

# Erythroblast Cells: ML Models for Multiclass Classification in Single Image and Mixed Magnification.

Afnan Abdul Gafoor

Project Guide: Nirmal Punjabi, IIT Bombay  
DH 307: R & D Project  
Week 3

February 4, 2025

# Overview

- 1 Task Overview
- 2 Paper Review
- 3 Findings and Results
- 4 Conclusion
- 5 Plan for This Week

# Task Overview

- Implement **YOLO** for detecting and classifying multiple blood cell types in a single image.
- Goal: Train YOLO on the blood cell dataset to predict and localize cell types in combined images.

# YOLO Overview

- YOLO (You Only Look Once) is a real-time object detection system that treats detection as a regression problem, predicting bounding boxes and class probabilities directly from full images.
- It uses a single convolutional neural network (CNN) for end-to-end training and inference, dividing the image into a grid to detect multiple objects simultaneously.
- YOLO is extremely fast and generalizes well to new domains, making it suitable for applications like autonomous driving and real-time surveillance.
- Key strengths include speed, global reasoning, and reduced background errors, though it faces challenges with small object localization.

# Findings and Results

- The model was trained using the pretrained weight `yolo11n.pt` on non-combined images.
- Some images had missing labels and were removed.
- Some images had incorrect ground truth labels. These were retained due to the large number of training samples.
- Training time was high, taking approximately 30 minutes per epoch (with 300 epochs and a patience of 50).

# Findings and Results

BA\_298210.jpg

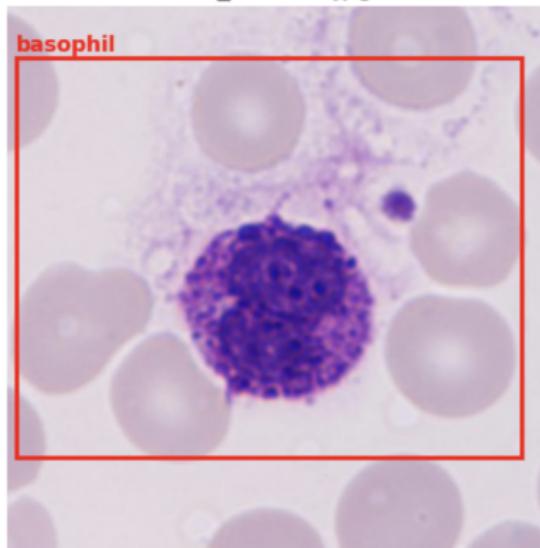


Figure: Image with Incorrect Ground Truth Labels

# Findings and Results

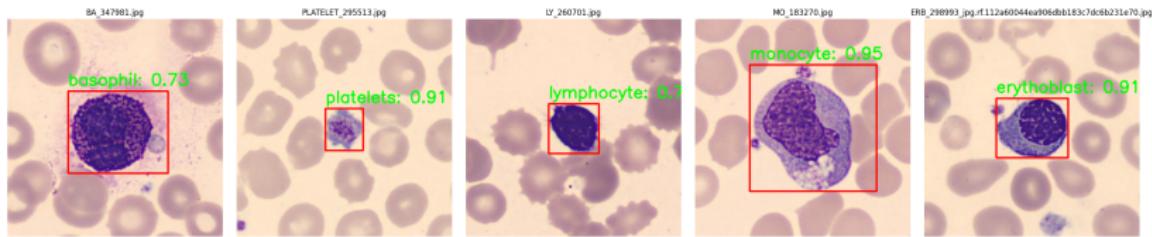


Figure: Detection on Individual Images

# Findings and Results

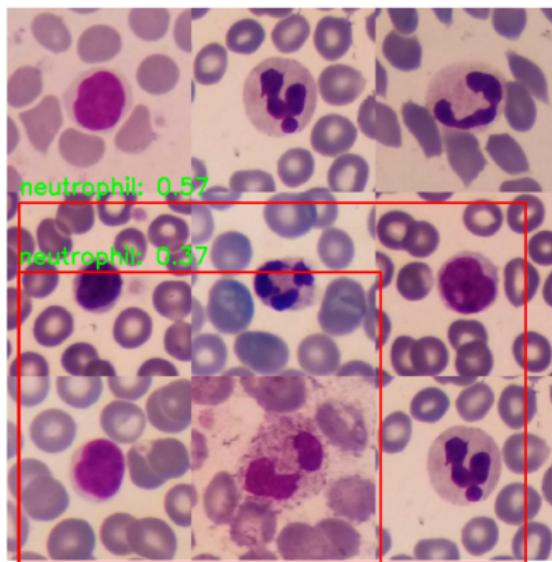


Figure: Detection on Combined Image

# Conclusion

- The model was trained for 30 epochs.
- It performed well on individual images but showed poor performance on combined images.
- Further training on combined images is required to improve multi-class detection.

# Plan for This Week

- **Data Curation:**

- Identify and remove incorrectly labeled data.
- Augment the dataset if necessary to improve model generalization.

- **Model Fine-Tuning:**

- Train the model on combined images to assess improvements in multi-class detection performance.
- Fine-tune the YOLO model using the curated dataset.
- Evaluate performance metrics and refine hyperparameters accordingly.

# References

-  J. Redmon, S. Divvala, R. Girshick, and A. Farhadi. (2016) You Only Look Once: Unified, Real-Time Object Detection. *arXiv preprint arXiv:1506.02640*.  
<https://arxiv.org/abs/1506.02640>.
-  Ultralytics Documentation.  
<https://docs.ultralytics.com>.  
Accessed: 4 February 2025.