

An illustration of a blood smear. It features a large, light pink, irregular shape representing a blood drop. Inside this shape, there are three red blood cells depicted as red, biconcave discs. One cell is at the top left, another is in the middle left, and a larger one is at the bottom center. The background is white.

AI Microscope

-Classify Blood Cells-

Frouke Albrecht



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01

Introduction

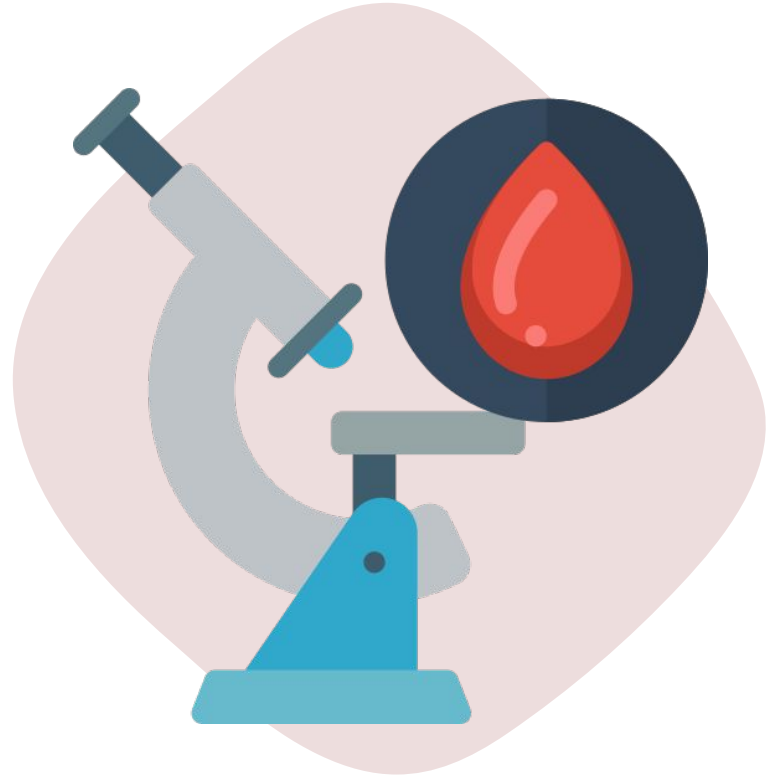
Background

- White blood cells important for the **immune system** and defend the body **against infectious disease** and foreign materials
- **5 main types** of white blood cells
- Share commonalities but are **distinct in form and function**



Objective

Automize Classification of
different types of **white**
blood cells in microscope
images



Motivation

- Support medical experts with visual diagnosis
- Increase diagnostic accuracy

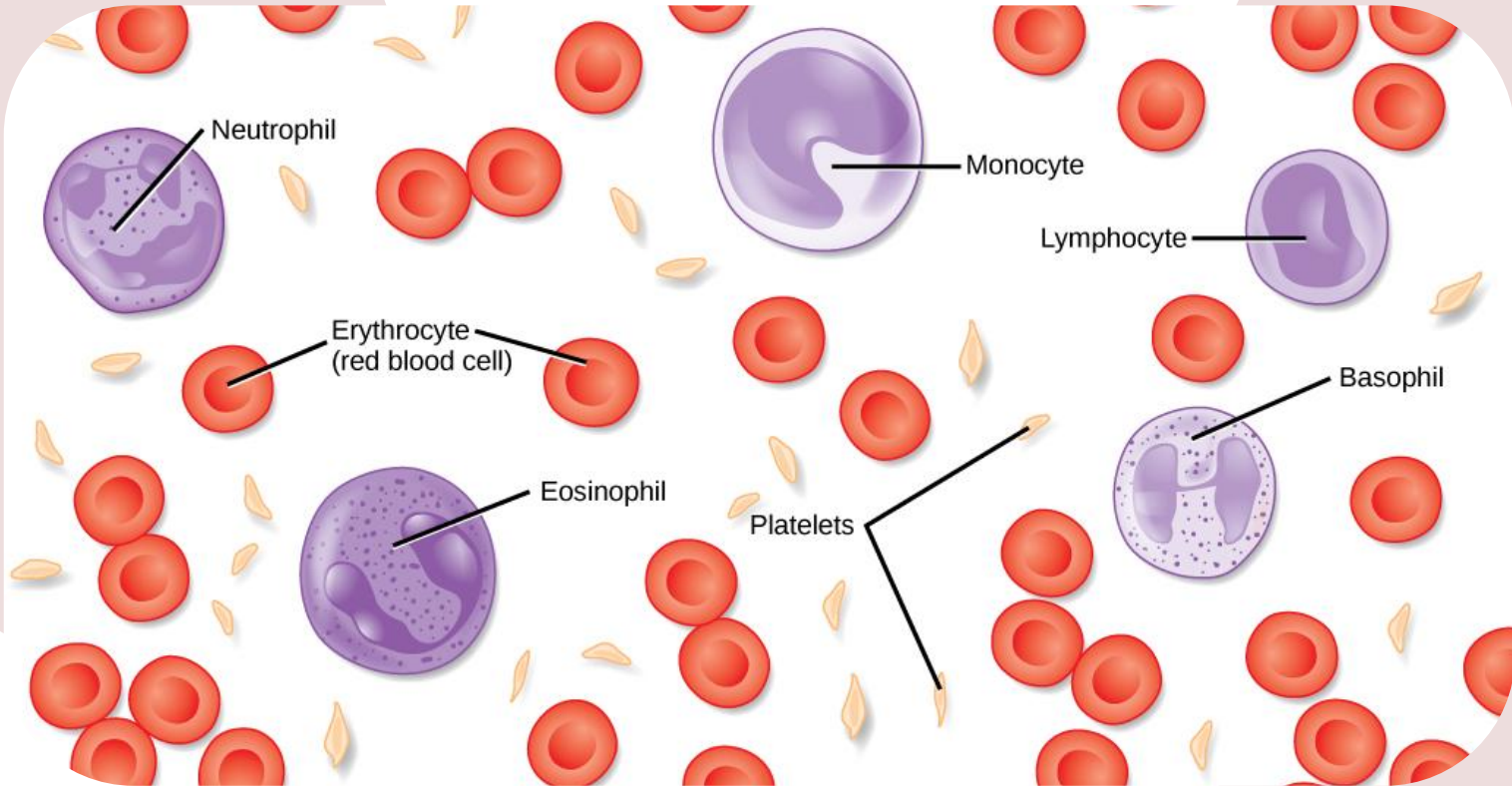




02

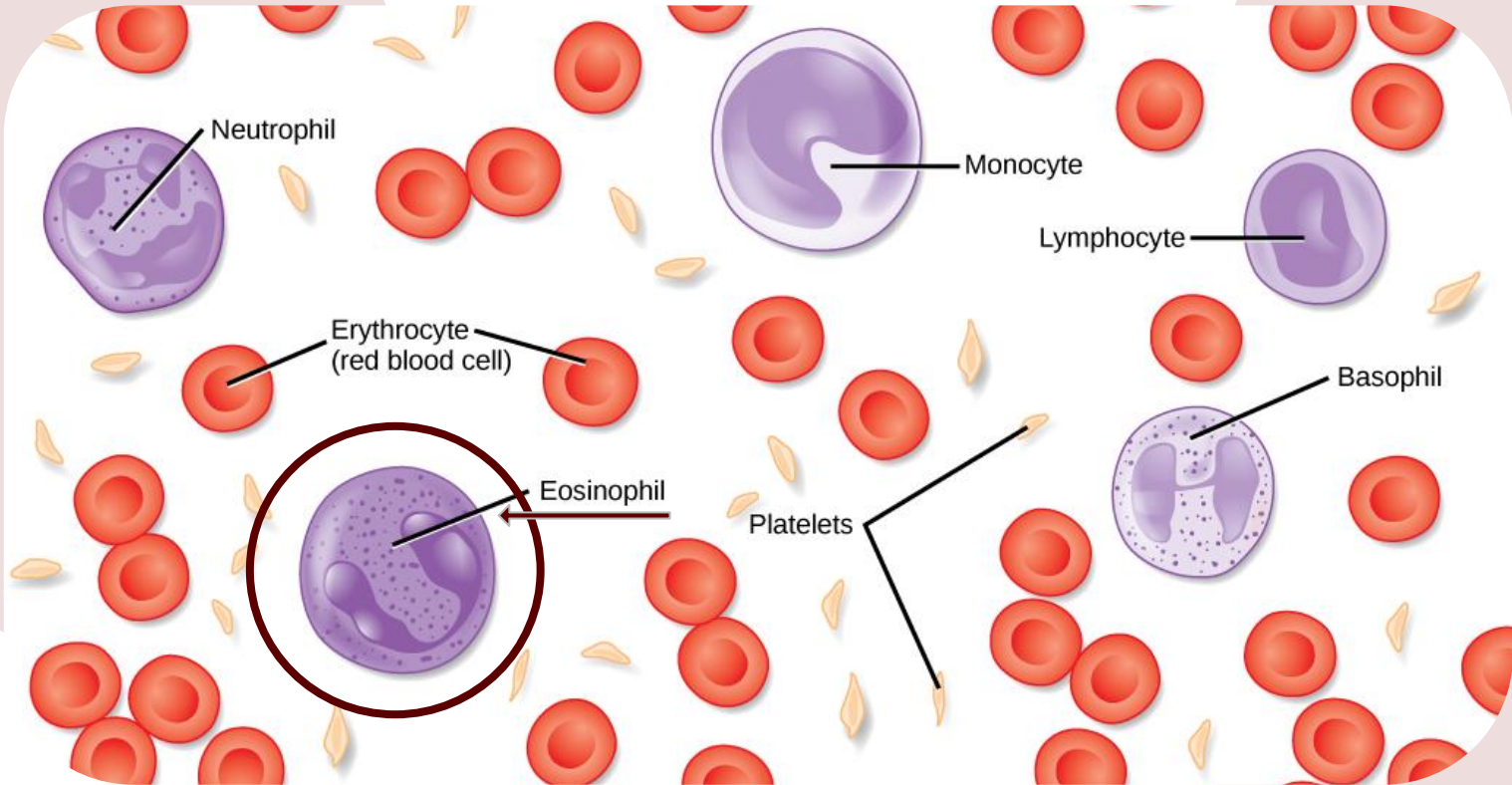
Data

Data



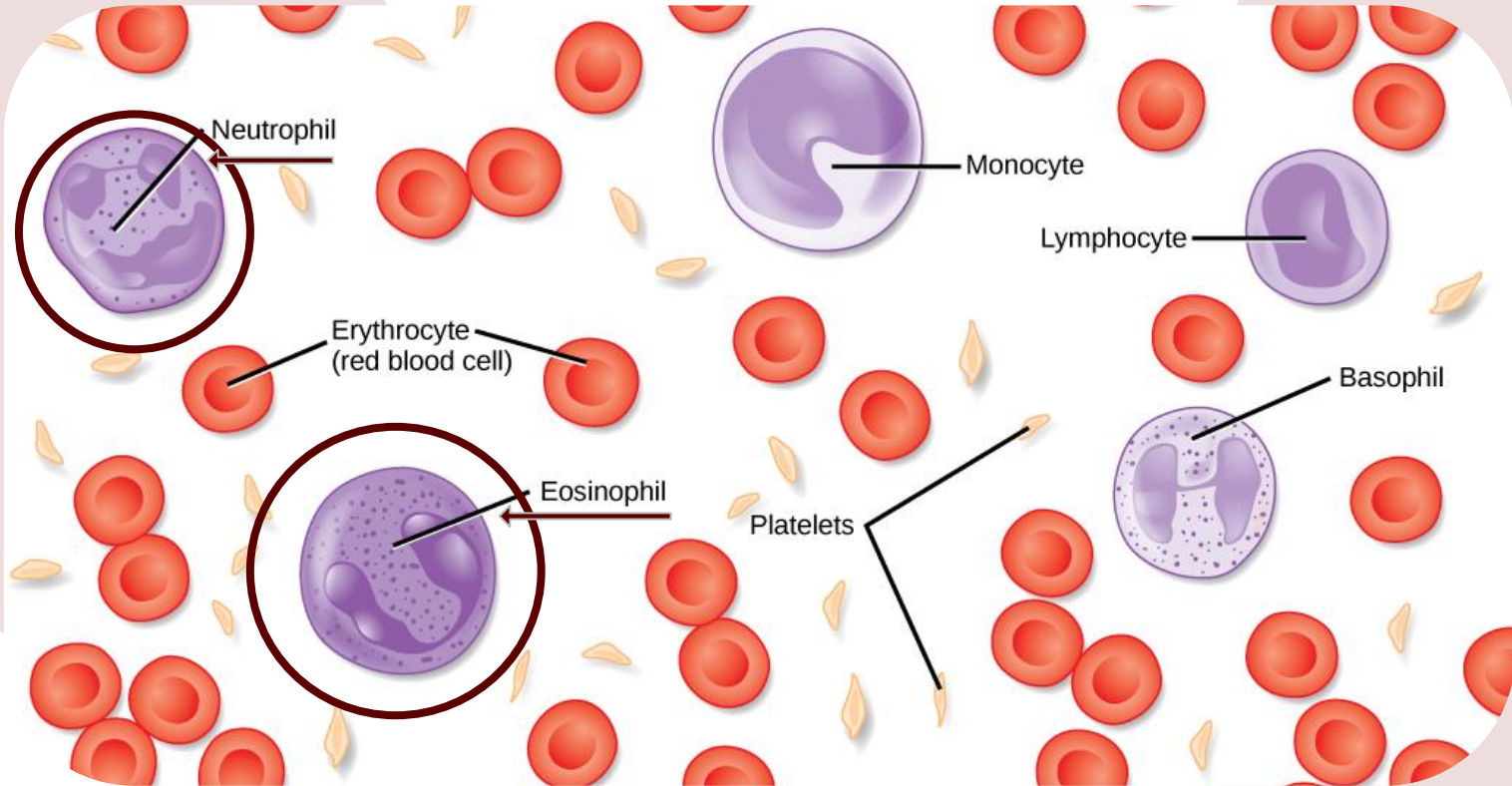
5 main types of white blood cells

Data



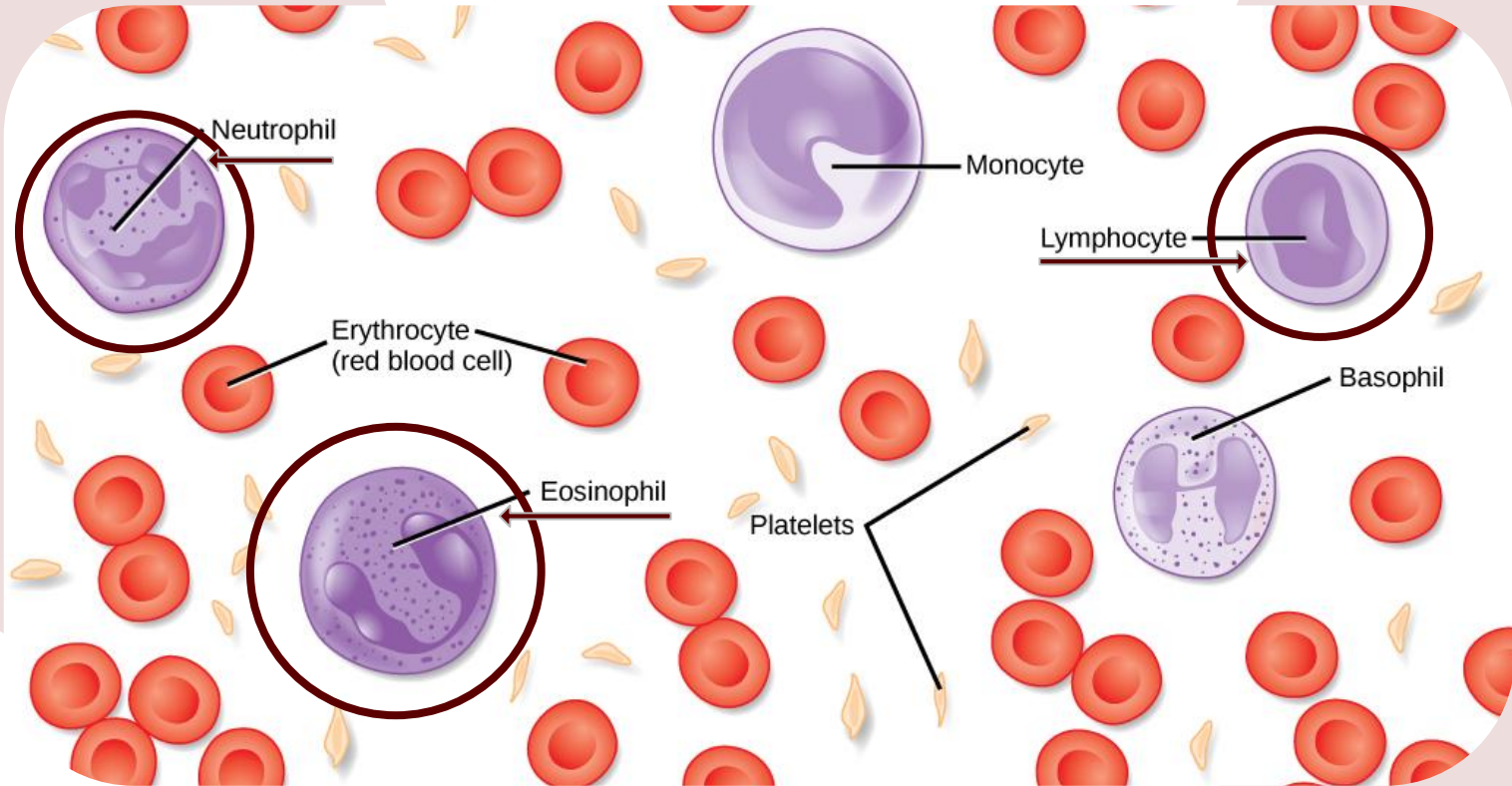
5 main types of white blood cells

Data



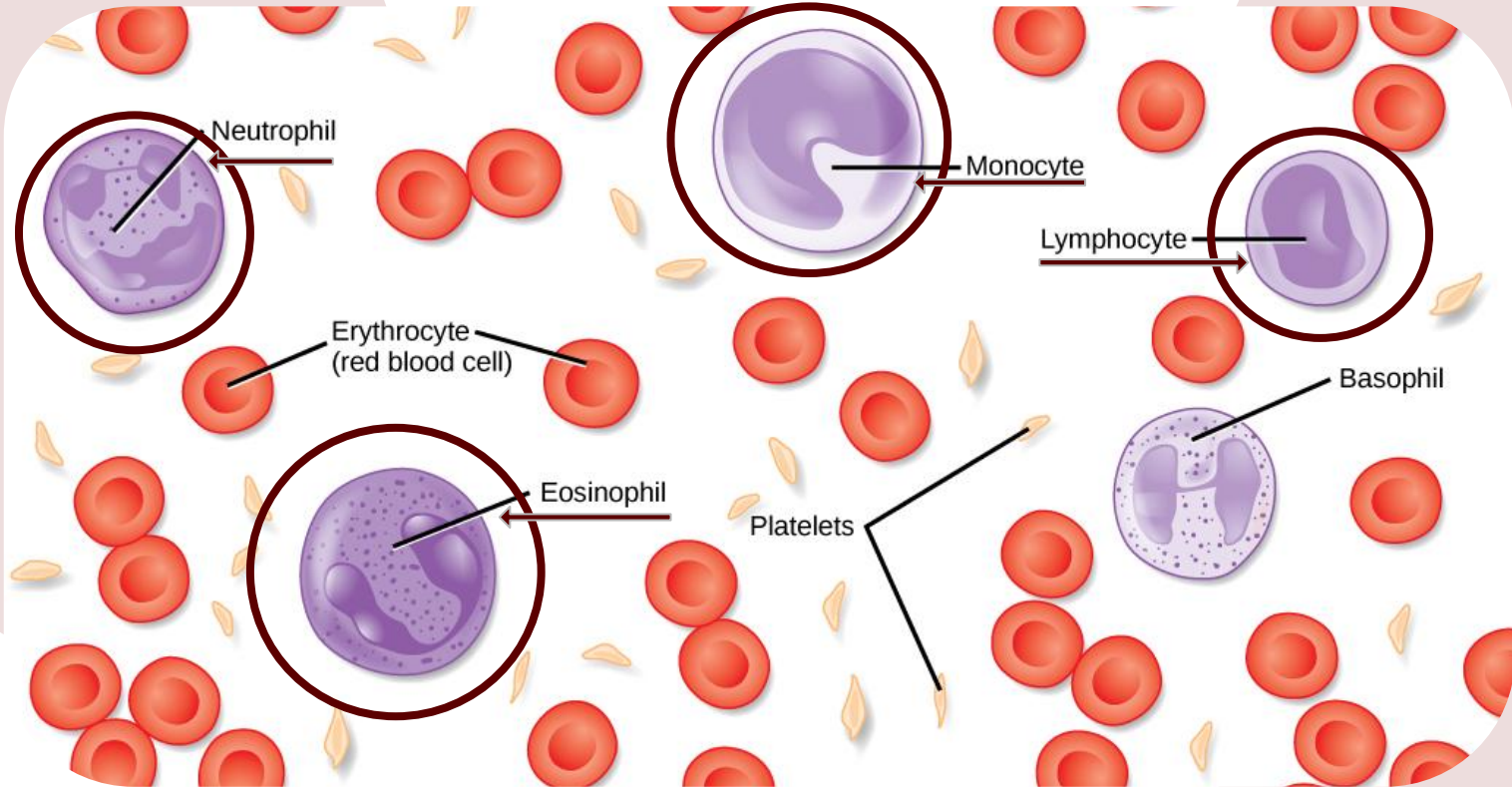
5 main types of white blood cells

Data



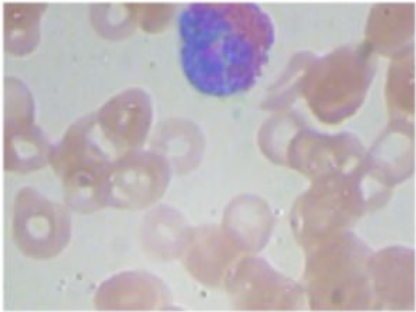
5 main types of white blood cells

Data

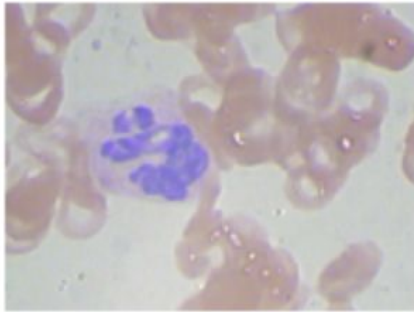


5 main types of white blood cells

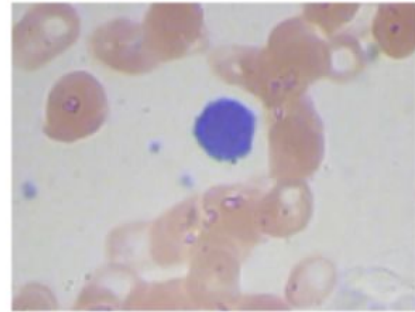
Examples



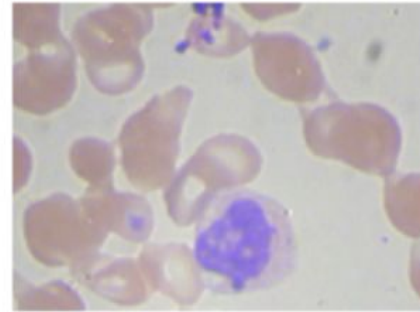
Eosinophil



Neutrophil



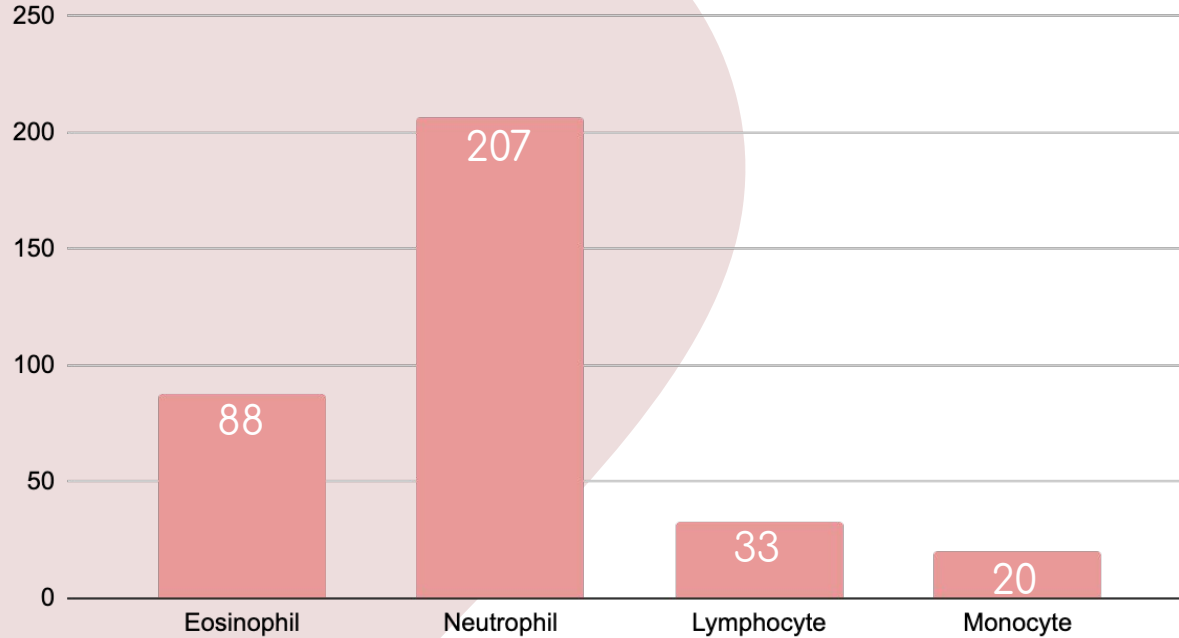
Lymphocyte



Monocyte

Data

Images



348 images total

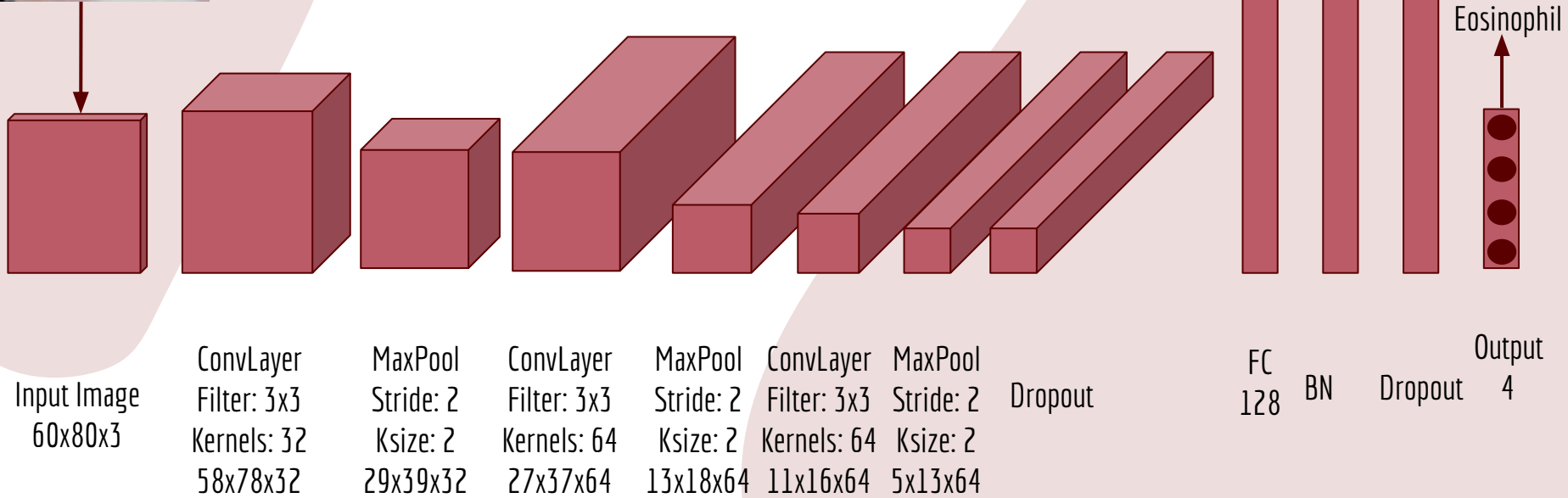
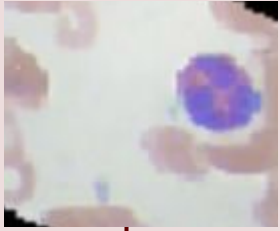
Images have been
augmented to about
2500 for each
category

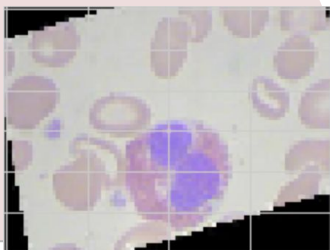


03

Approach

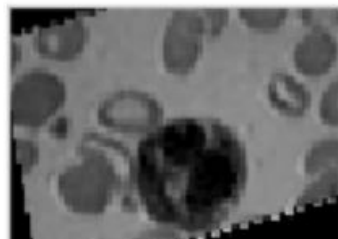
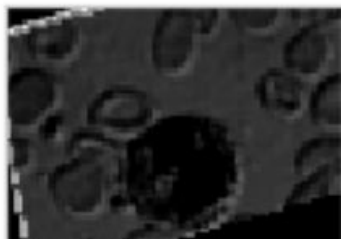
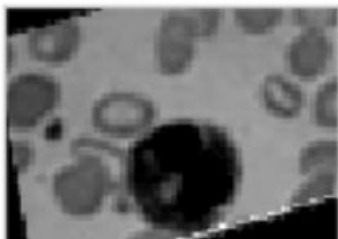
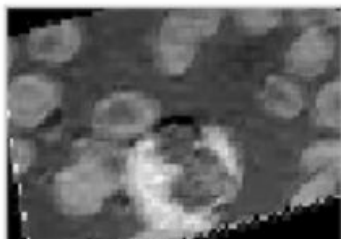
Convolutional Neural Network





input

Feature Importance



1. ConvLayer



2. ConvLayer



3. ConvLayer

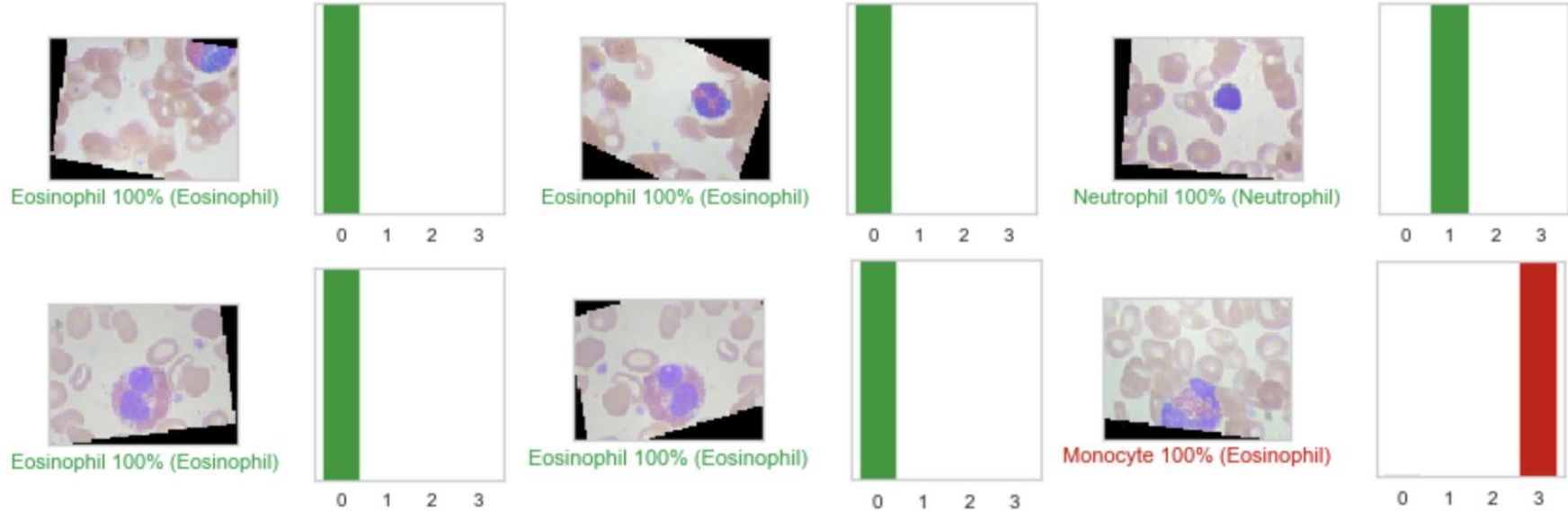


04

Results

Results

Accuracy 85%



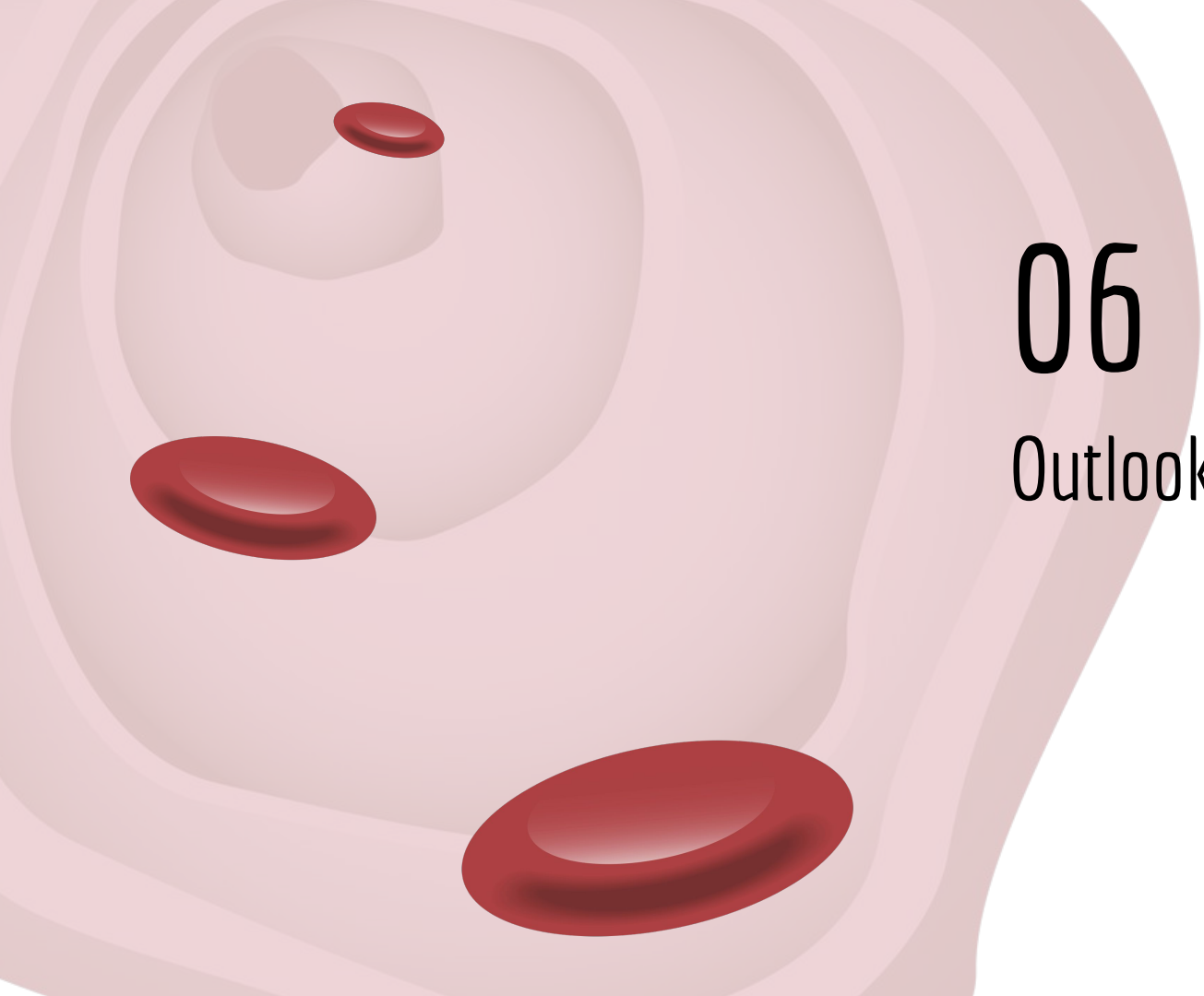


05

Conclusions

Conclusions

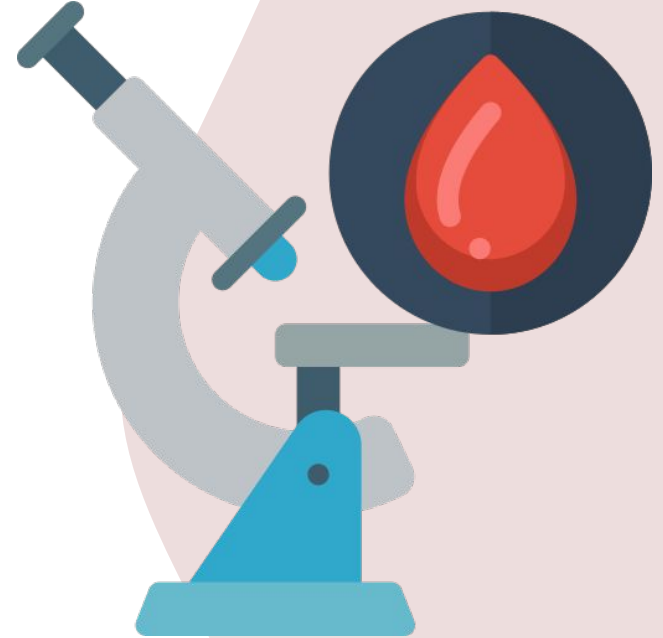
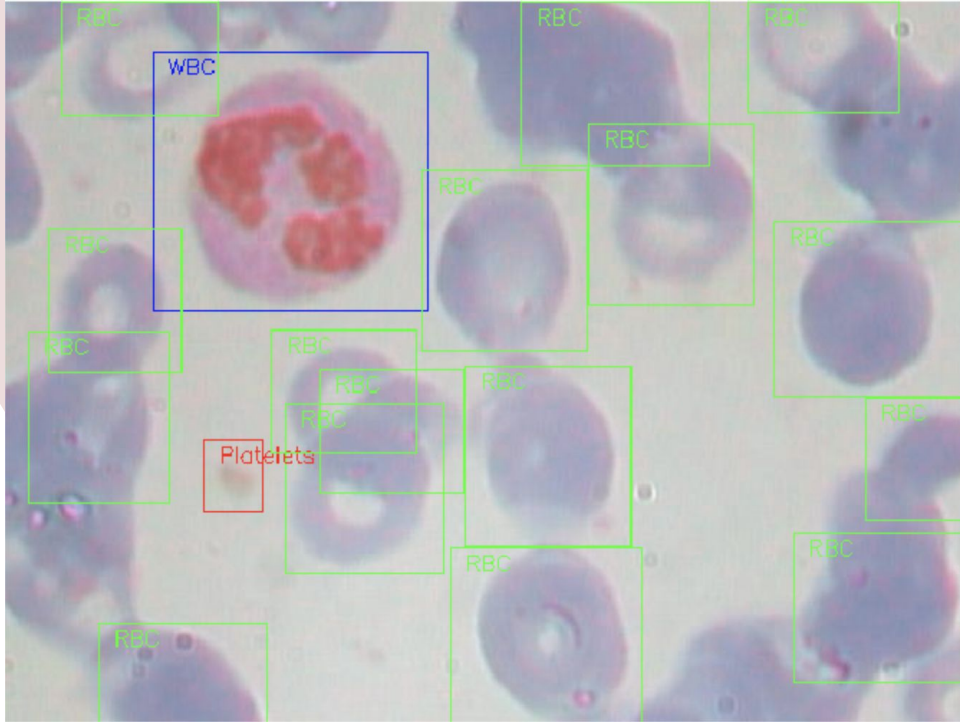
- Developed automated tool for blood cell classification from images
- Classified 4 types of cells
- 85% accuracy
- First step to a bigger problem:
In practice important to detect and count white blood cells



06

Outlook

Outlook: Object Detection



An increased or decreased number of leukocytes indicates the presence of a disorder.

Thank you.



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<https://github.com/froukje/>

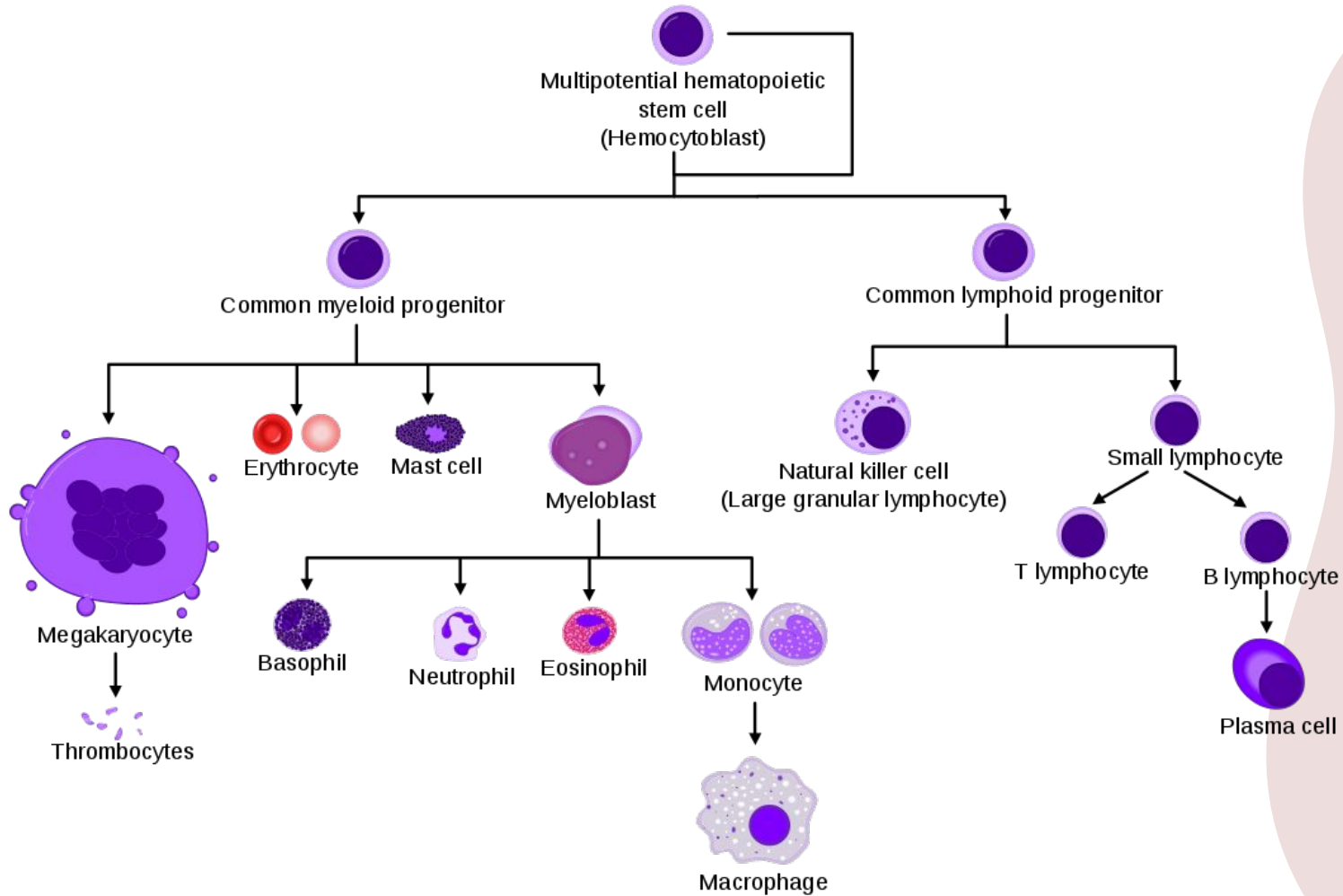
CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.

Data

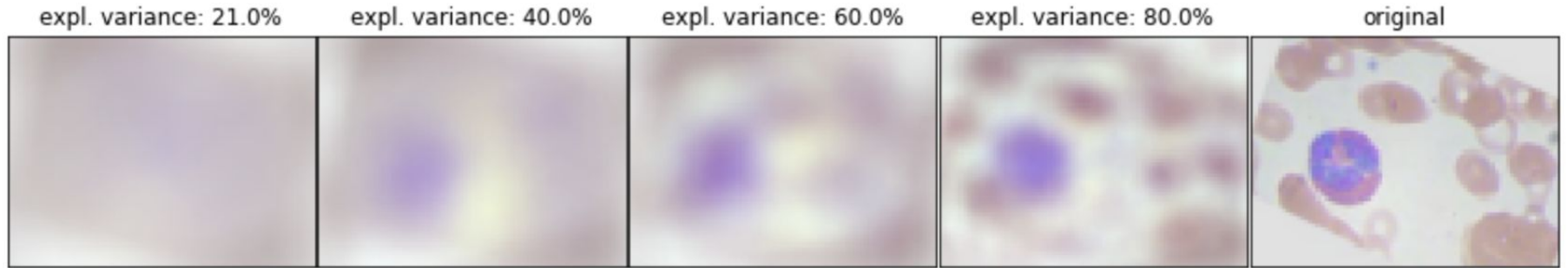
Category	
Eosinophil	Responsible for combating multicellular parasites and certain infections; control mechanisms associated with allergy and asthma
Neutrophil	Kill bacterias. Migrate toward sites of infection or inflammation
Lymphocyte	Lysis of virally infected cells and tumour cells; Release cytokines and growth factors that regulate other immune cells; Immunoregulation and cytotoxicity; Secretion of antibodies
Monocyte	Replenishing resident macrophages under normal conditions; migration in response to inflammation signals; differentiation into macrophages or dendritic cells to effect an immune response.

Data

Category	Type	Size	%
Eosinophil	granulocyte/ myeloid	12-17 μ m	1 - 3%
Neutrophil	granulocyte/ myeloid	12-15 μ m	60 - 70%
Lymphocyte	mononuclear leukocyte (agranulocyte)/ lymphoid	6-10 μ m	25 - 40%
Monocyte	mononuclear leukocyte (agranulocyte)/ myeloid	12-10 μ m	2 - 10%

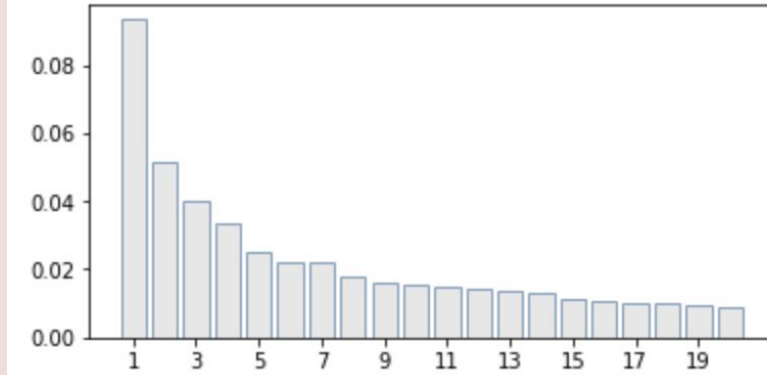


Principal Component Analysis

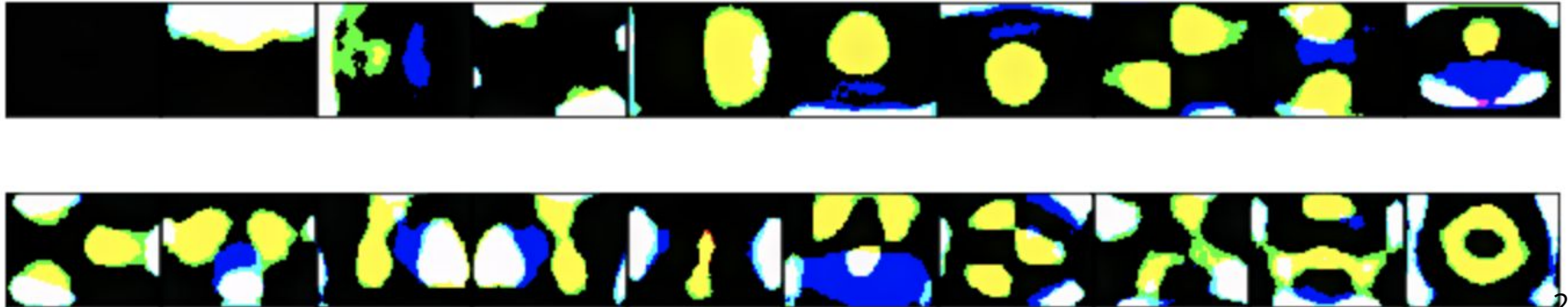


Principal Component Analysis

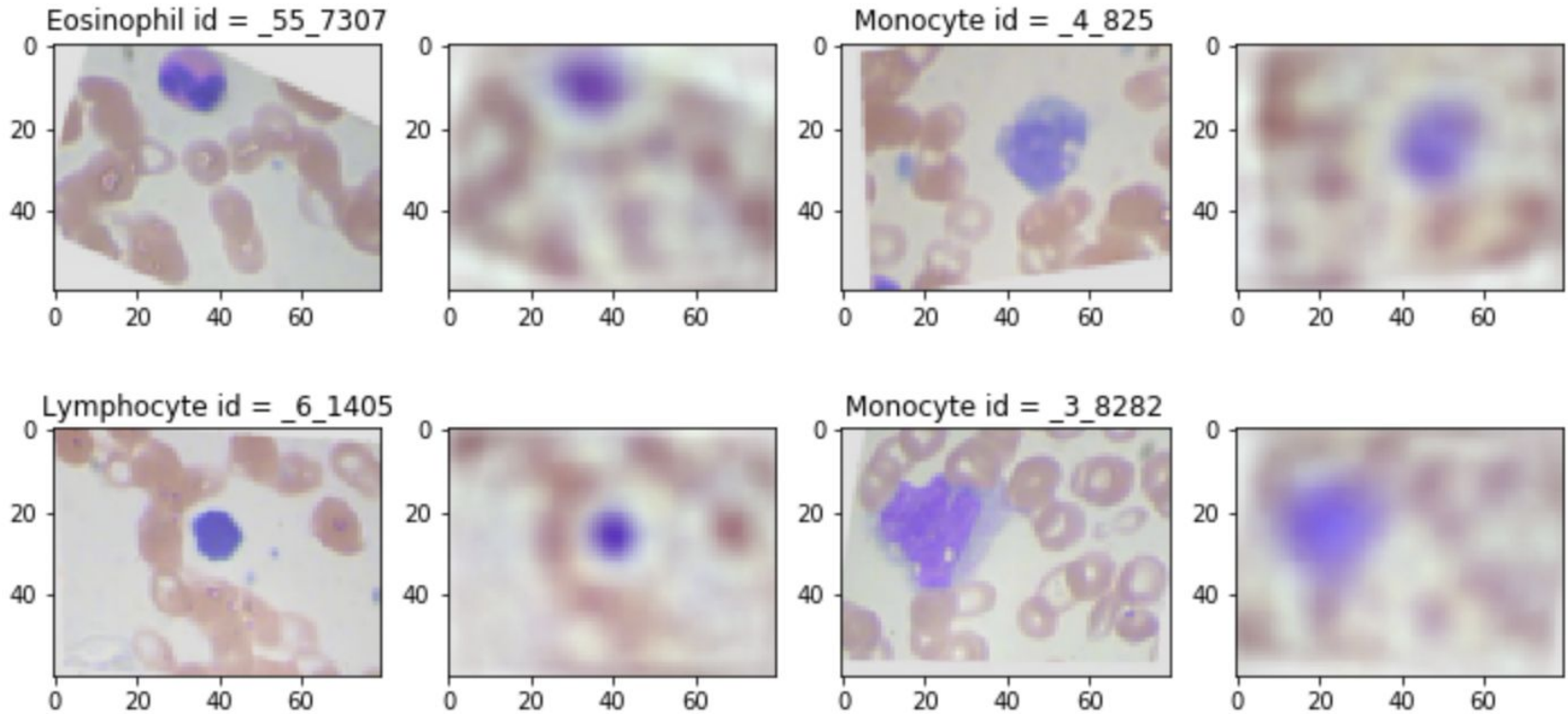
Explained Variance



Eigenvectors



Principal Component Analysis



Convolutional Neural Network

