

An illustration of a blood smear. It features a large, light pink, irregular shape representing a blood drop. Inside this drop, 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-

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Outlook

The background of the slide features a series of concentric, overlapping circles in various shades of pink, creating a tunnel-like or ripple effect. Three red blood cells, depicted as biconcave discs with a dark red color and a lighter red center, are scattered across the left side of the image.

01

Introduction

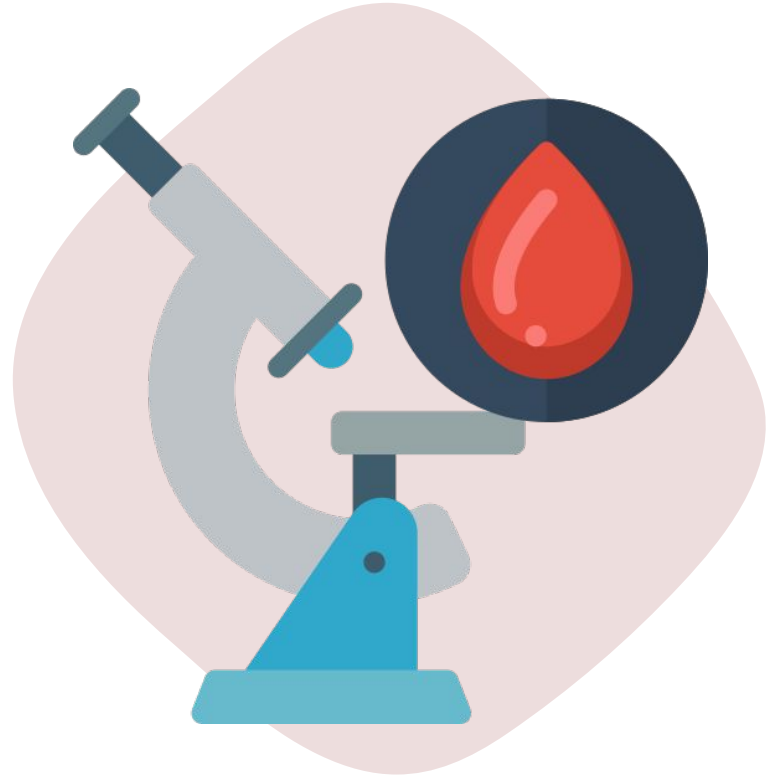
Background

- 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

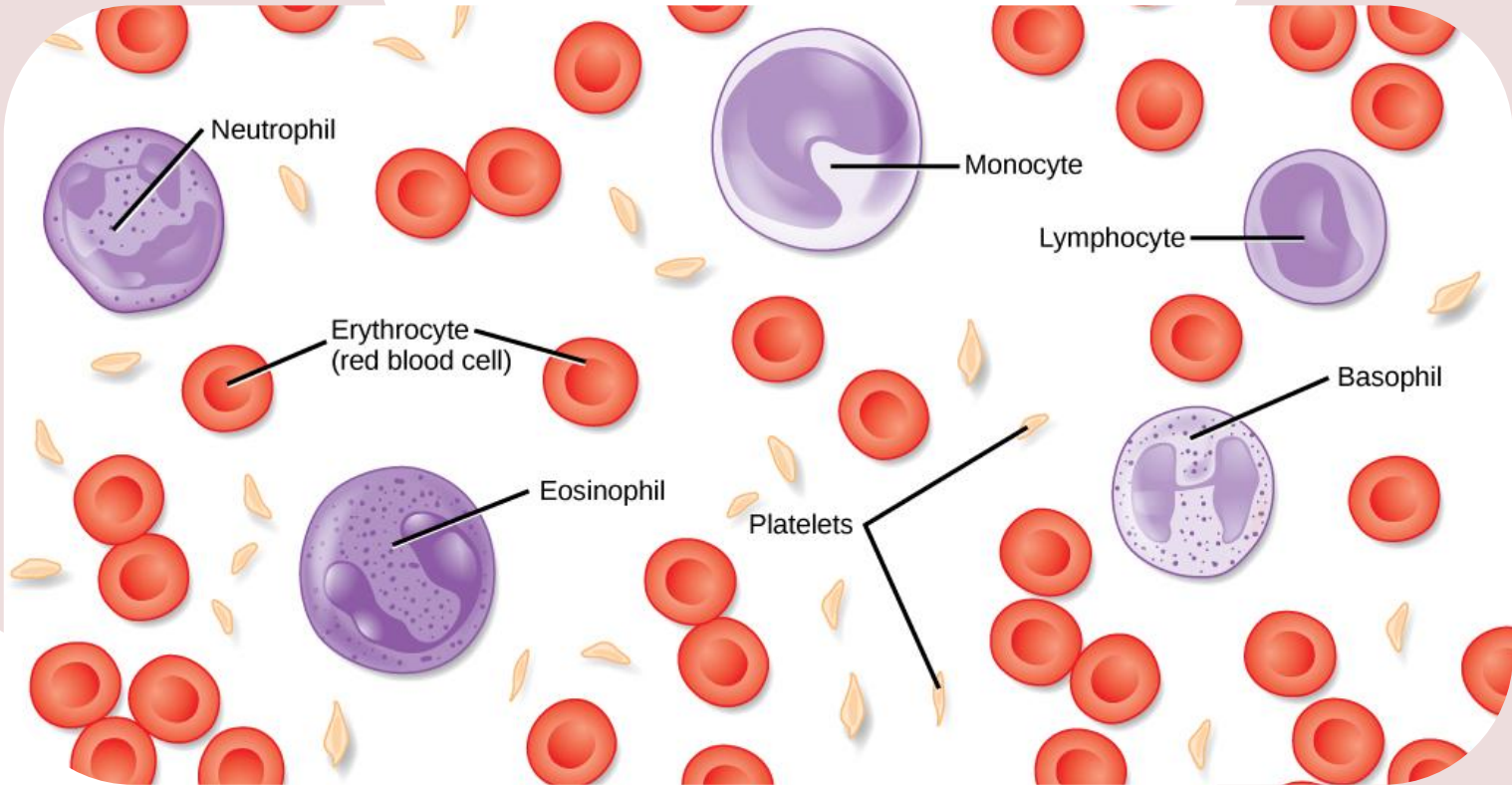


The background of the slide is a light pink color with several concentric, irregular circles or ripples emanating from the left side. Three red blood cells are depicted: one small one near the top left, one medium one in the middle left, and one large one at the bottom center. They are all rendered in a dark red color with a slight 3D effect.

02

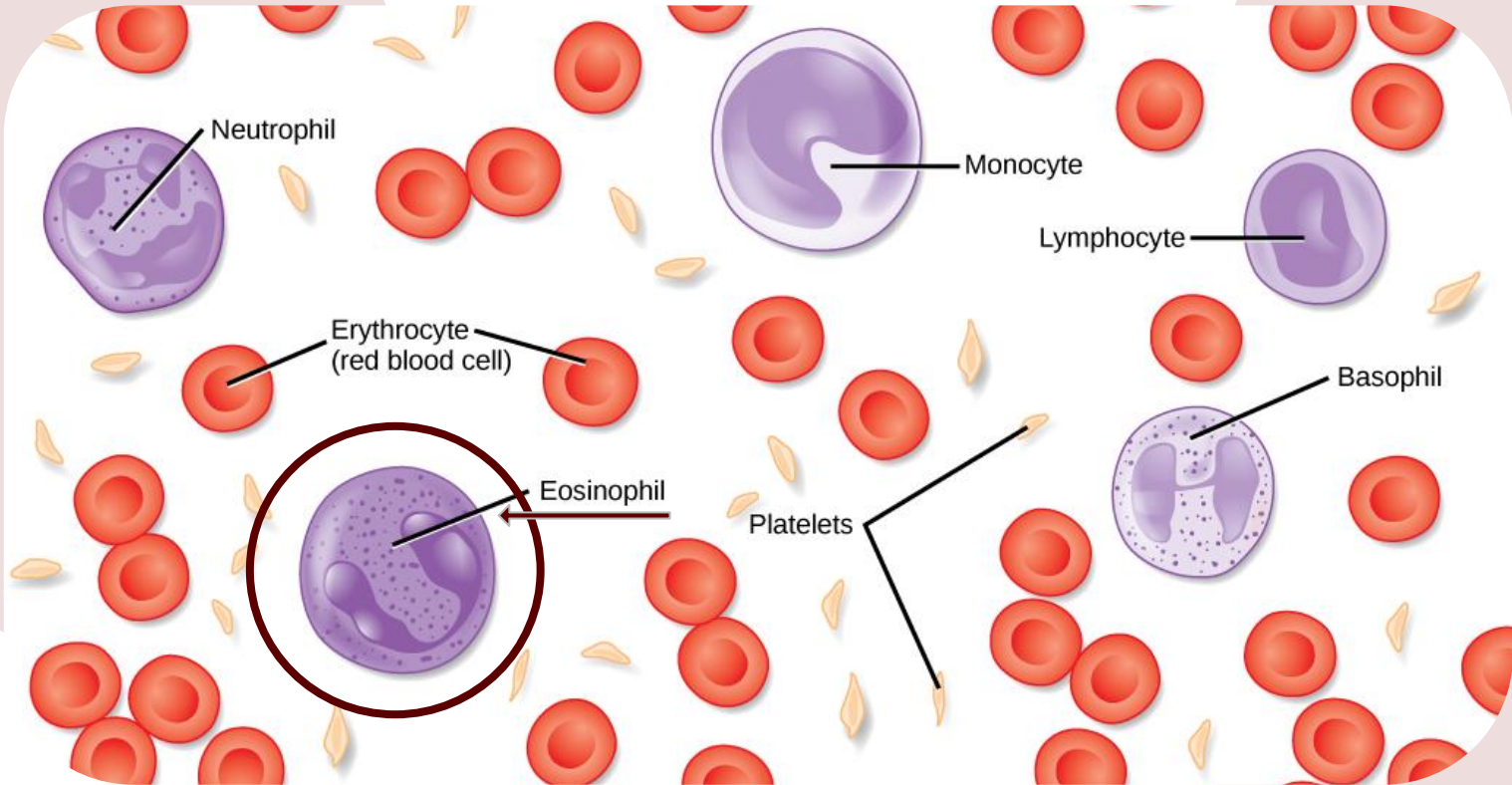
Data

Data



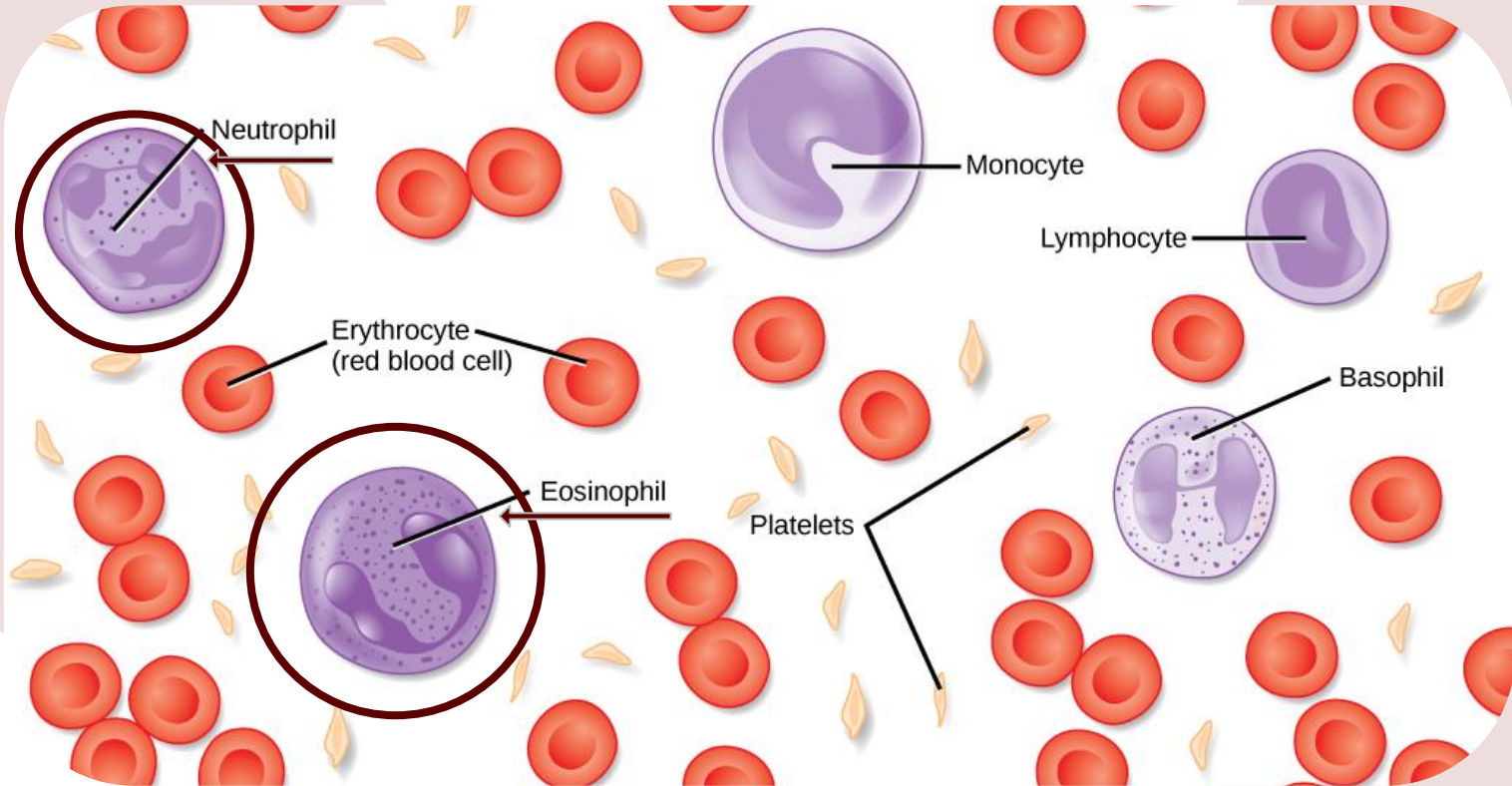
5 main types of white blood cells

Data



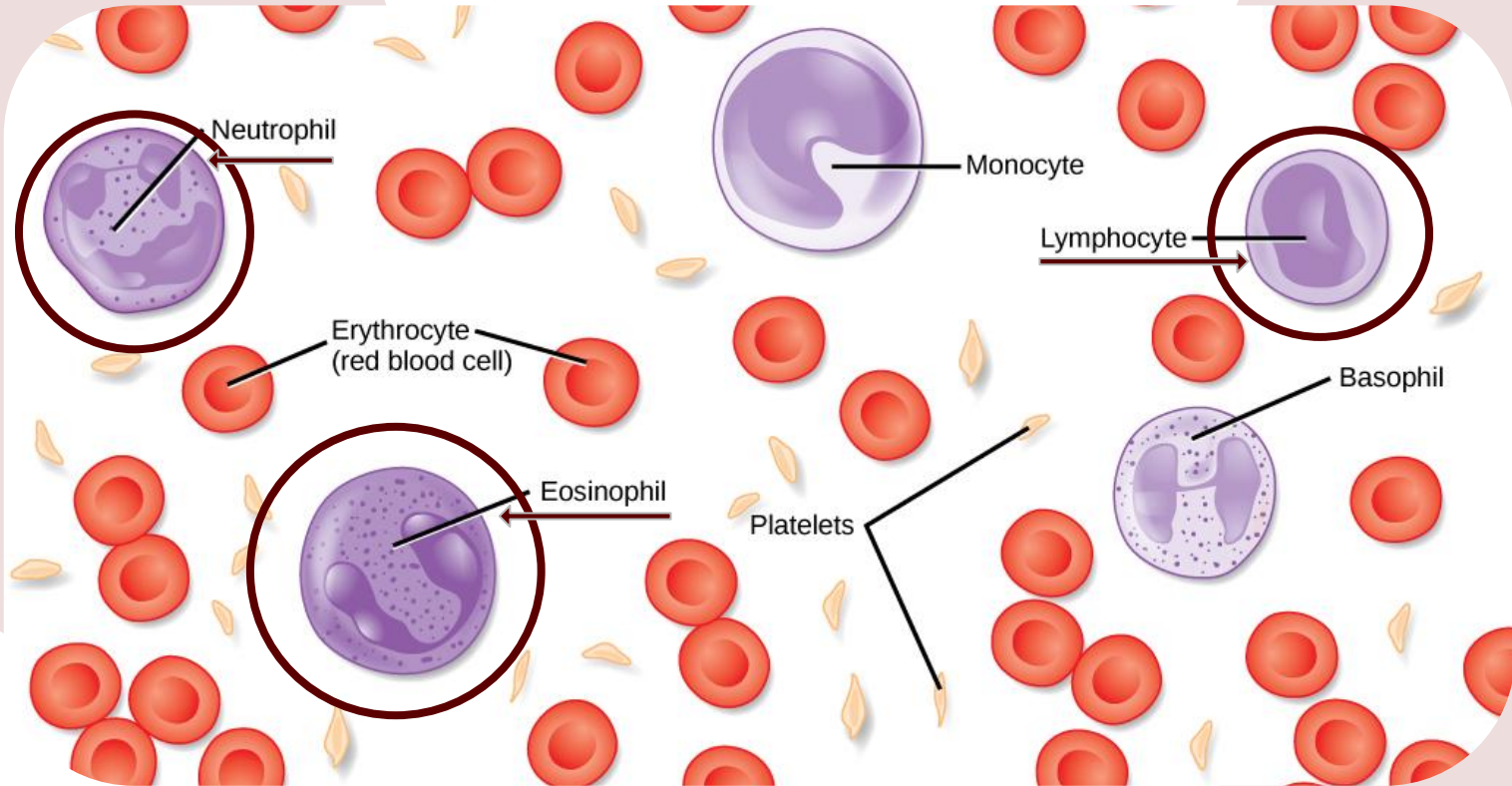
5 main types of white blood cells

Data



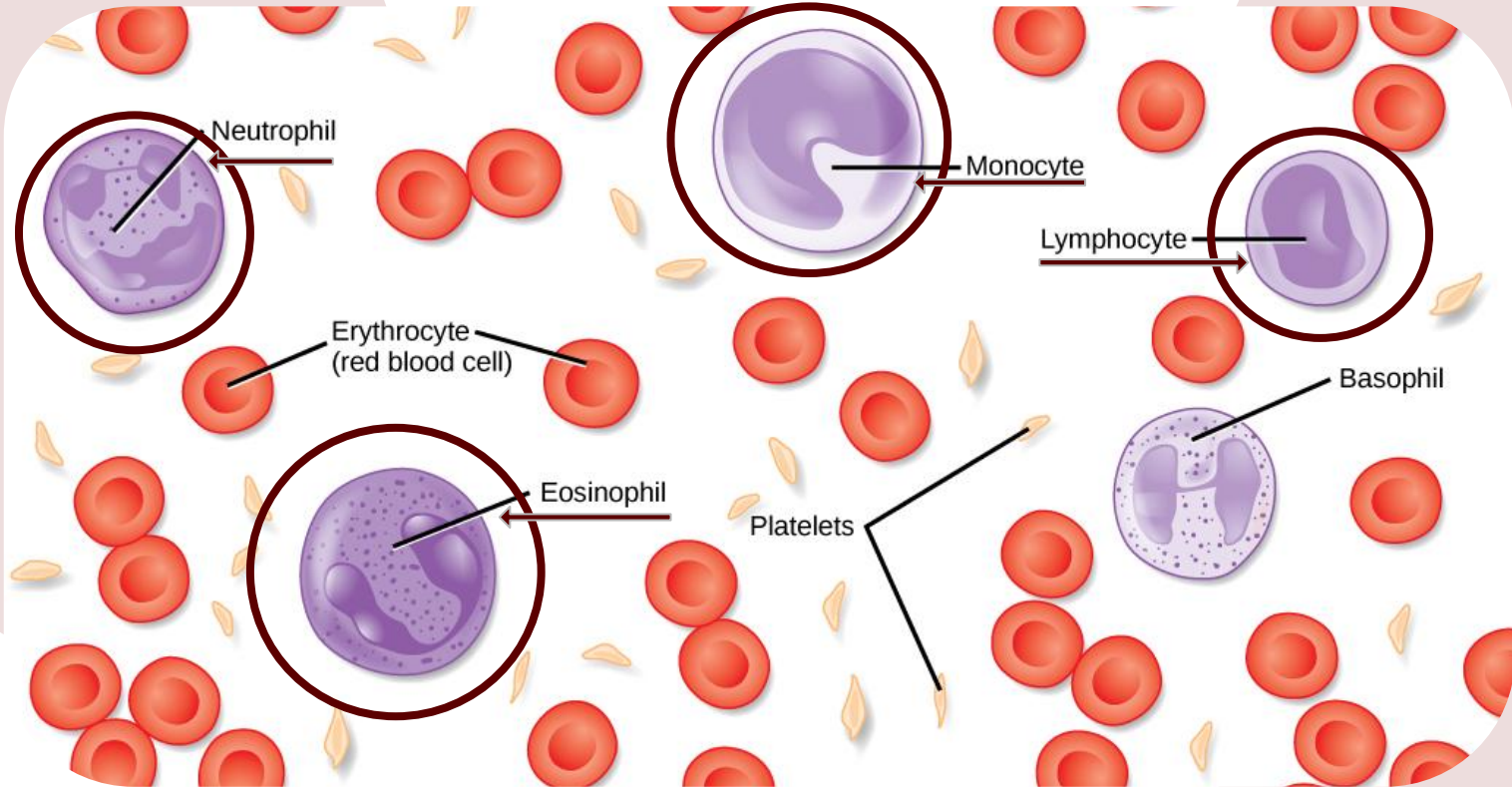
5 main types of white blood cells

Data



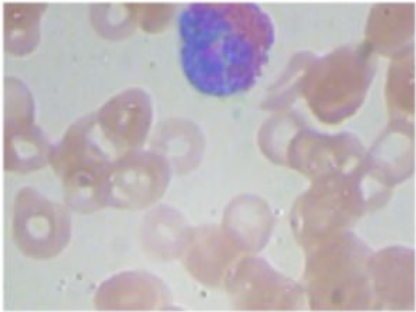
5 main types of white blood cells

Data

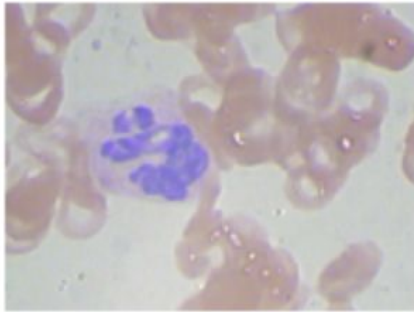


5 main types of white blood cells

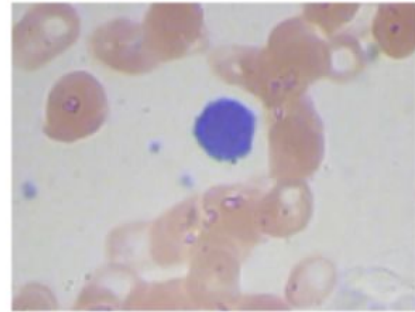
Examples



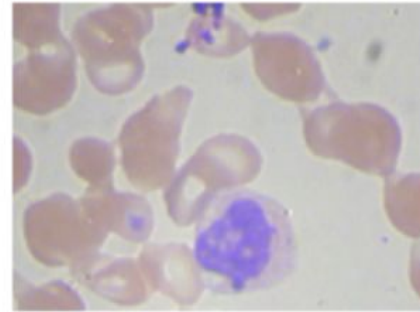
Eosinophil



Neutrophil



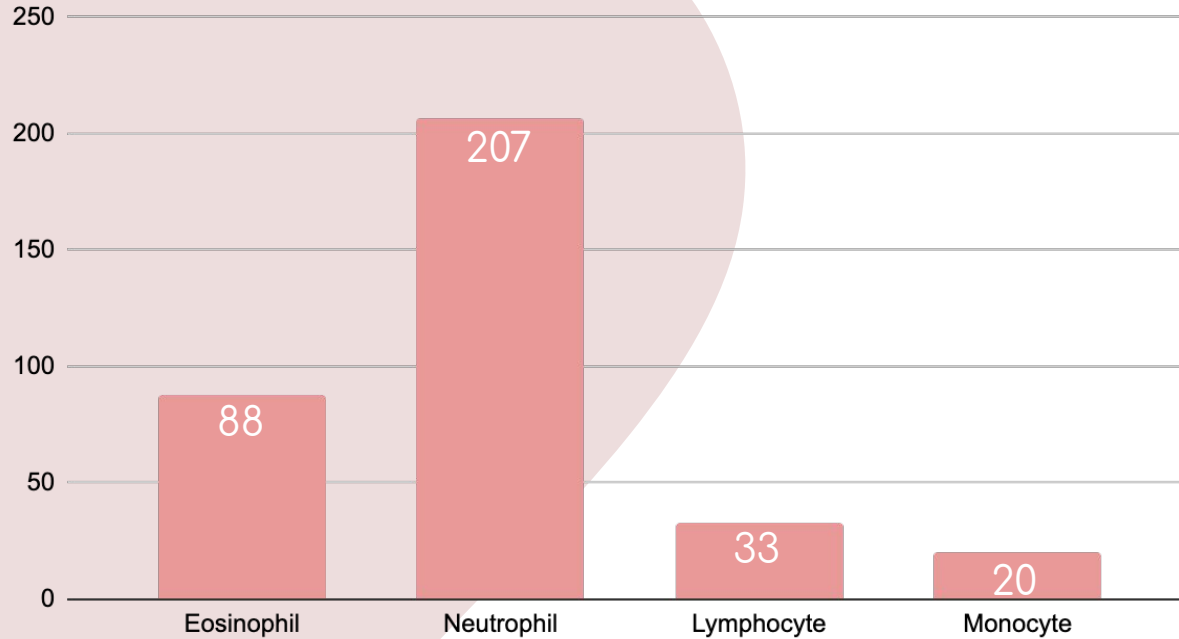
Lymphocyte



Monocyte

Data

Images



348 images total

Images have been
augmented to about
2500 for each
category

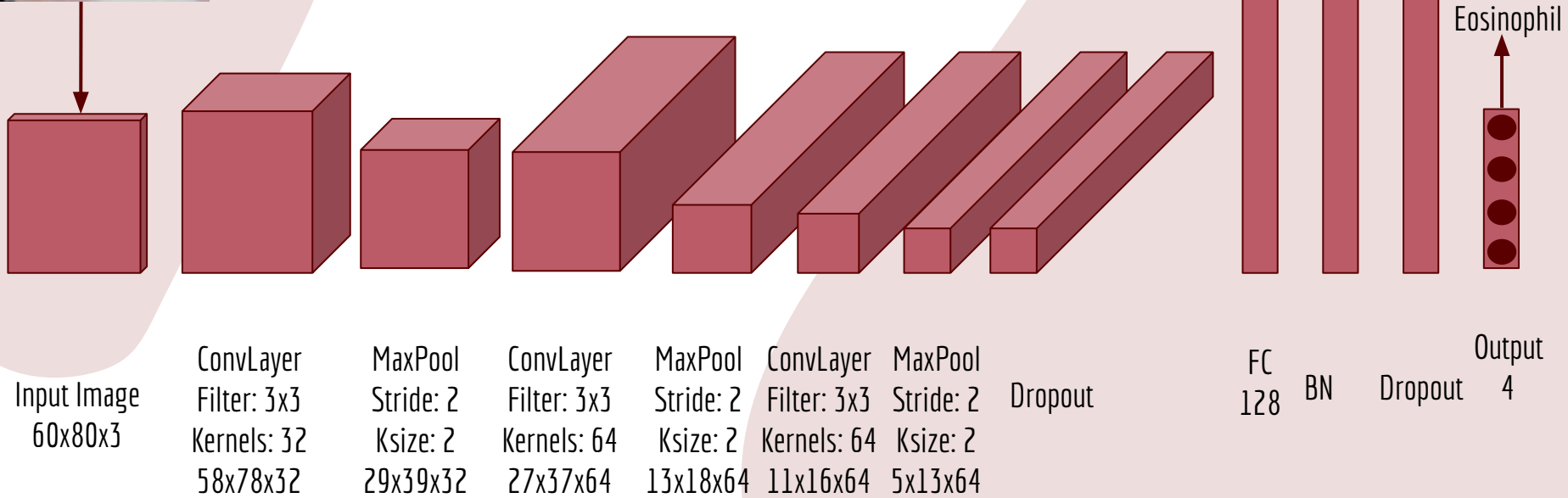
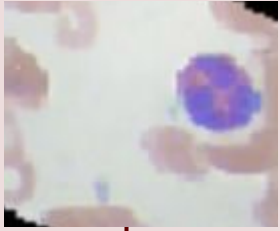
Data Source: <https://www.kaggle.com/paultimothymooney/blood-cells>



03

Approach

Convolutional Neural Network



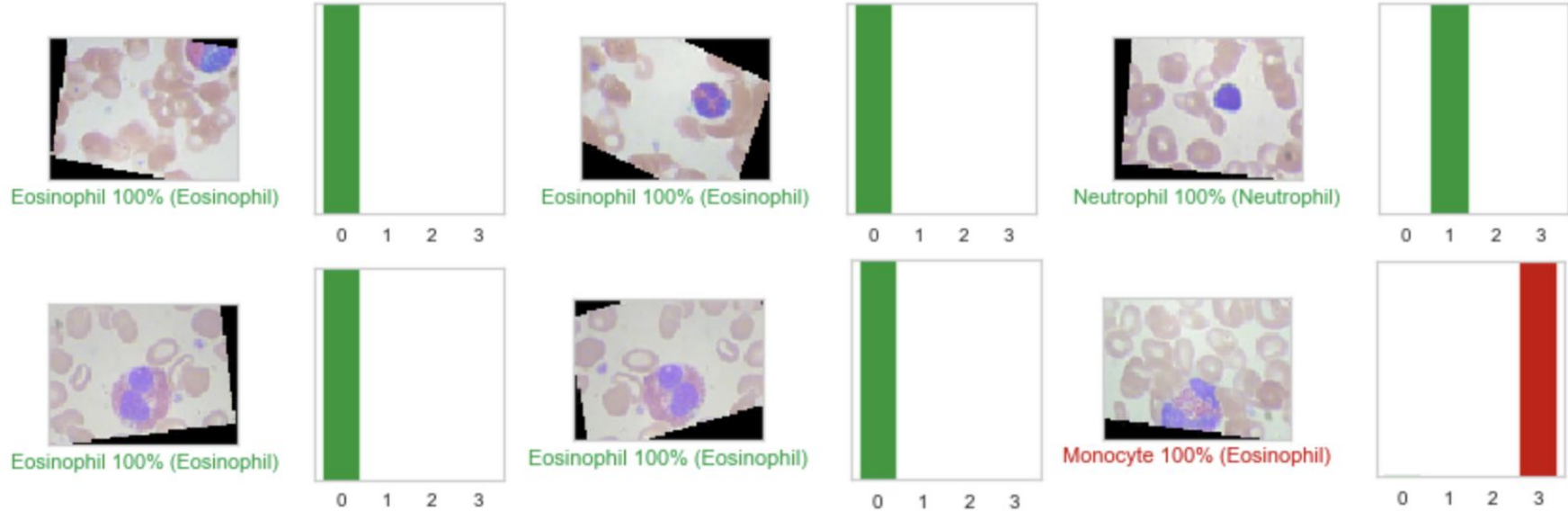


04

Results

Results

Accuracy 85%



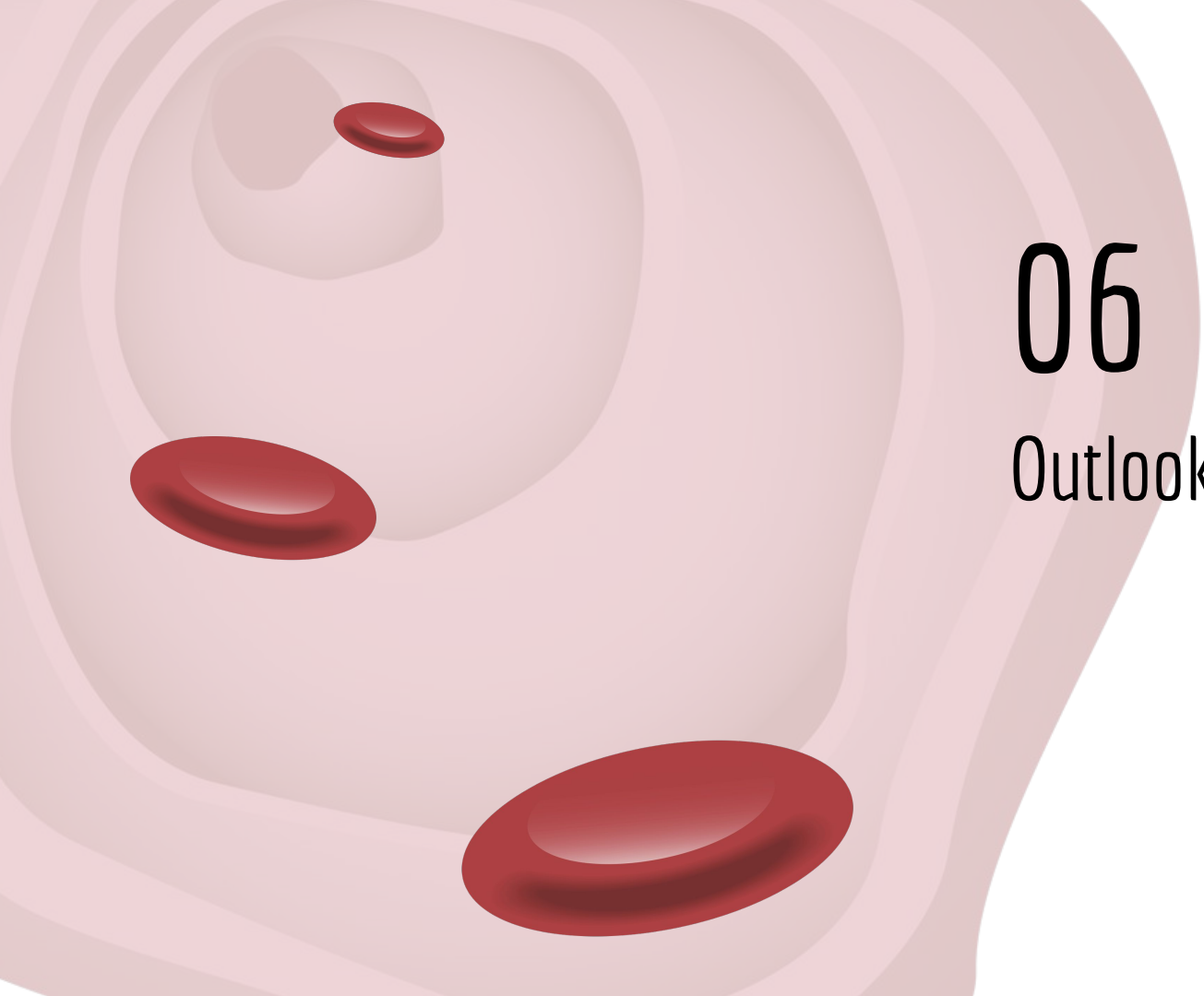


05

Conclusions

Conclusions

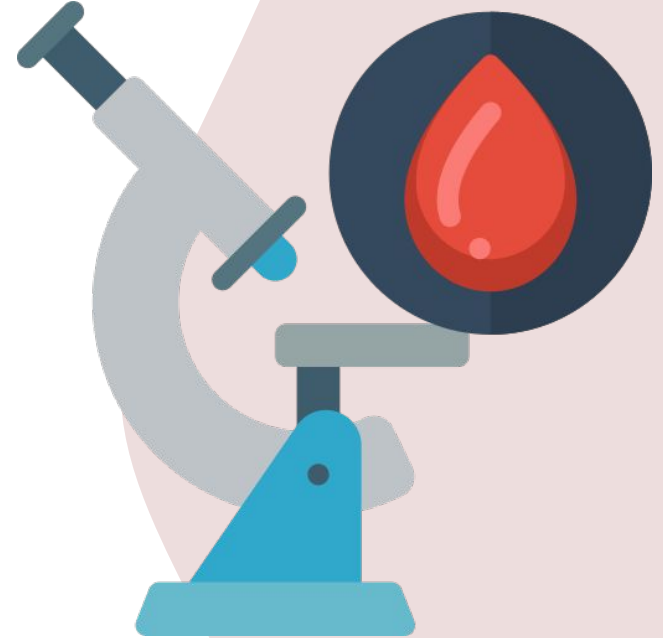
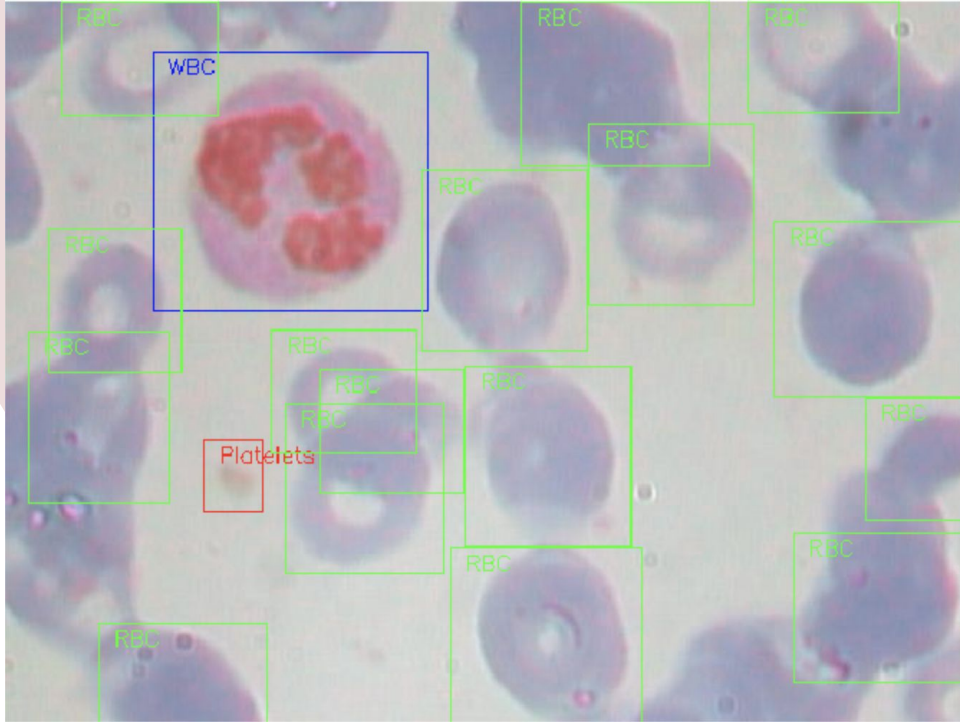
- Developed automated tool for blood cell classification from images
- Classified 4 types of cells
- 85% accuracy
- First step to a bigger problem:
In practice important to detect and count white blood cells



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/>

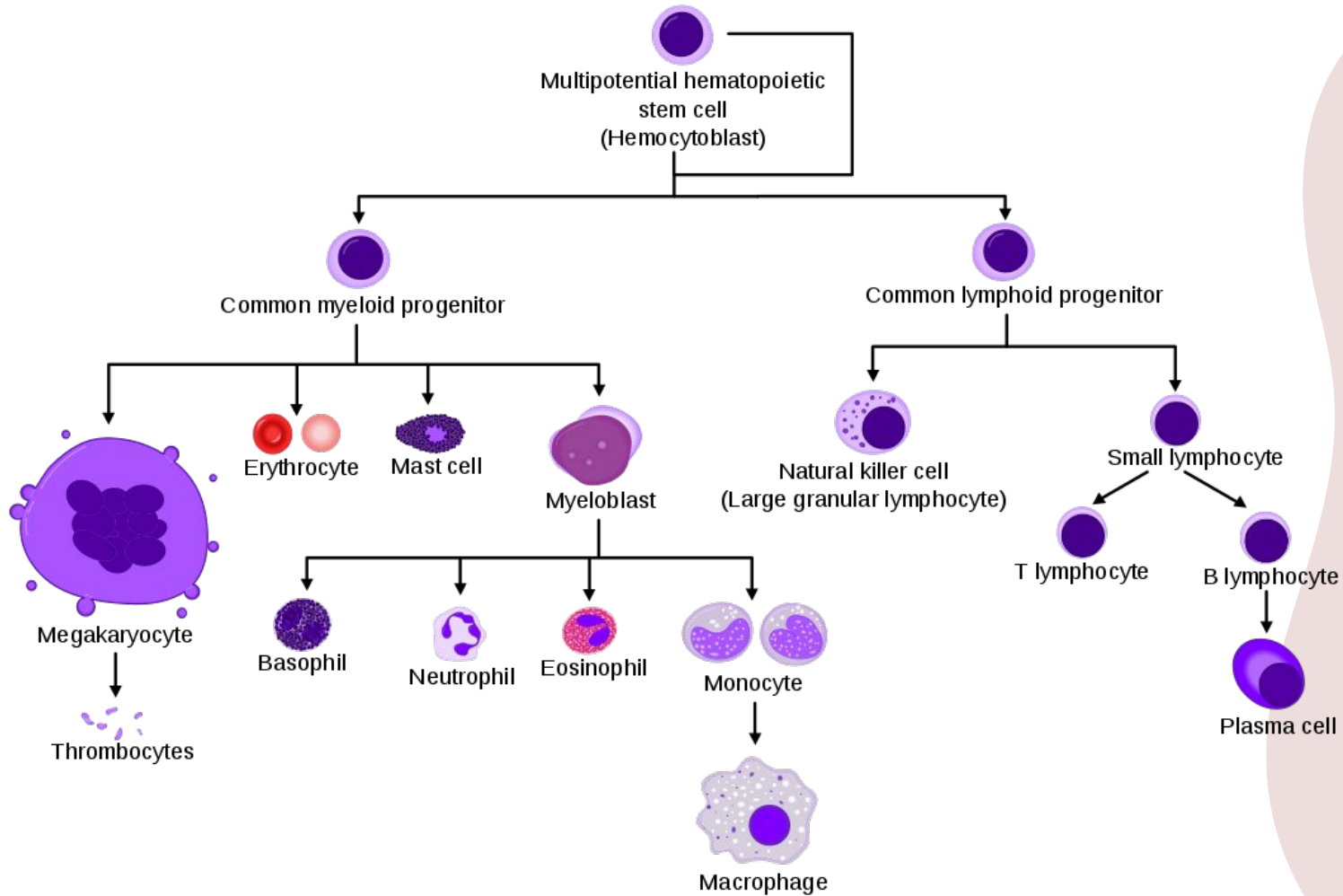
CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.

Data

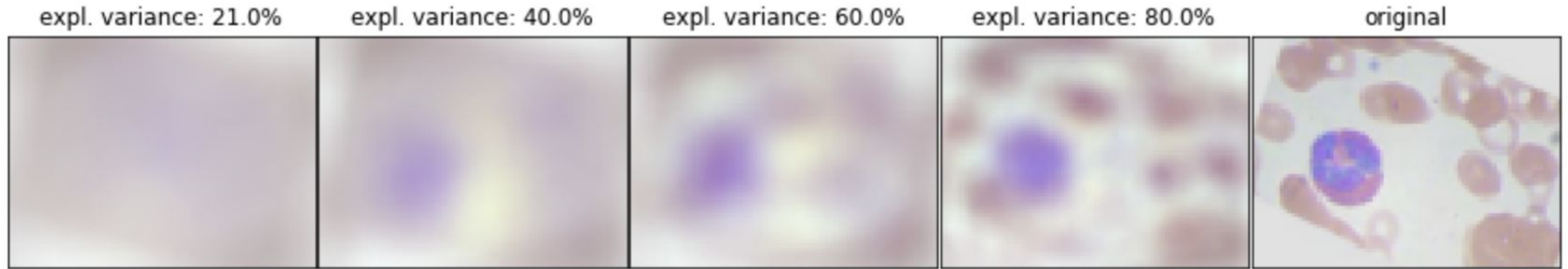
Category	
Eosinophil	Responsible for combating multicellular parasites and certain infections; control mechanisms associated with allergy and asthma
Neutrophil	Kill bacterias. Migrate toward sites of infection or inflammation
Lymphocyte	Lysis of virally infected cells and tumour cells; Release cytokines 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%

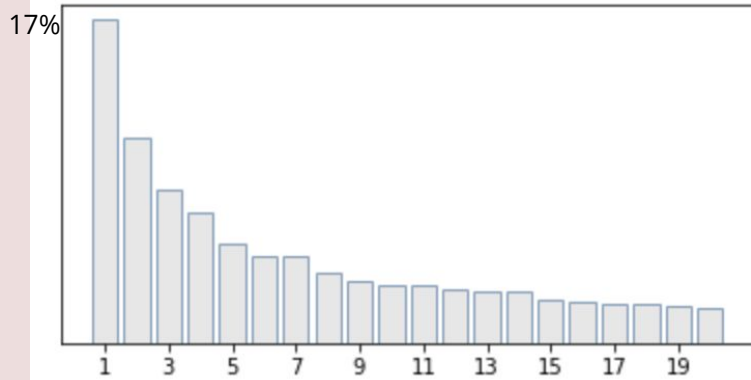


Principal Component Analysis

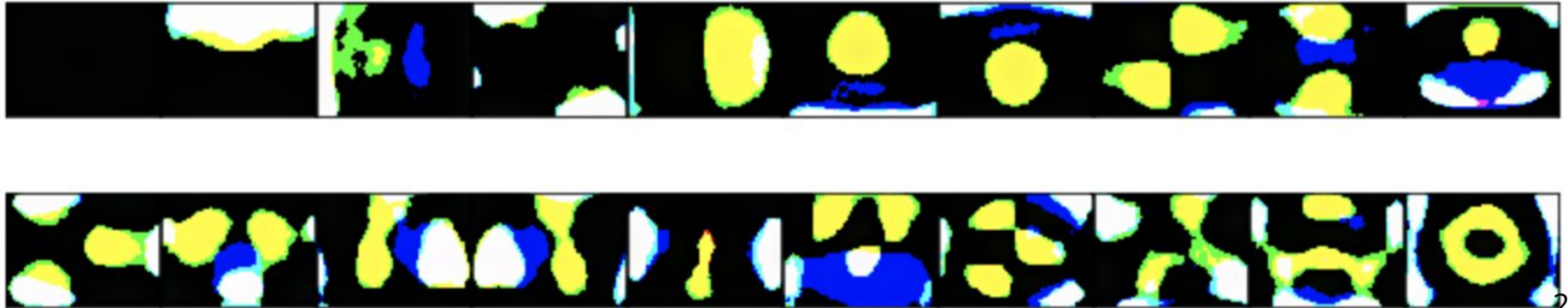


Principal Component Analysis

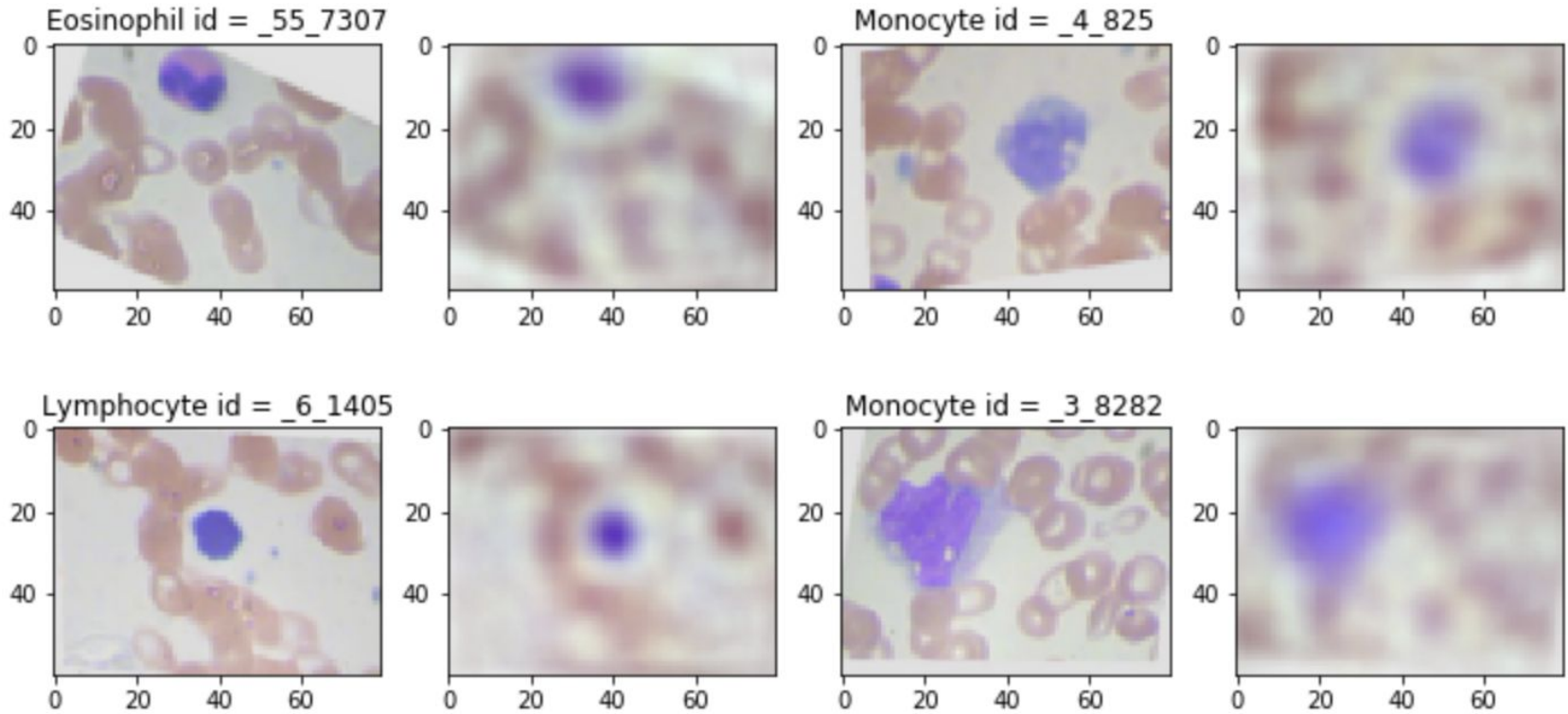
Explained Variance

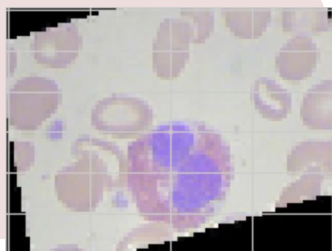


Eigenvectors



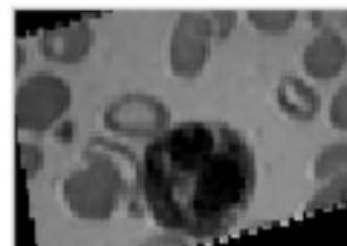
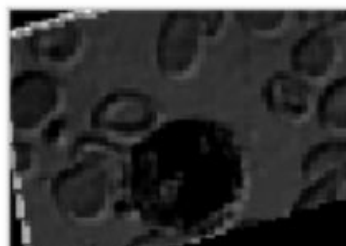
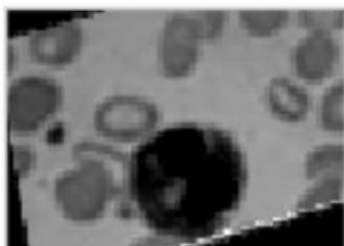
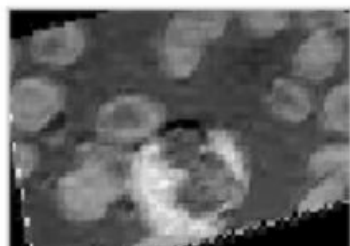
Principal Component Analysis



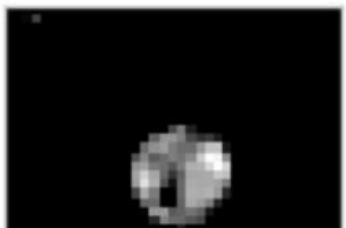


input

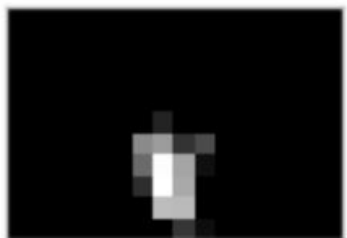
Feature Importance



1. ConvLayer



2. ConvLayer



3. ConvLayer

Convolutional Neural Network

