuracy ceiling:** 100% accuracy may suggest *data leakage* or a lack of diversity in the validation set.
2. **Clinical Application:** High confidence (1.00) is promising, but testing on out-of-distribution (OOD) data is necessary for real-world clinical validation.