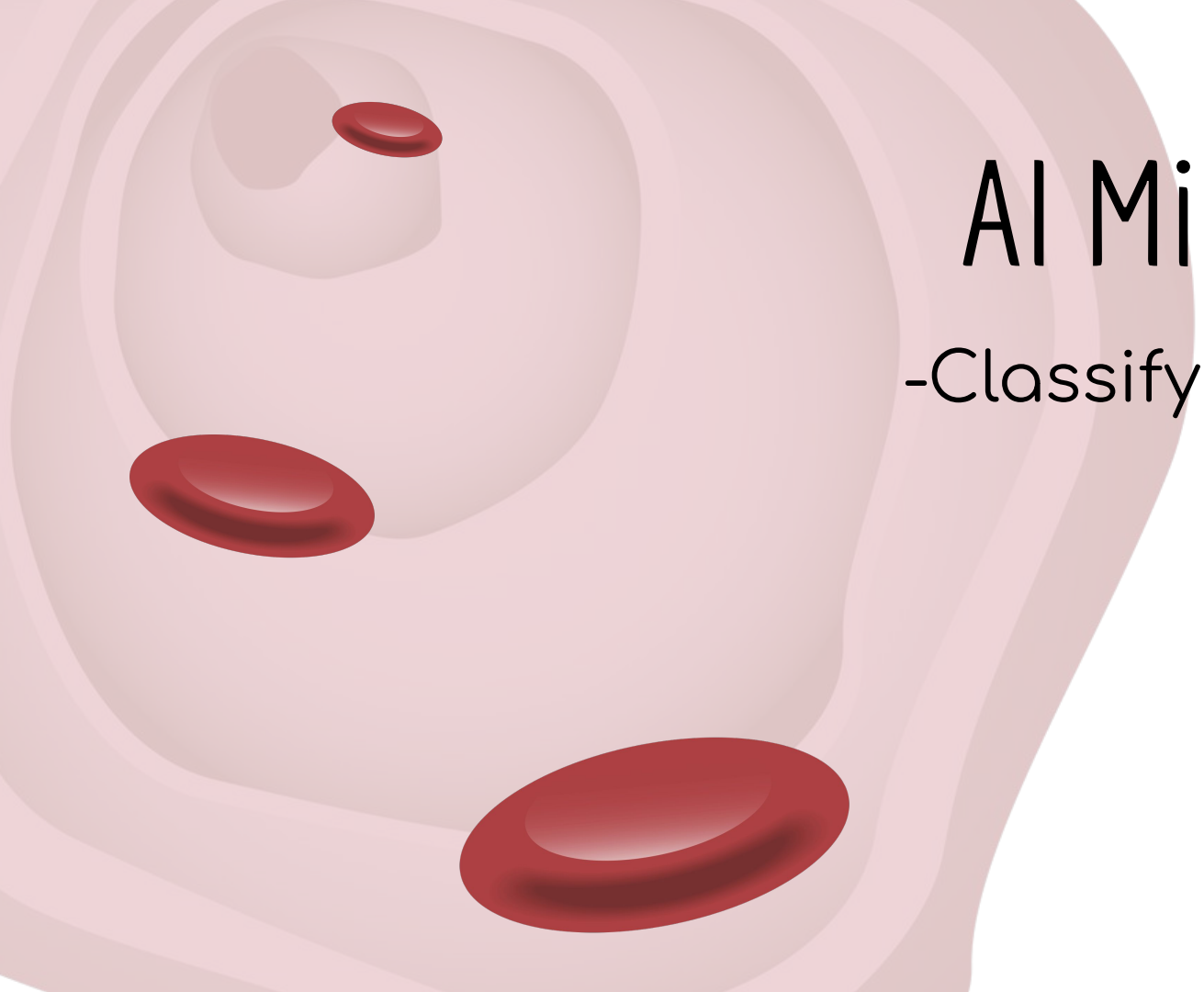
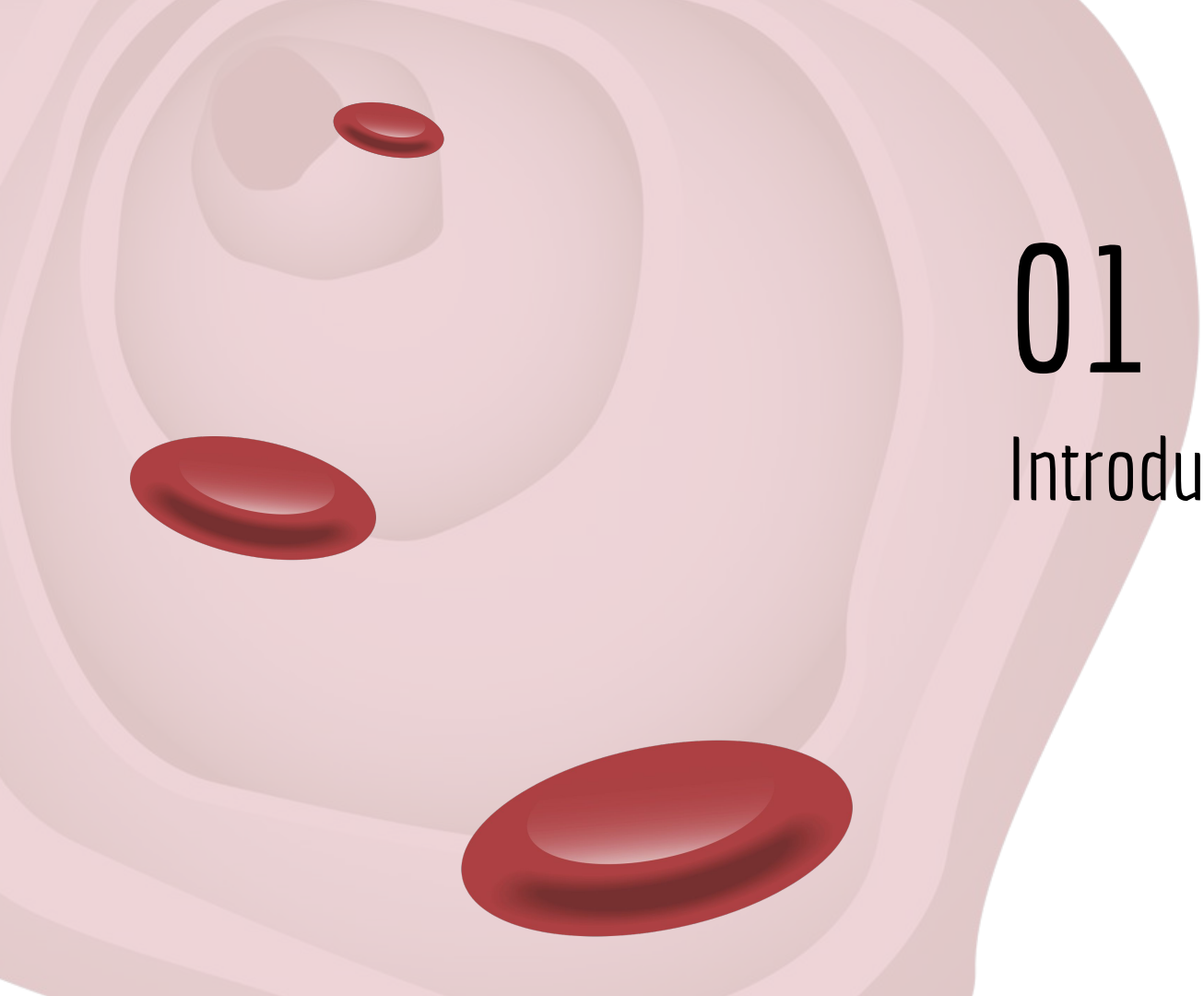


# AI Microscope

## -Classify Blood Cells-

Frauke Albrecht

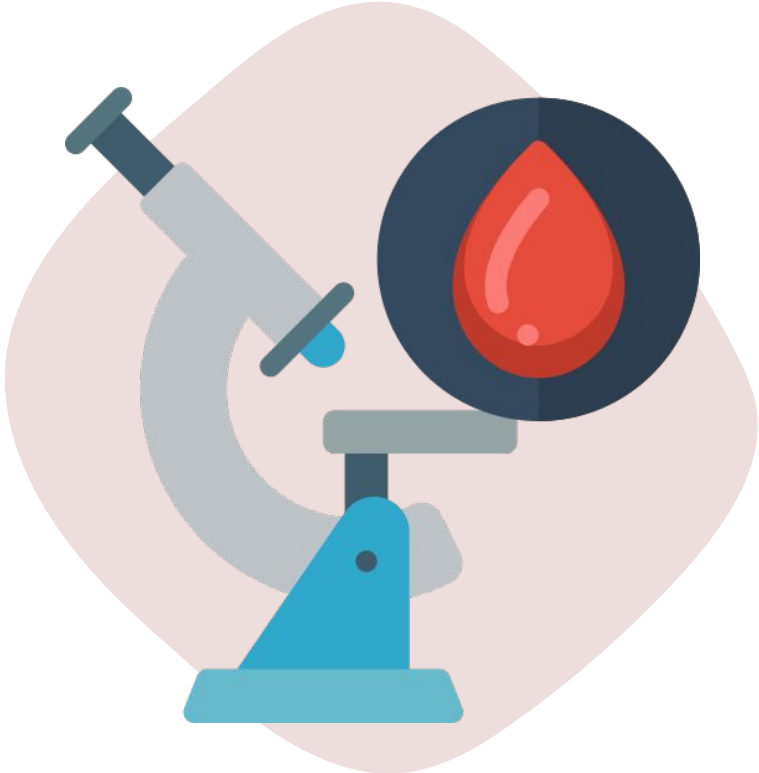


# 01

# Introduction

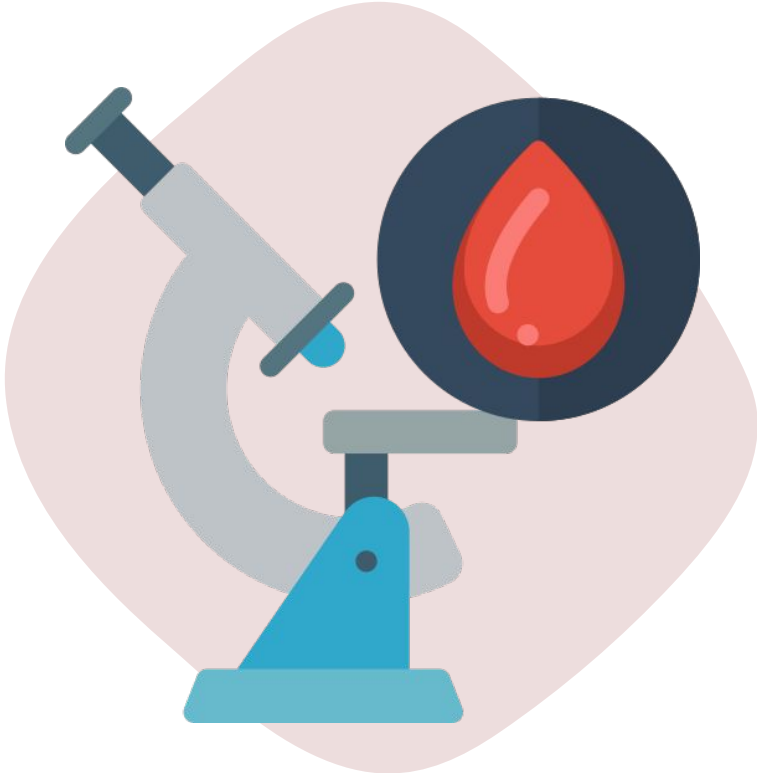
# Background

- 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**



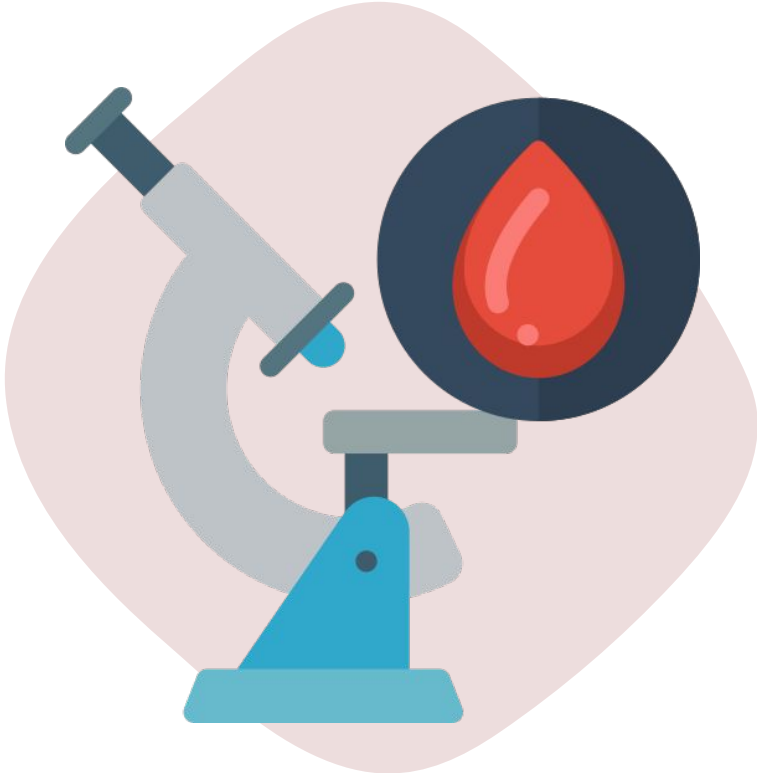
# Objective

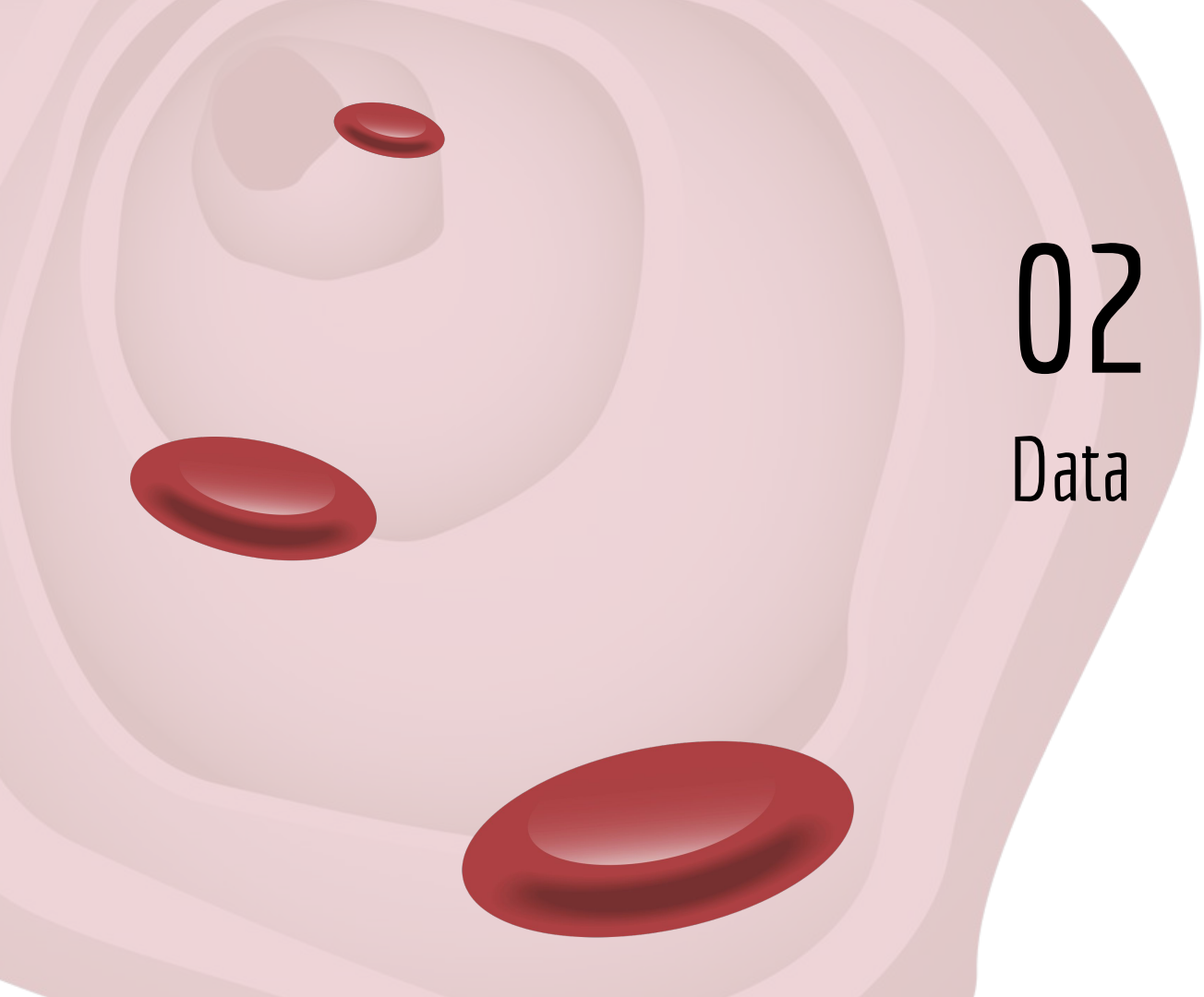
Automize **Classification** of different types of **white blood cells** in microscope images



# Motivation

- **Support medical experts** with visual diagnosis
- **Increase** diagnostic **accuracy**

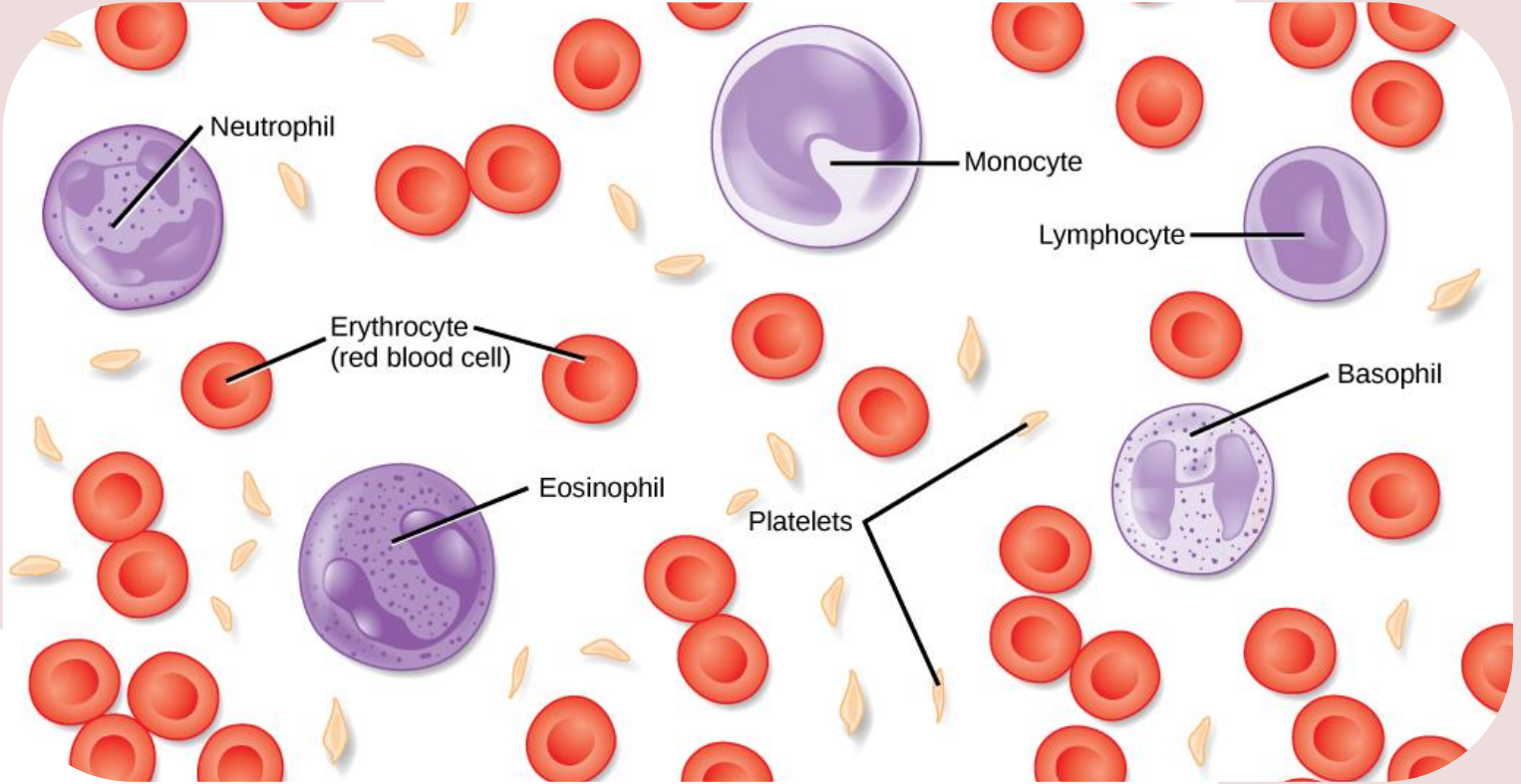




# 02

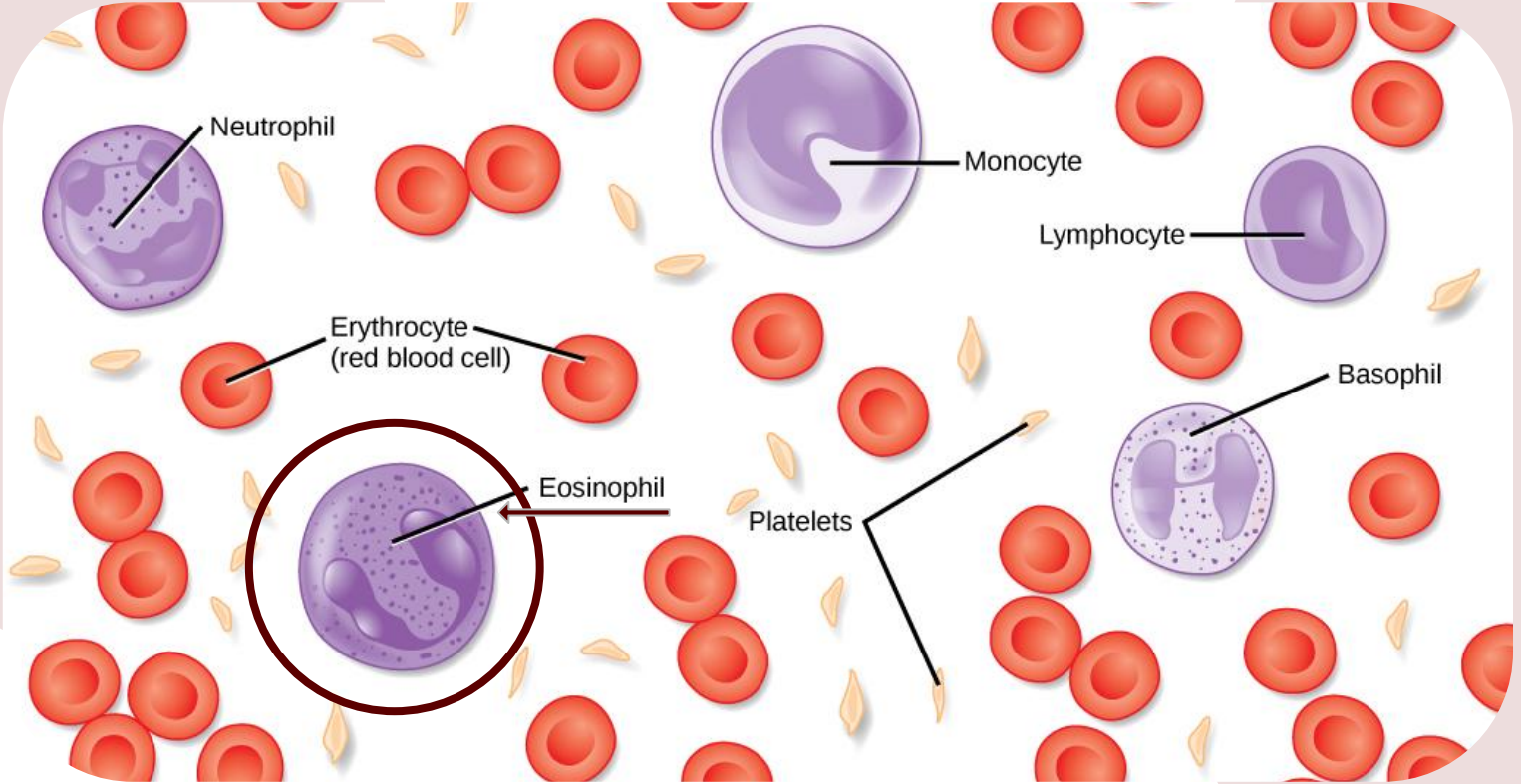
# Data

# Data



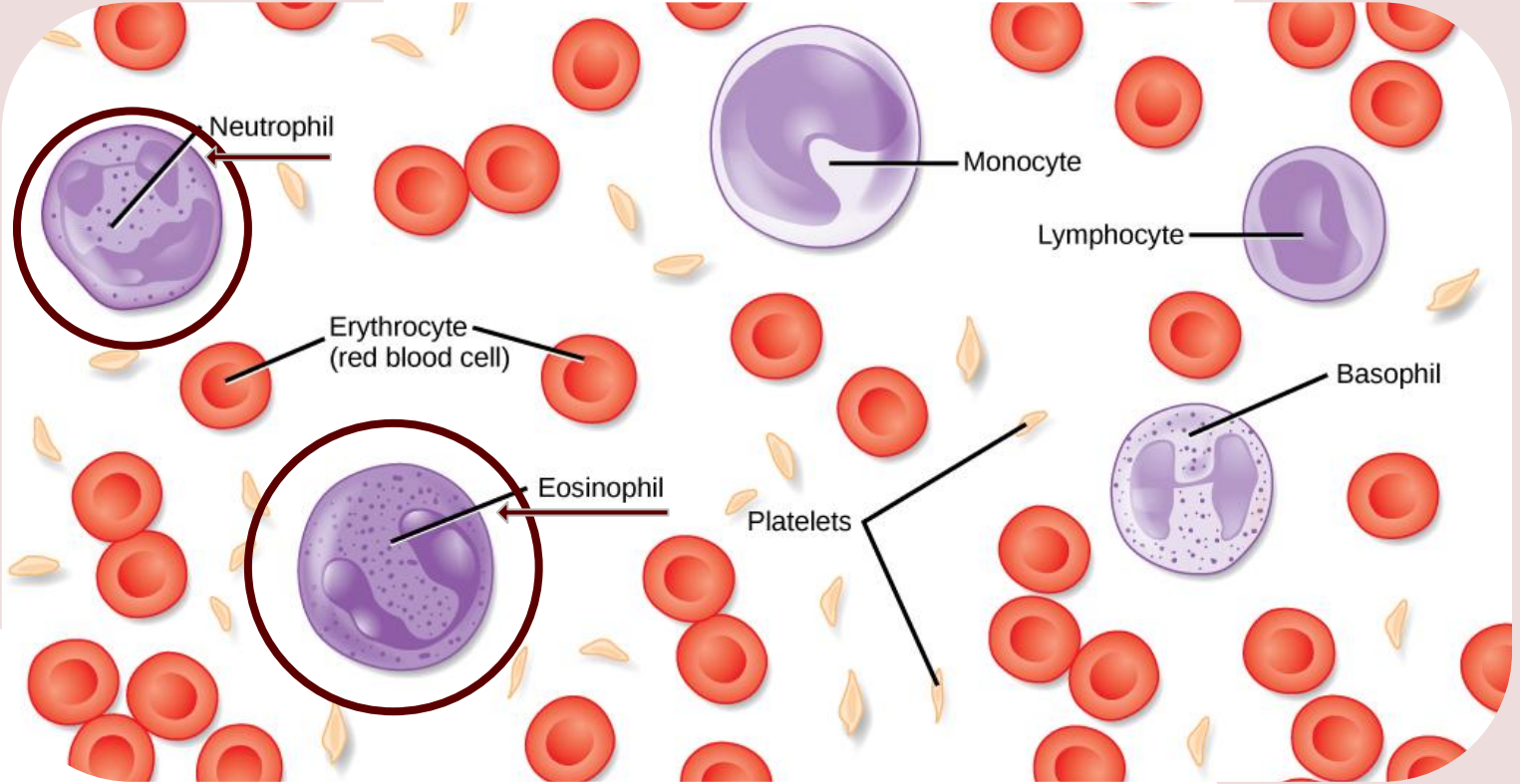

5 main types of white blood cells

# Data



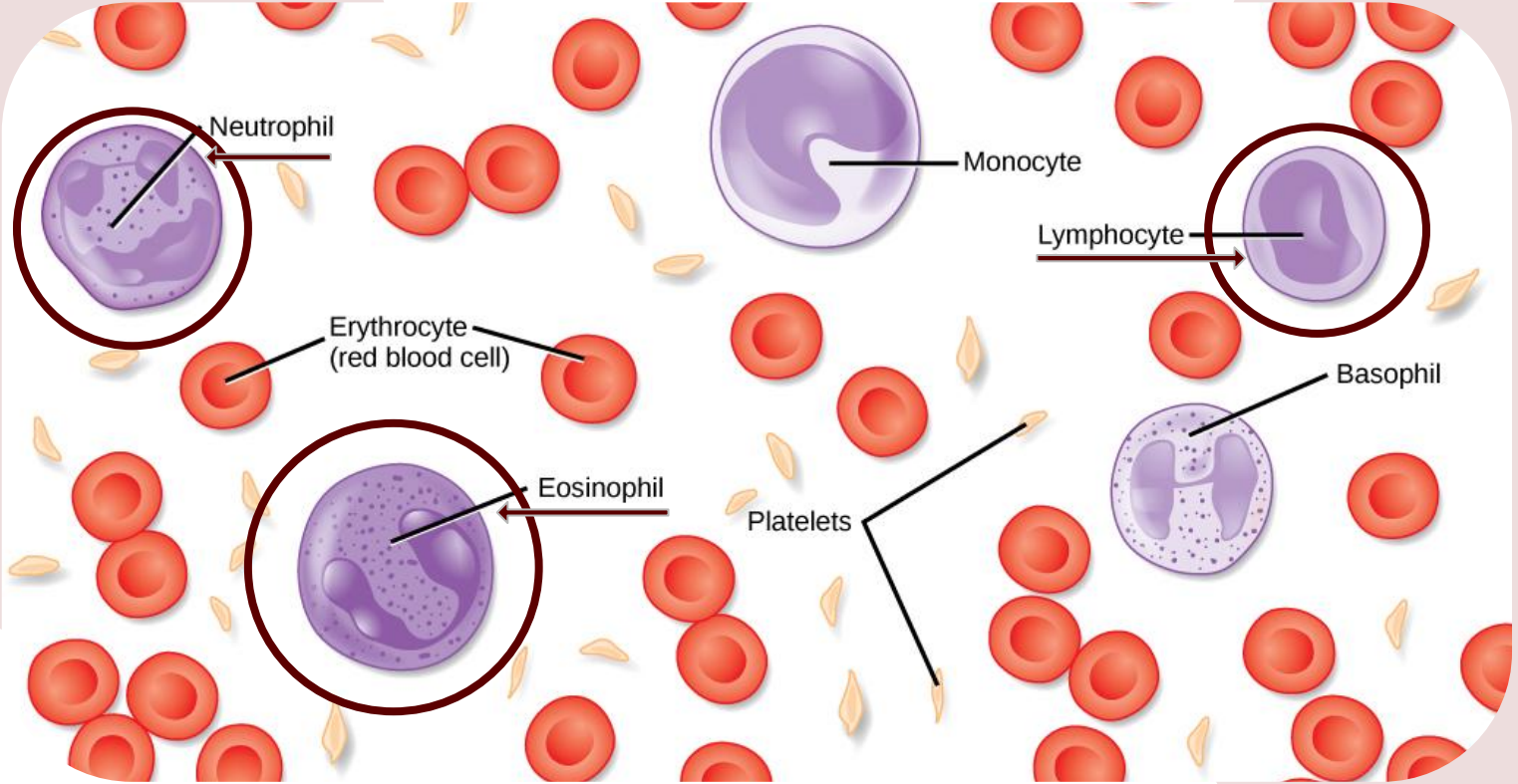

5 main types of white blood cells

# Data



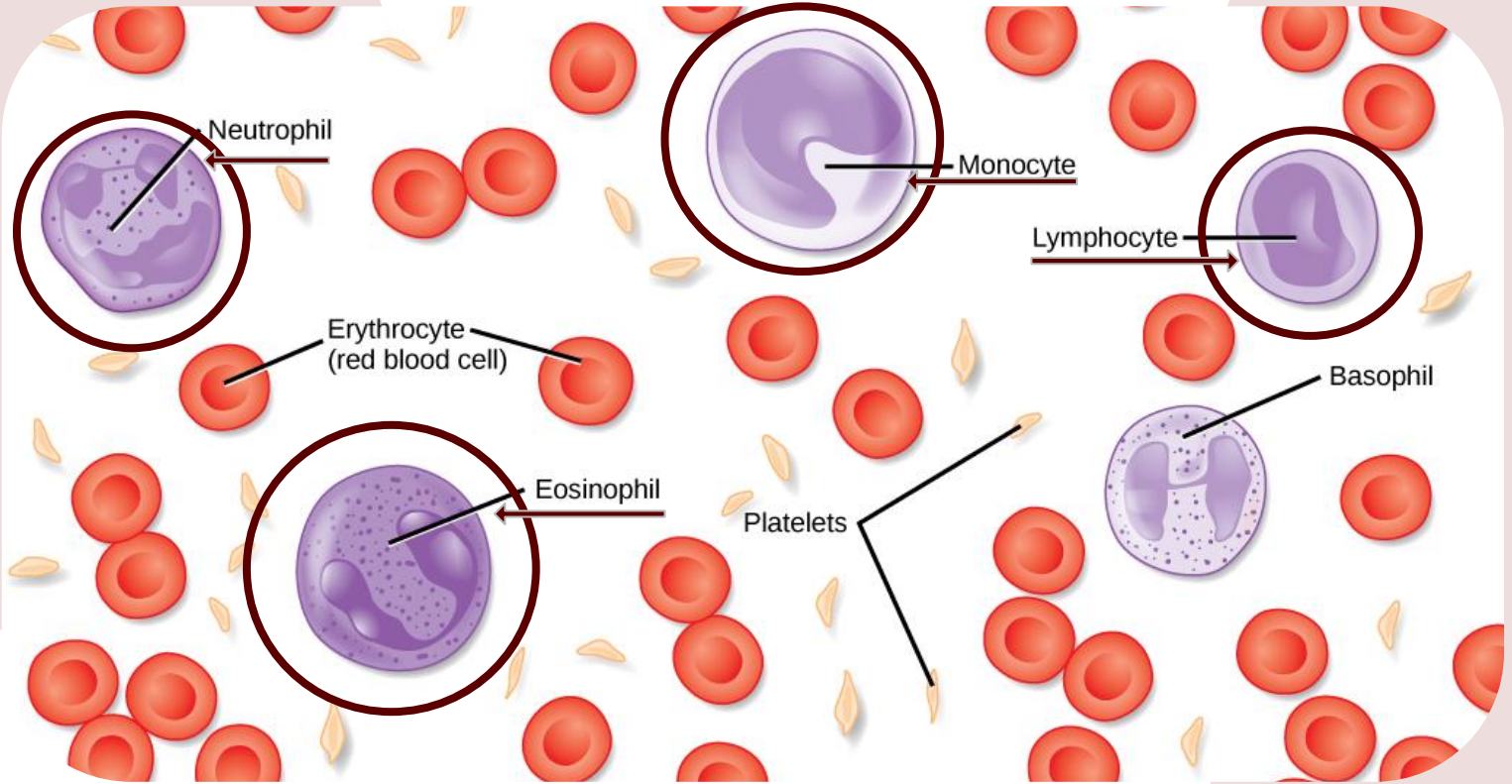

5 main types of white blood cells

# Data



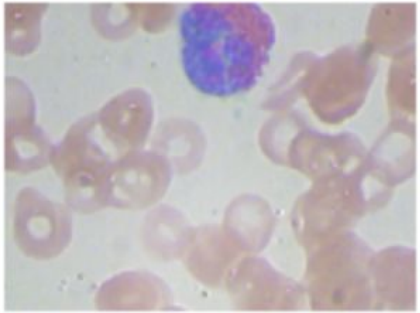

5 main types of white blood cells

# Data

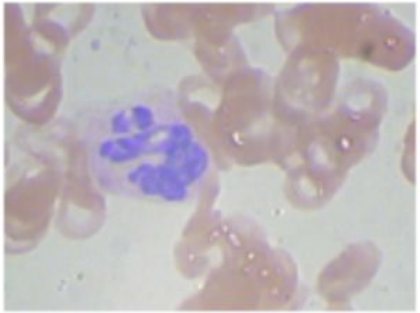



5 main types of white blood cells

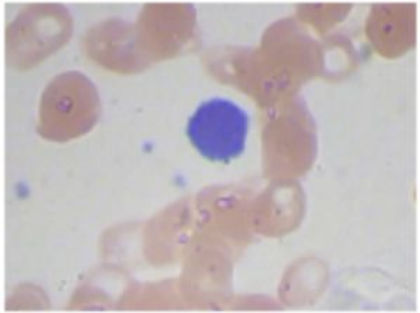
# Examples



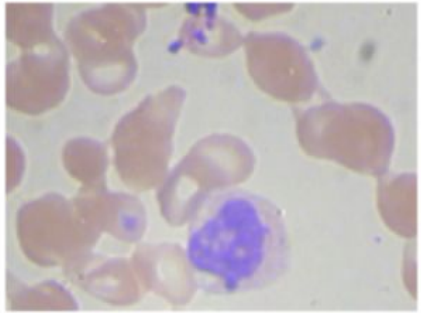
Eosinophil



Neutrophil

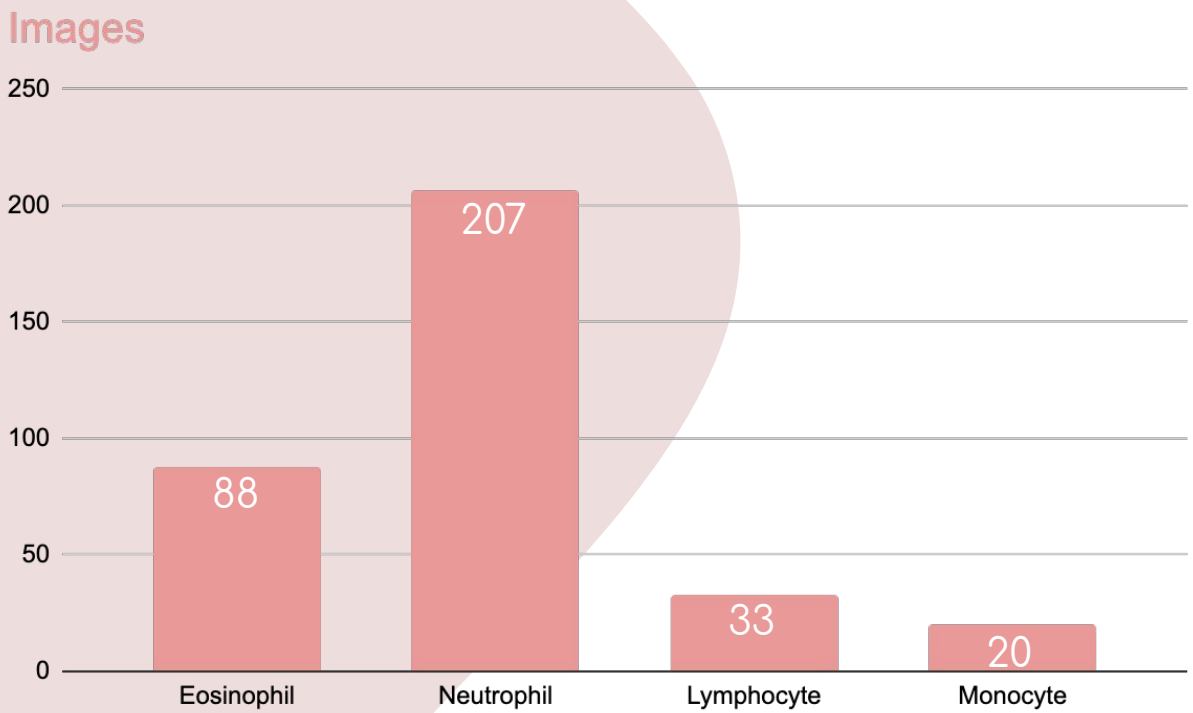


Lymphocyte



Monocyte

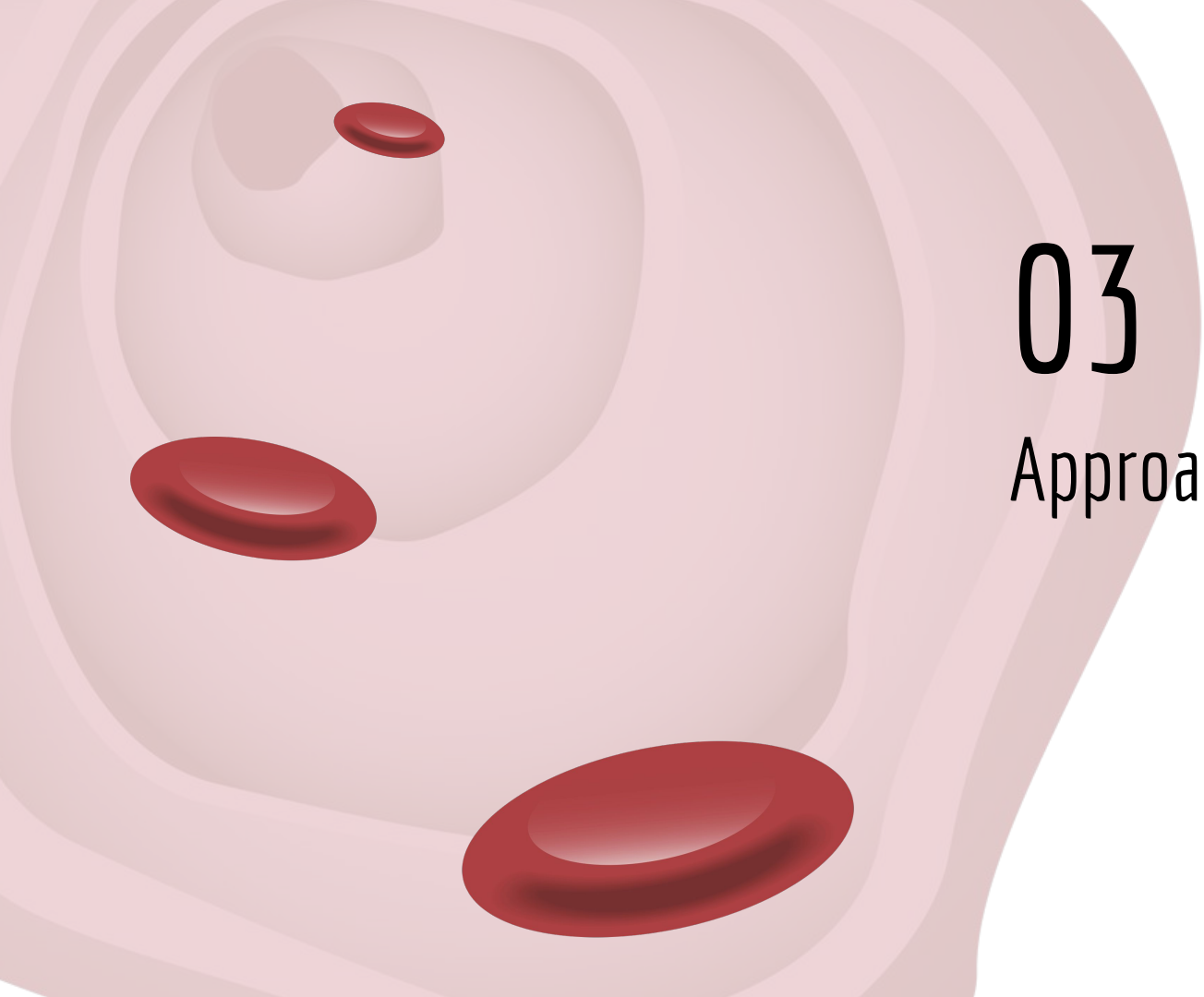
# Data




**348** images **total**

Images have been **augmented** to about **2500** for each category

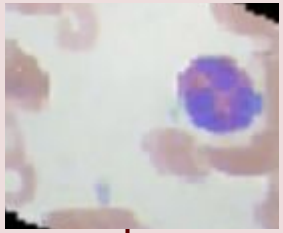
Data Source: https://www.kaggle.com/paultimothymooney/blood-cells

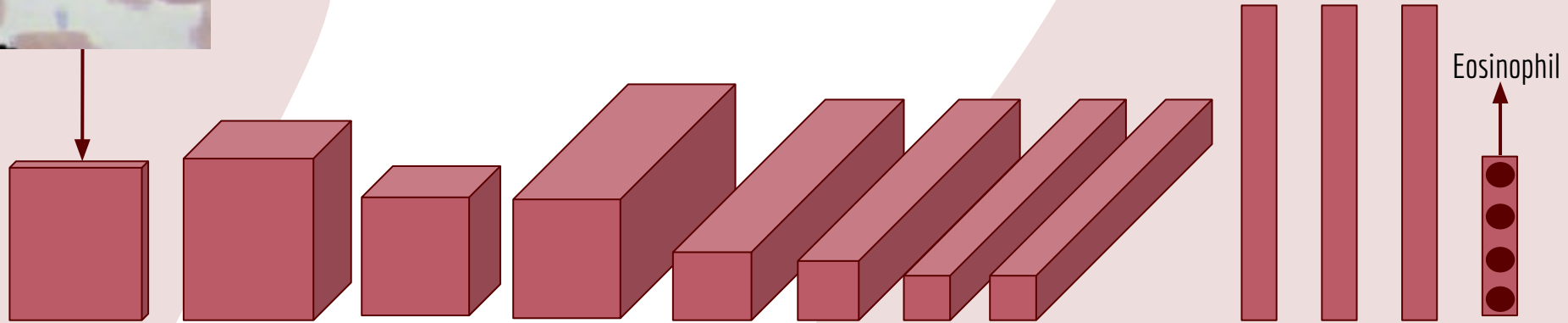


# 03

# Approach

# Convolutional Neural Network






Input Image
60x80x3

ConvLayer
Filter: 3x3
Kernels: 32
58x78x32

MaxPool
Stride: 2
Ksize: 2
29x39x32

ConvLayer
Filter: 3x3
Kernels: 64
27x37x64

MaxPool
Stride: 2
Ksize: 2
13x18x64

ConvLayer
Filter: 3x3
Kernels: 64
11x16x64

MaxPool
Stride: 2
Ksize: 2
5x13x64

Dropout

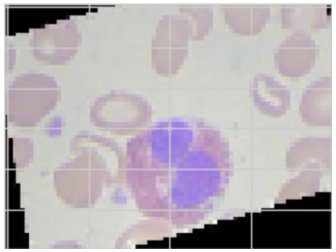
FC
128

BN

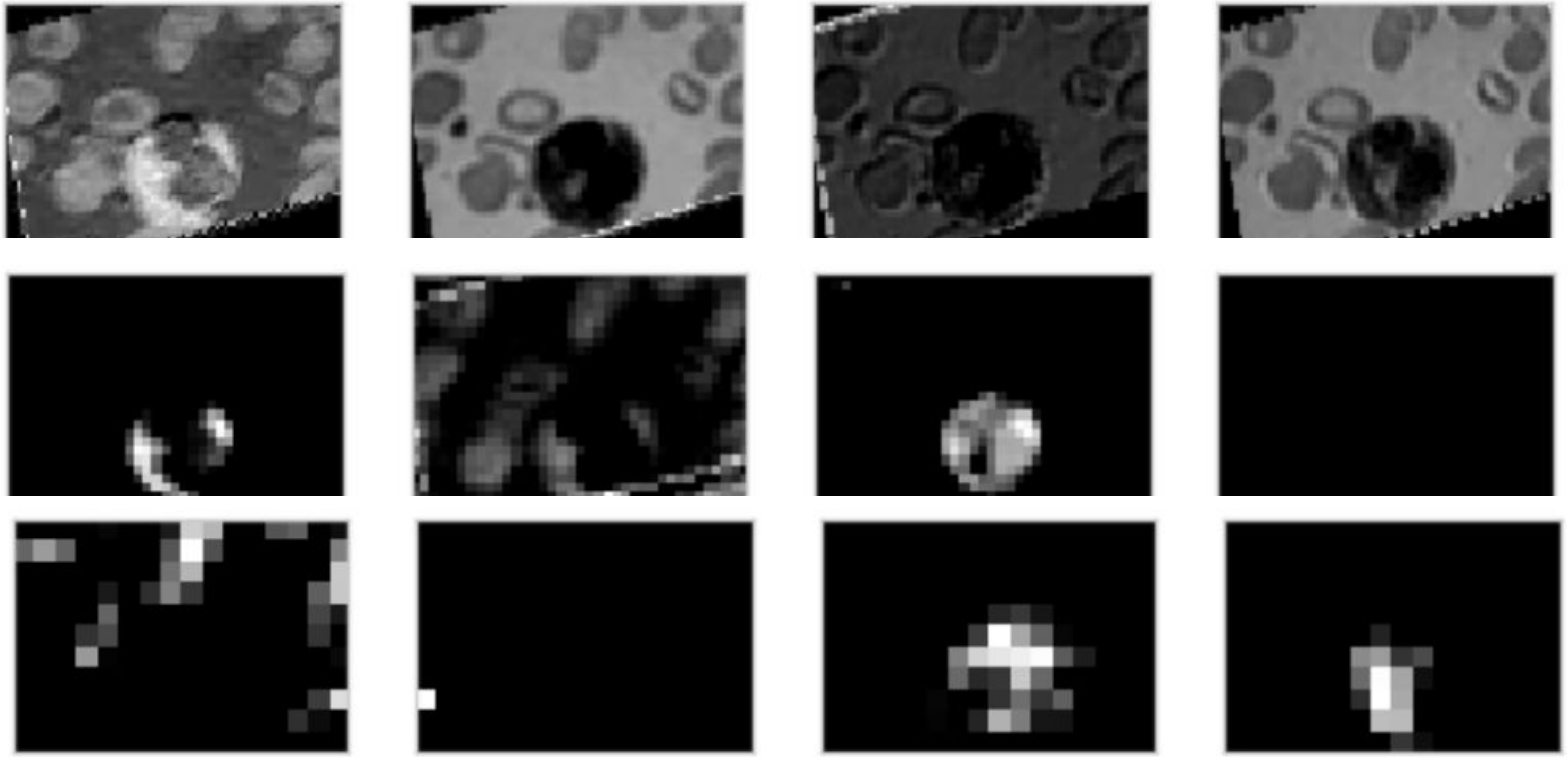
Dropout

Output
4

# Feature Importance



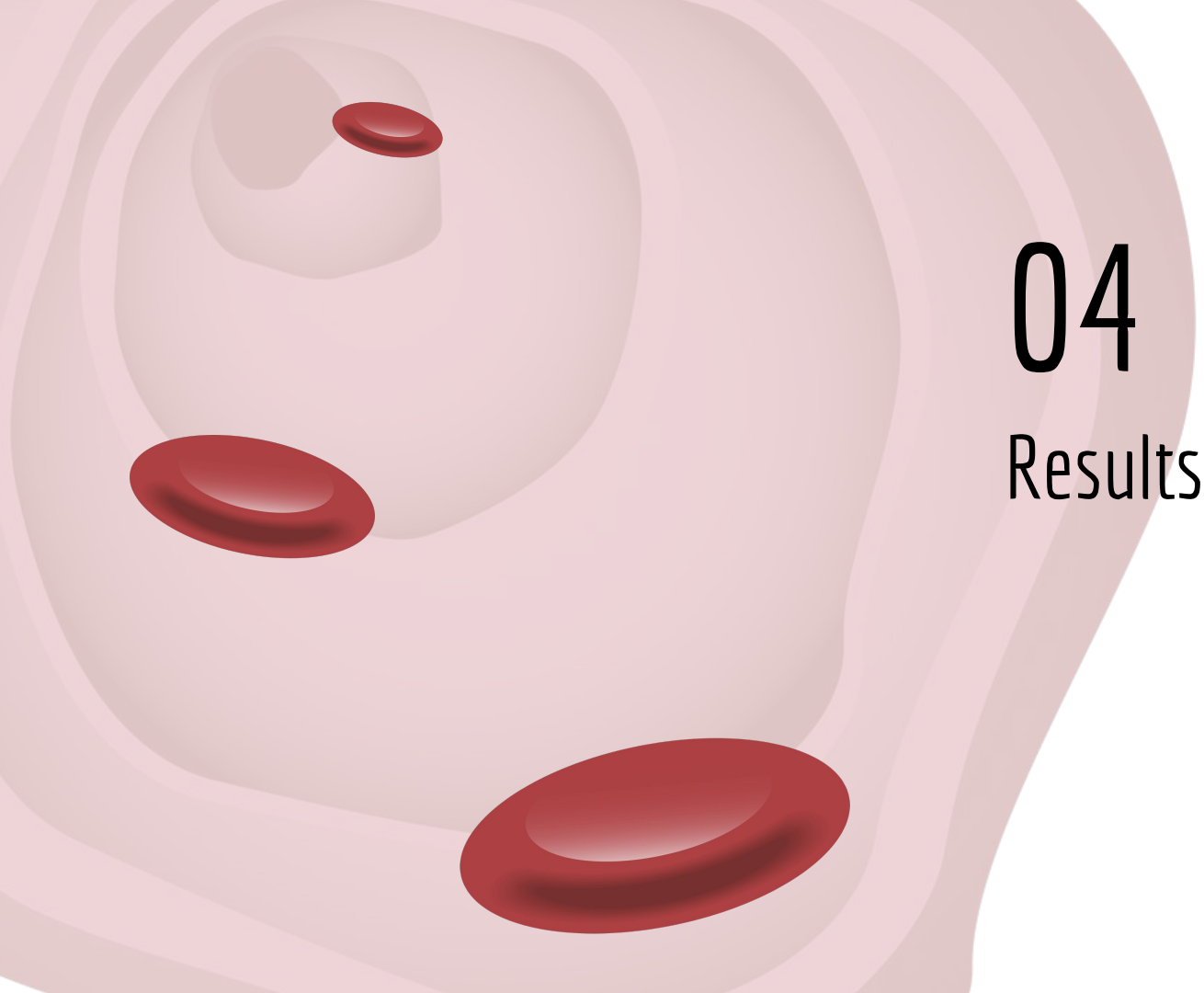
input



1. ConvLayer

2. ConvLayer

3. ConvLayer

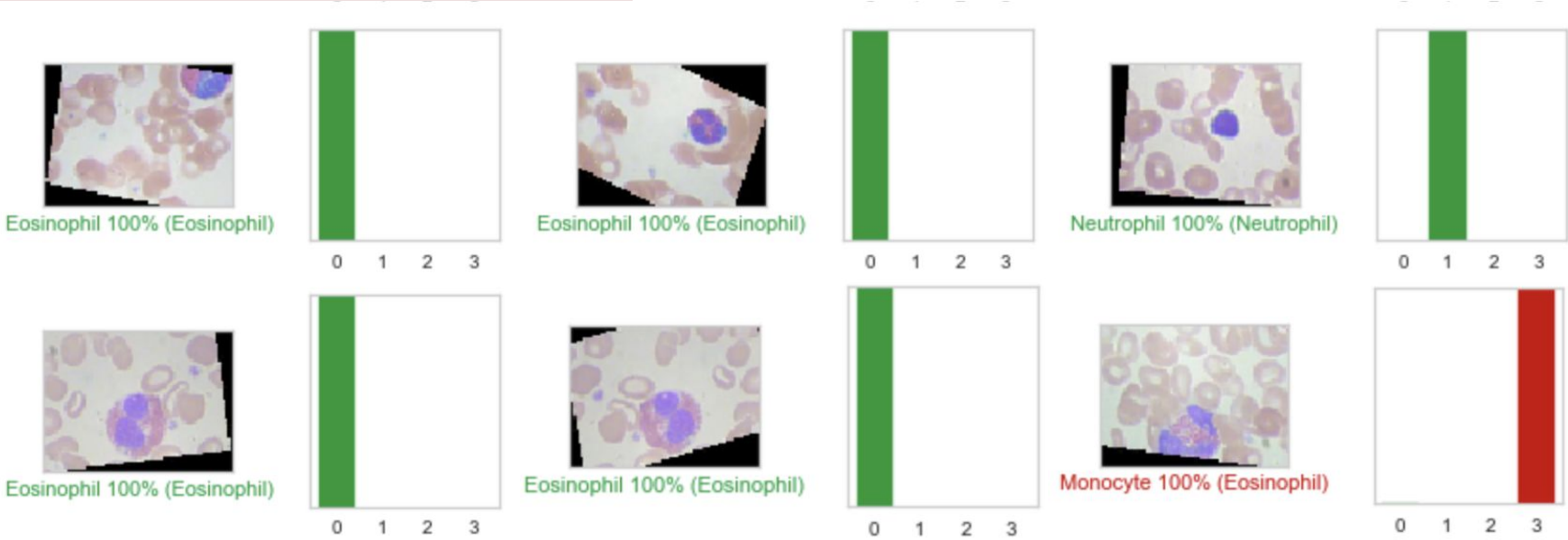


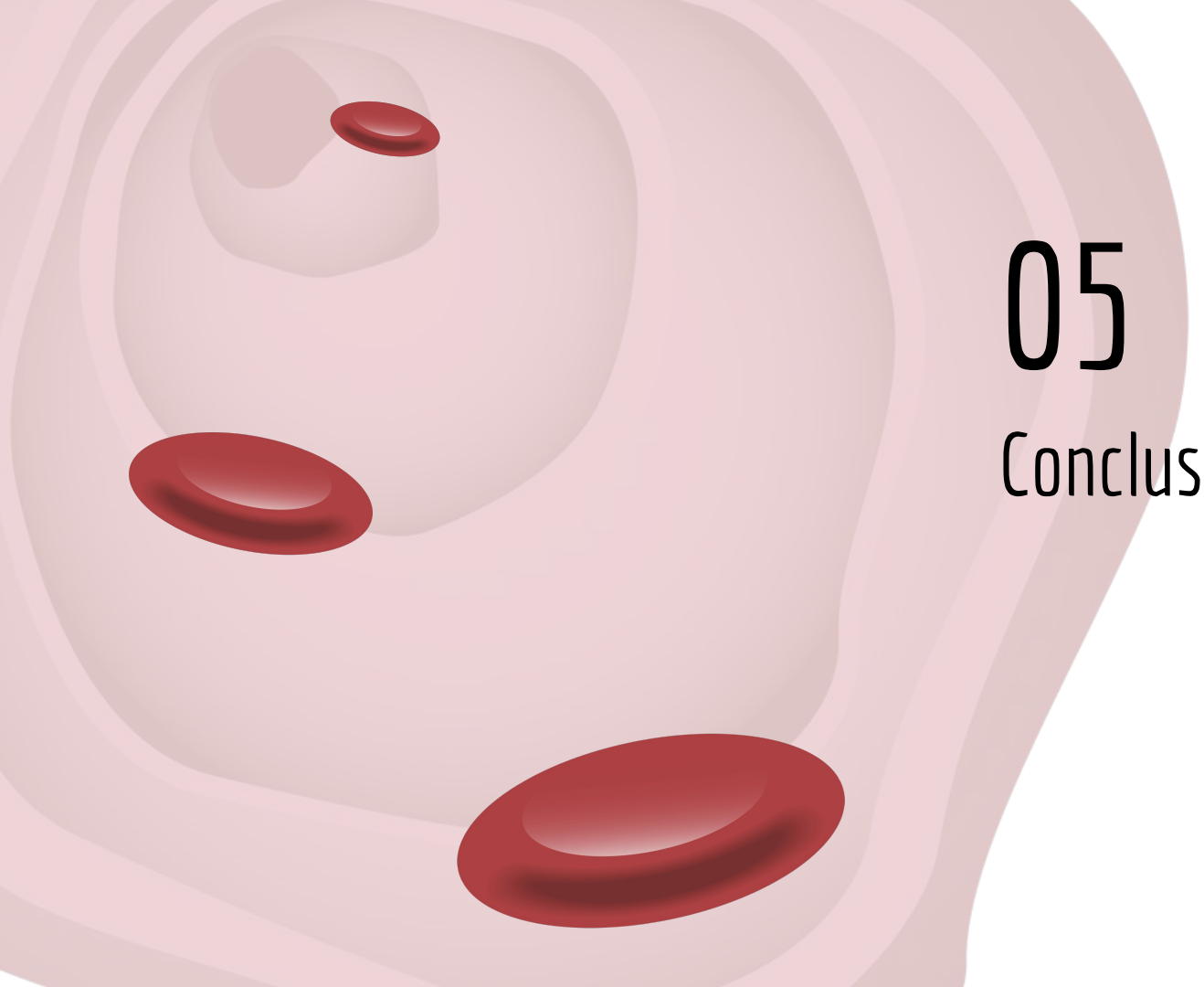
# 04

# Results

# Results

Accuracy 85%



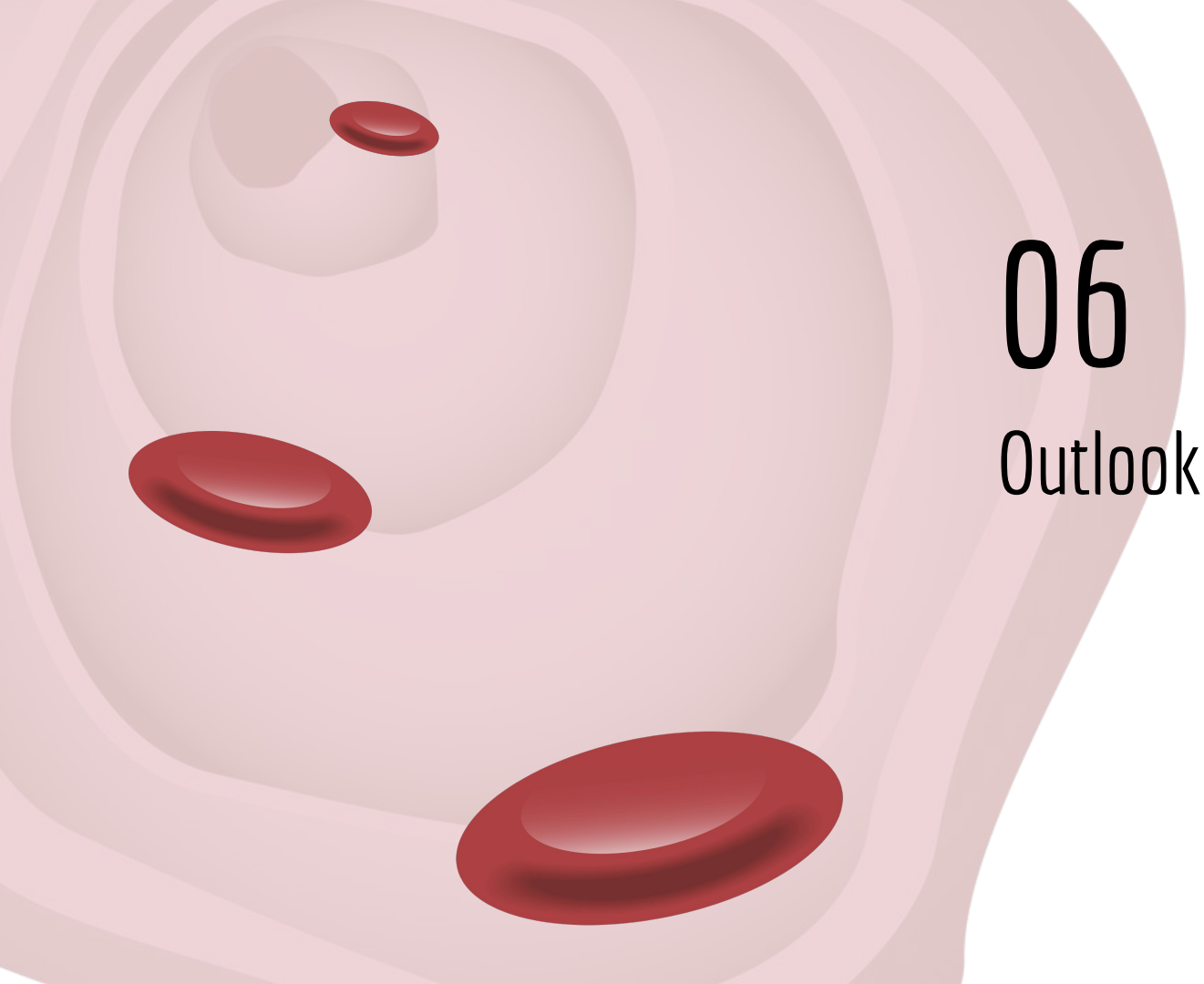


# 05

# Conclusions

# Conclusions

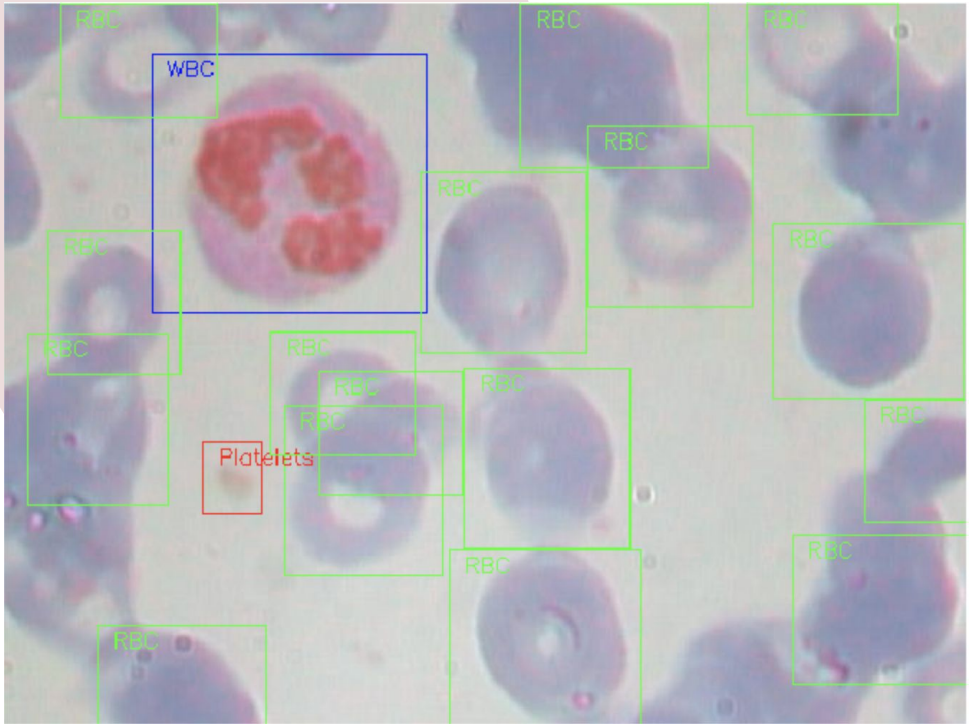
- Developed automated tool for blood cell classification from images
- Classified 4 types of cells
- 85% accuracy
- First step to a bigger problem:
  In practice important to detect and count white blood cells

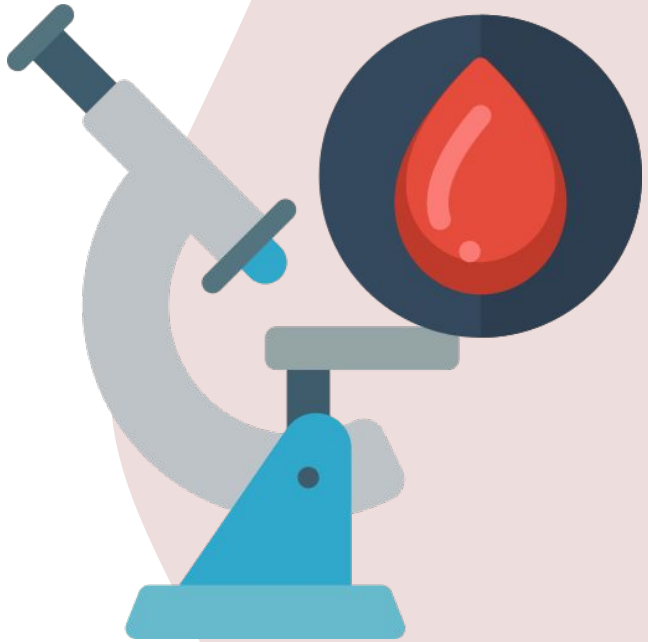


# 06

# Outlook

# Outlook: Object Detection



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

# Thank you.

falbrechtg@gmail.com

https://github.com/froukje/

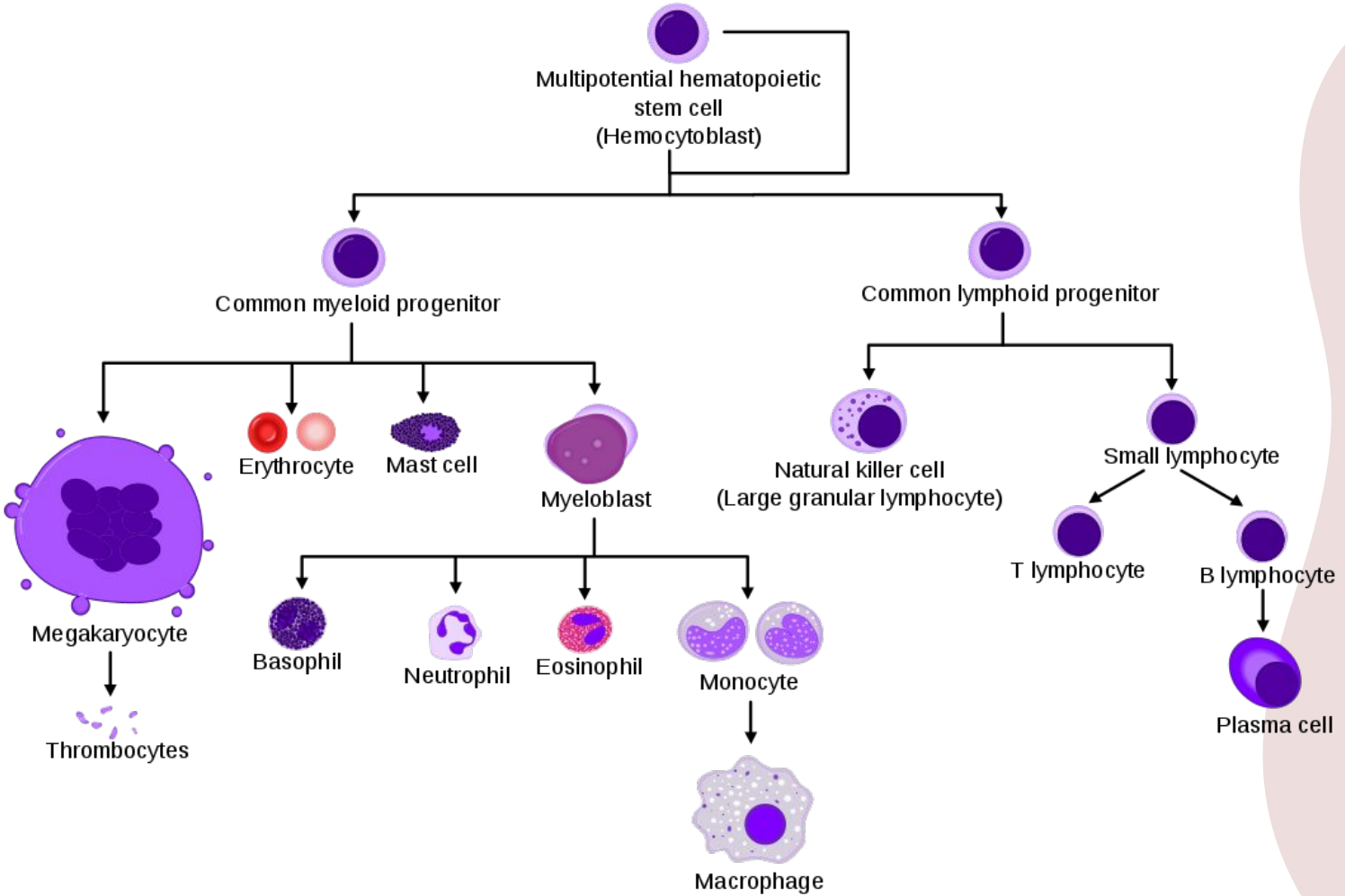
CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.

# 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

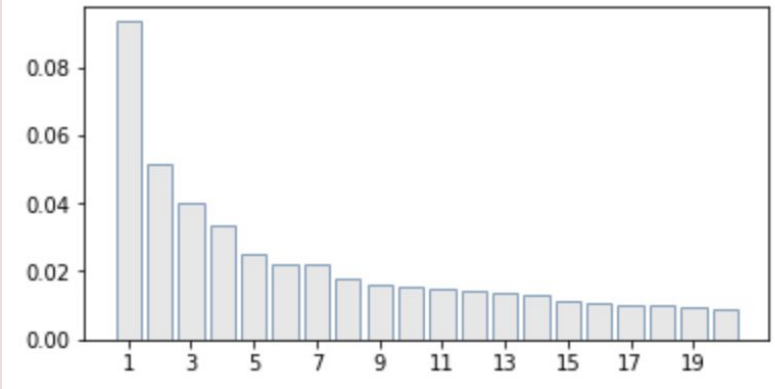
| Category | Type | Size | % |
|---|---|---|---|
| Eosinophil | granulocyte/ myeloid | 12–17μm | 1 - 3% |
| Neutrophil | granulocyte/ myeloid | 12–15μm | 60 - 70% |
| Lymphocyte | mononuclear leukocyte (agranulocyte)/ lymphoid | 6-10μm | 25 - 40% |
| Monocyte | mononuclear leukocyte (agranulocyte)/ myeloid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



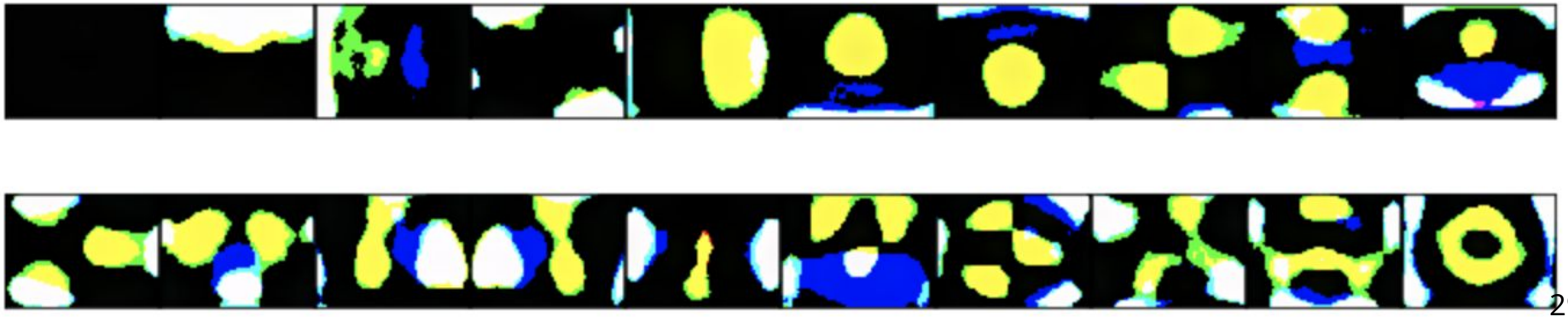
# Principal Component Analysis

# Principal Component Analysis

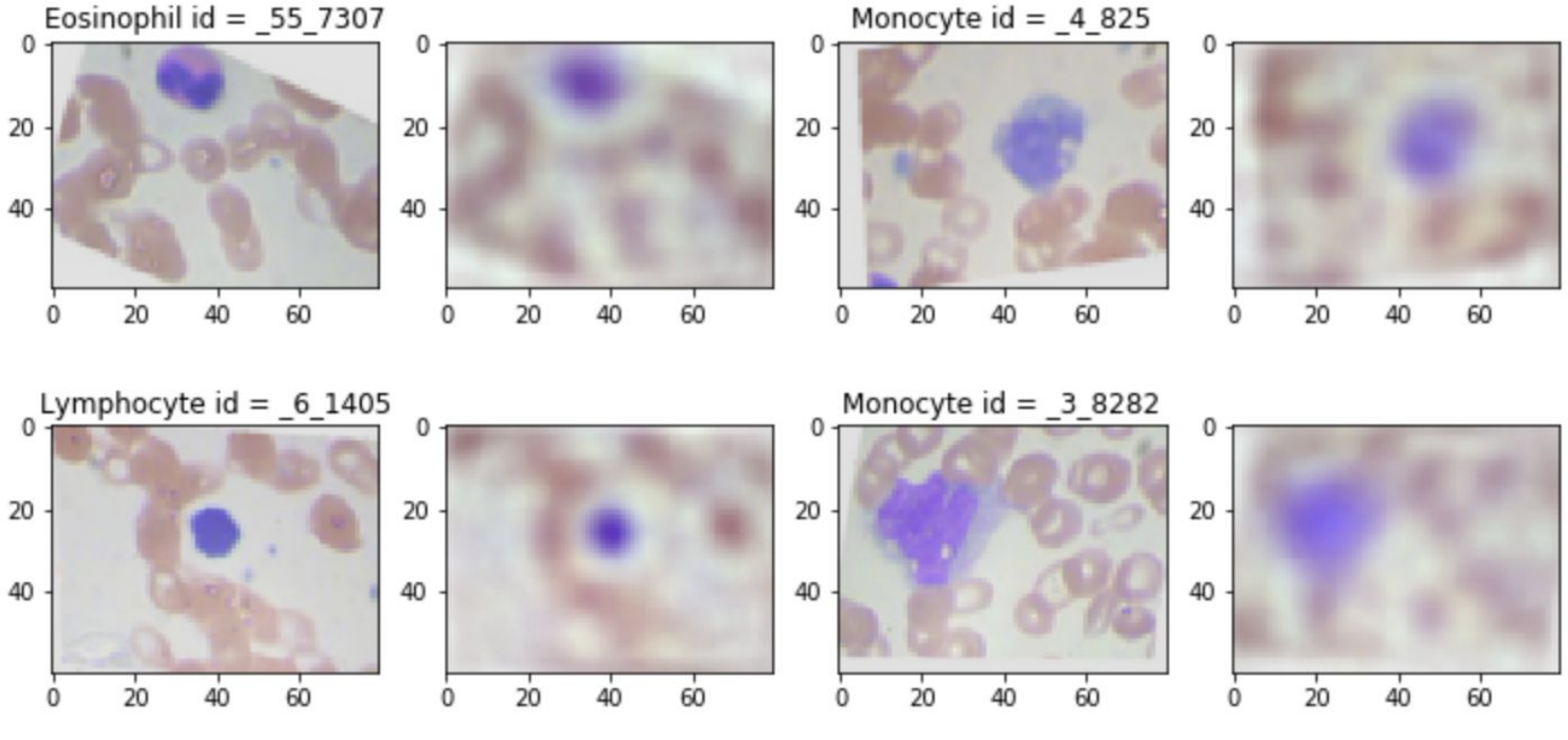
Explained Variance



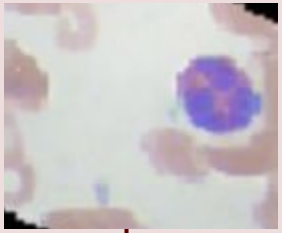

Eigenvectors

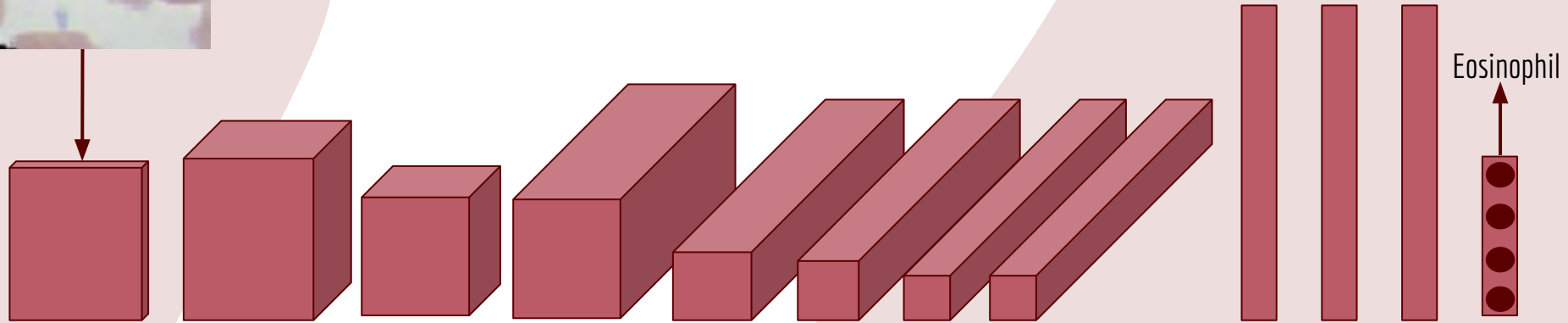


# Principal Component Analysis



# Convolutional Neural Network



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