



Blood Cell Classification

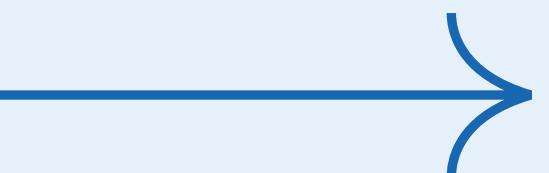


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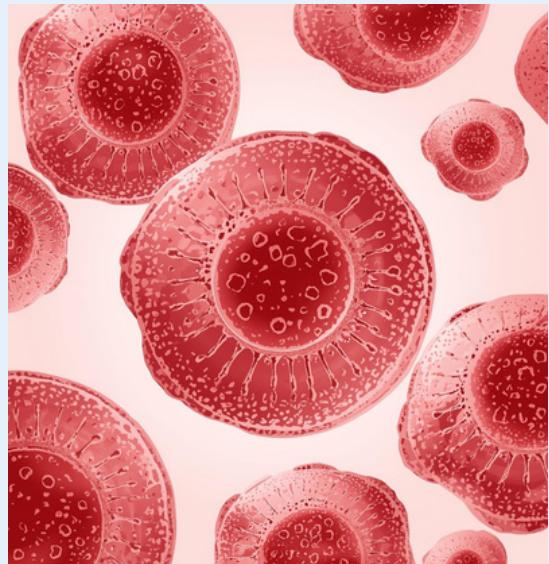
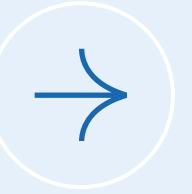
Introduction to Blood Cells

THE NEED FOR AUTOMATED CLASSIFICATION

- Accurate blood cell classification is vital for early disease detection and treatment planning.
- Manual microscopic examination is slow, labor-intensive, and highly dependent on human expertise. Human fatigue and subjective interpretation increase the chances of diagnostic errors.
- Growing patient loads in hospitals create the need for faster and more scalable diagnostic methods.
- Automated machine learning systems can process large numbers of images with speed and consistency.
- Deep learning enables highly accurate pattern recognition, outperforming traditional manual methods.

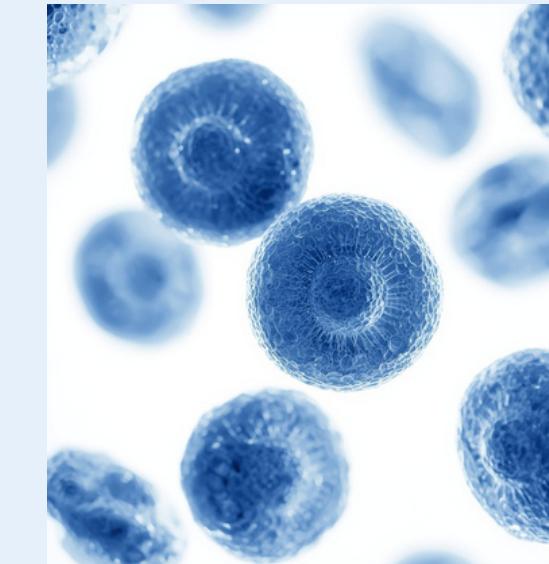


Types of Blood Cells in the Dataset



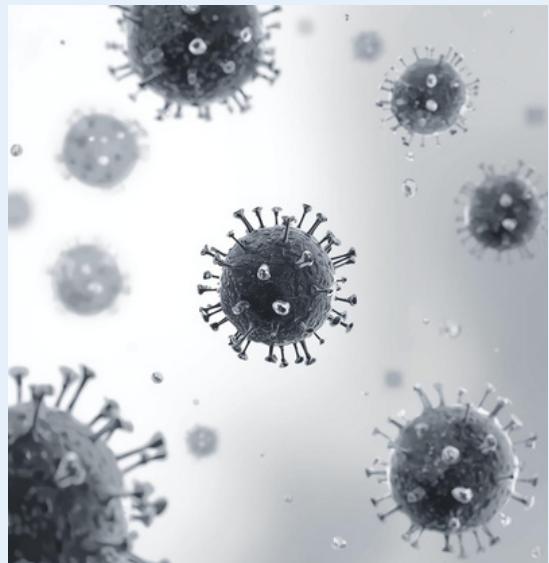
Eosinophils

Key role in allergic reactions and parasites.



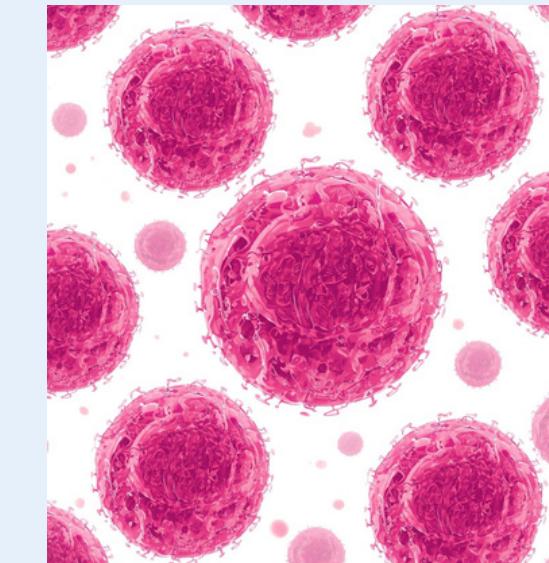
Lymphocytes

Crucial for adaptive immunity and pathogen defense.



Monocytes

Important for phagocytosis and inflammation response.



Neutrophils

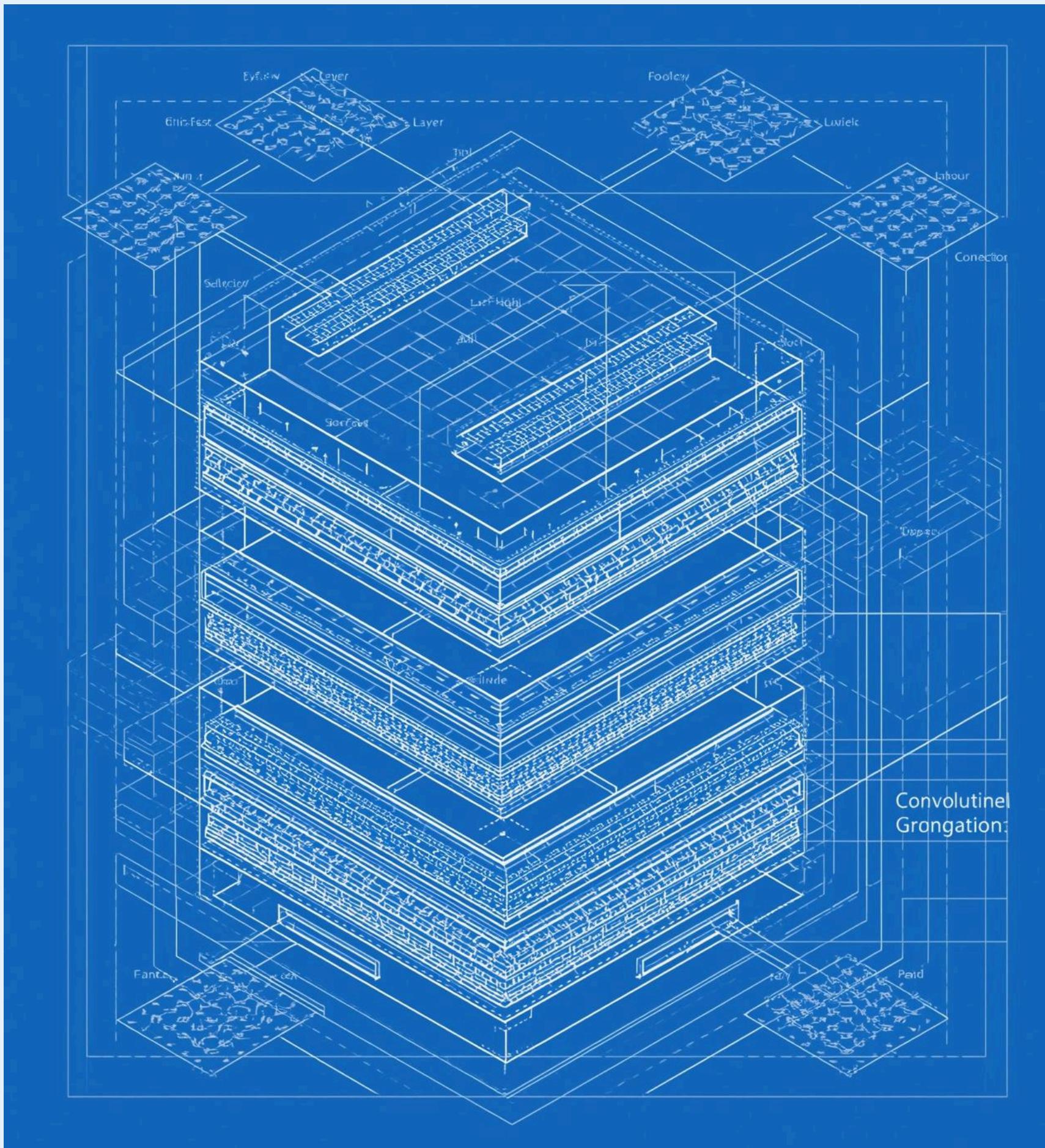
First responders to infection and inflammation.

Dataset Overview



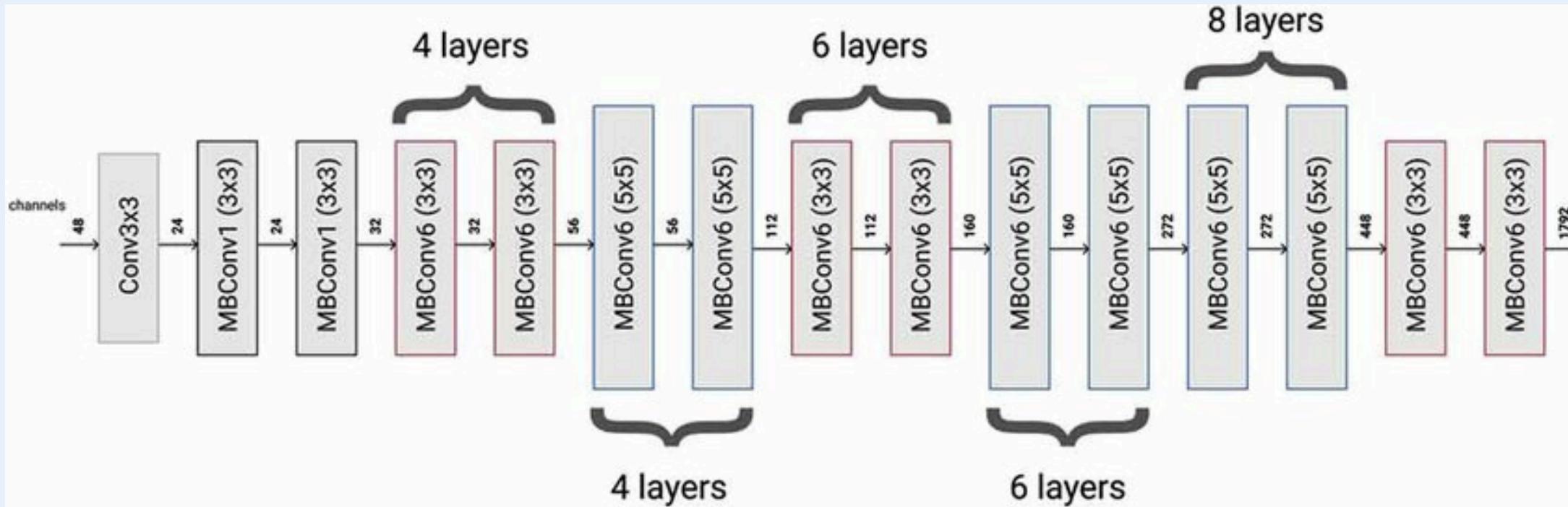
This project utilizes a **Kaggle dataset** containing thousands of labeled images of blood cells. The dataset includes preprocessing steps such as normalization and augmentation to enhance model performance and robustness, ultimately enabling efficient classification of different blood cell types.

CNN Architecture



This section details the **architecture of the Convolutional Neural Network (CNN)** used in our project. It comprises multiple layers designed for optimal feature extraction and classification, utilizing a selected optimizer and loss function to enhance the model's performance during training and evaluation.

Model Used



EfficientNet-B4

EfficientNet-B4 is a high-accuracy CNN model that uses compound scaling and MBConv blocks. It takes **380×380×3** input images and contains approximately **19M parameters**. The network consists of ~86 layers, mostly MBConv blocks with squeeze-and-excitation. After global average pooling and dropout (0.4), the final fully connected classifier receives a **1792**-dimensional feature vector and outputs num_classes predictions.

89.3%

Model Accuracy Rate

The CNN achieved a high accuracy rate of **89.3%**, demonstrating effective classification of blood cells from the dataset images.

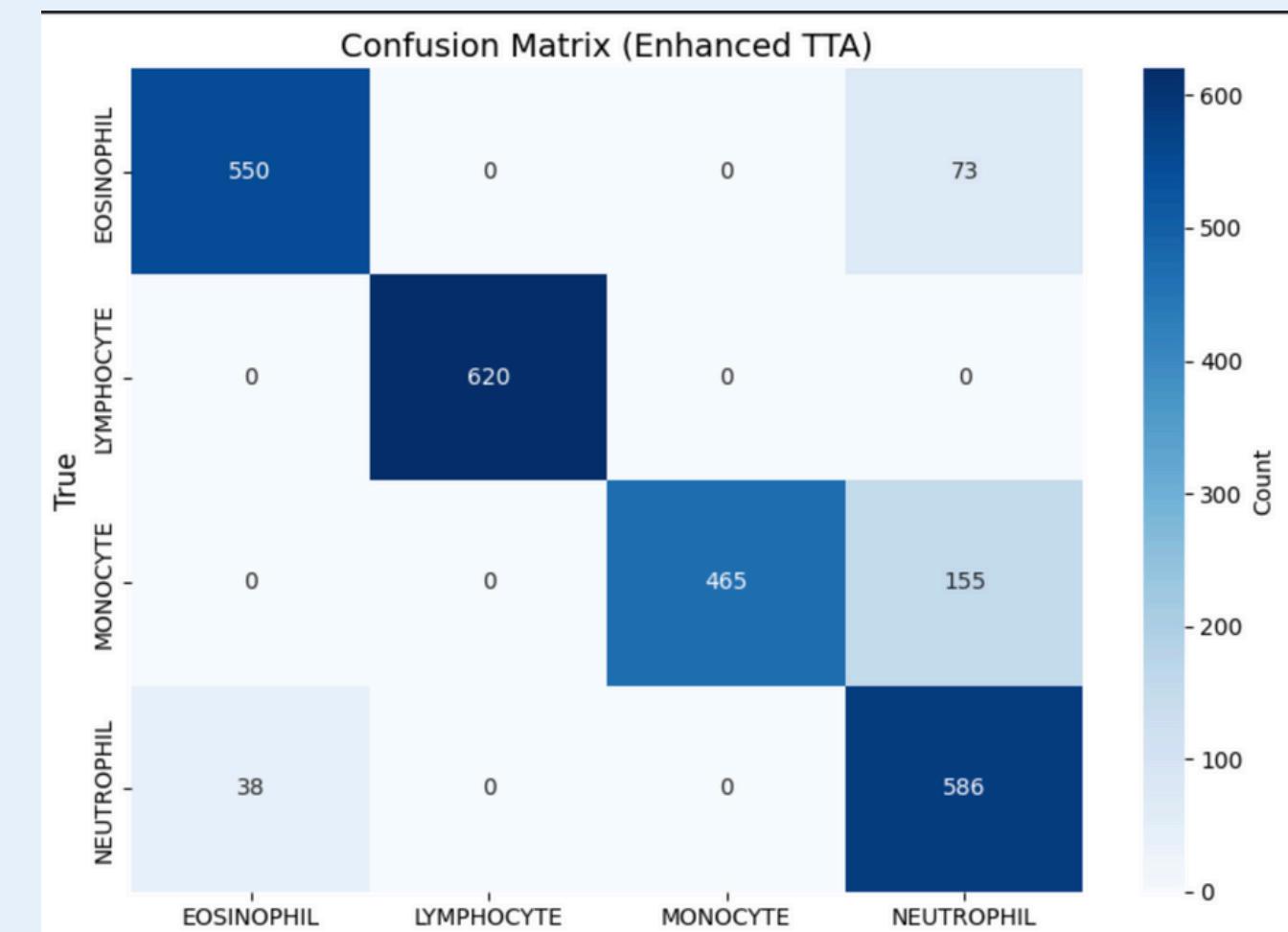


Final Results

ACHIEVING HIGH ACCURACY IN CLASSIFICATION

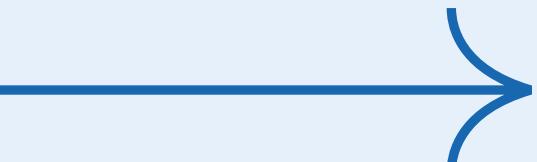
CLASSIFICATION REPORT				
	precision	recall	f1-score	support
EOSINOPHIL	0.9354	0.8828	0.9083	623
LYMPHOCYTE	1.0000	1.0000	1.0000	620
MONOCYTE	1.0000	0.7500	0.8571	620
NEUTROPHIL	0.7199	0.9391	0.8150	624
accuracy			0.8930	2487
macro avg	0.9138	0.8930	0.8951	2487
weighted avg	0.9135	0.8930	0.8950	2487

Our model demonstrated **impressive accuracy**, ensuring reliable blood cell classification. This performance highlights its potential for **clinical applications** in diagnostics and automated medical processes.

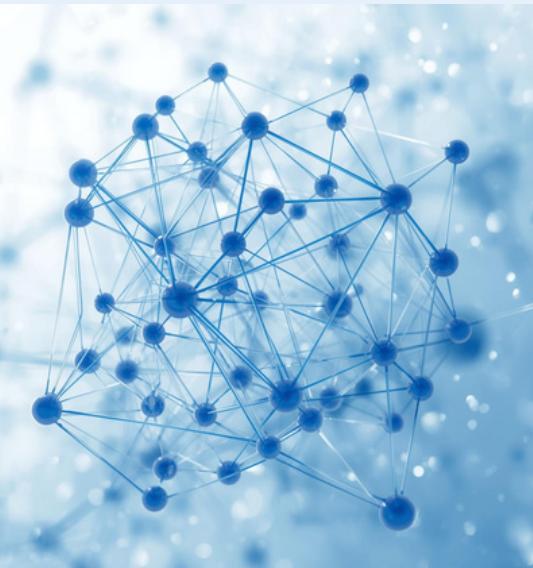
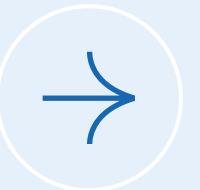


Per-Class Accuracy:
EOSINOPHIL: 88.28%
LYMPHOCYTE: 100.00%
MONOCYTE: 75.00%
NEUTROPHIL: 93.91%

Overall Test Accuracy: 89.30%



Future Enhancements for Blood Cell Classification



Deeper Models

Implement deeper CNN models for improved accuracy.



Expanded Dataset

Increase dataset size for better model training.



App Deployment

Create an application for on-the-go diagnosis.



Image Segmentation

Integrate image segmentation for precise analysis.

Thank You