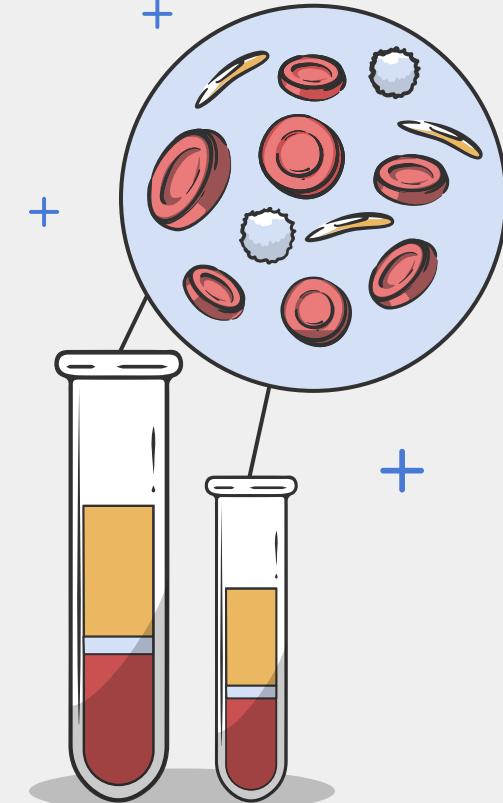
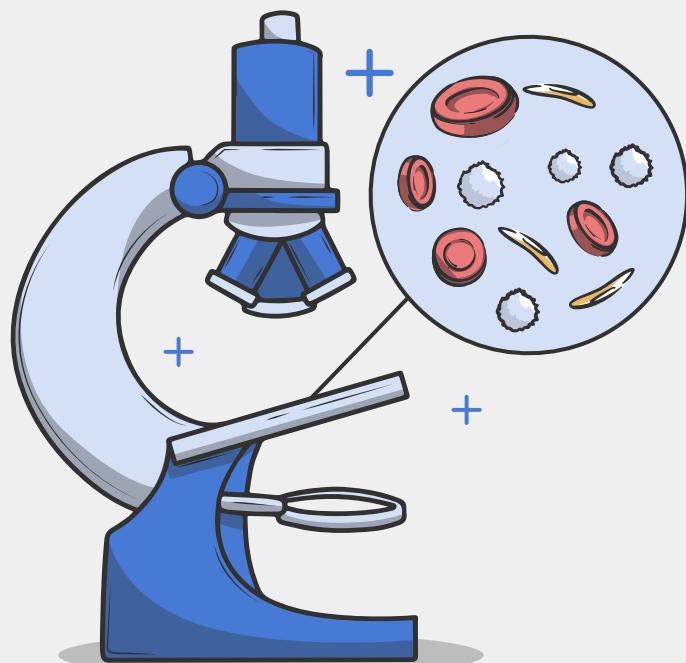


Blood Cell Detection

Machine learning in medicine





Group members

Phạm Xuân Trung - BI12-458

Nguyễn Anh Quân - BI12- 365

Hoàng Hà Đăng - BI12-077

Phùng Đức Thái - BI12-396

Hứa Hải Minh - BI12-272

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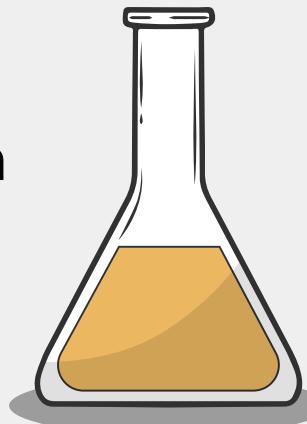
Evaluation

06

Results

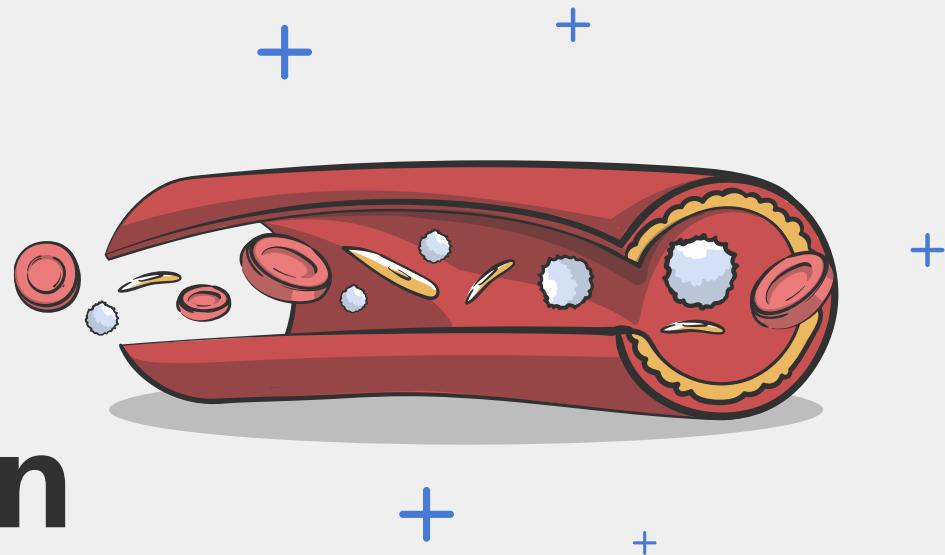
07

Conclusion



01

Introduction



Introduction

Blood cells: crucial components of the circulatory system

Blood cell detection is essential for diseases diagnosing, treatment monitoring, and medical researching

Blood cell samples are collected through advanced imaging techniques, then we perform detecting and classifying the cell types



Main types of blood cells



Red cells

Red blood cells contain a protein called hemoglobin, which carries oxygen from the lungs to all parts of the body



White cells

White blood cells are part of the body's immune system. They help the body fight infection and other diseases



Platelets

Platelets are pieces of very large cells in the bone marrow called megakaryocytes. They help form blood clots to slow or stop bleeding and to help wounds heal



Objective

- Develop and evaluate the performance of deep learning models for blood cell detection.
- Compare the effectiveness of YOLO v8, Detectron2, and RetinaNet models in accurately identifying blood cells in images.
- Assess the suitability of these models for potential applications in medical diagnostics and biomedical research.



02

Dataset



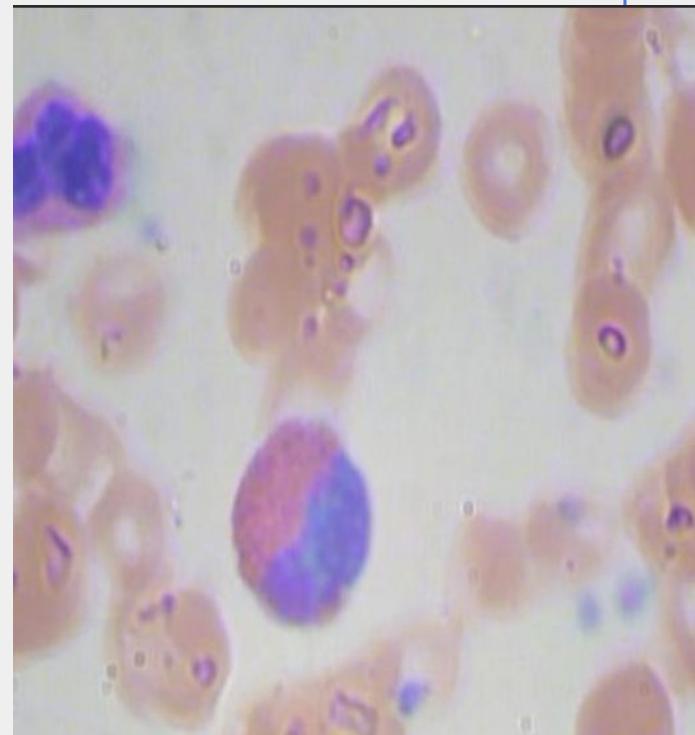
Blood cell detection datasets

Consists of 874 blood cells images across three classes: WBC (white blood cells), RBC (red blood cells), and Platelets. There are 4888 labels across 3 classes. The resolution of each images are 416 x 416.

Splitted into training, testing and validation datasets

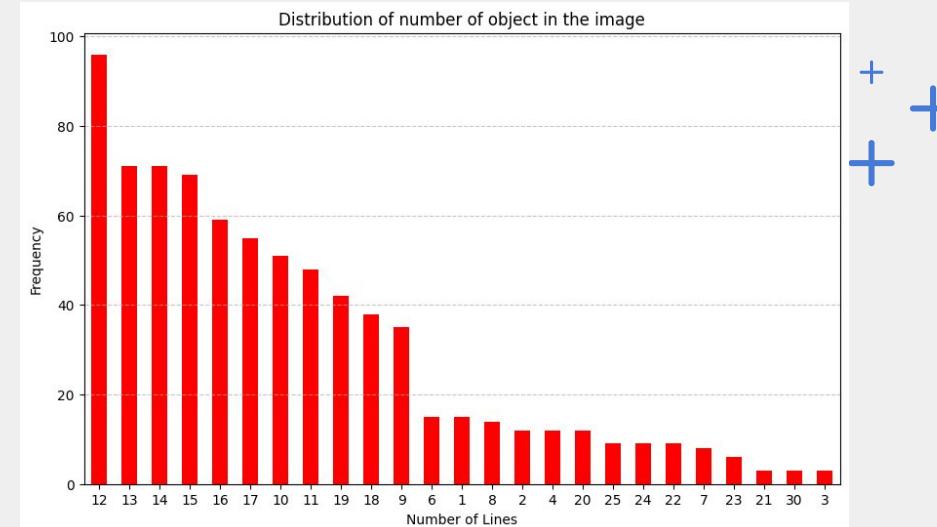
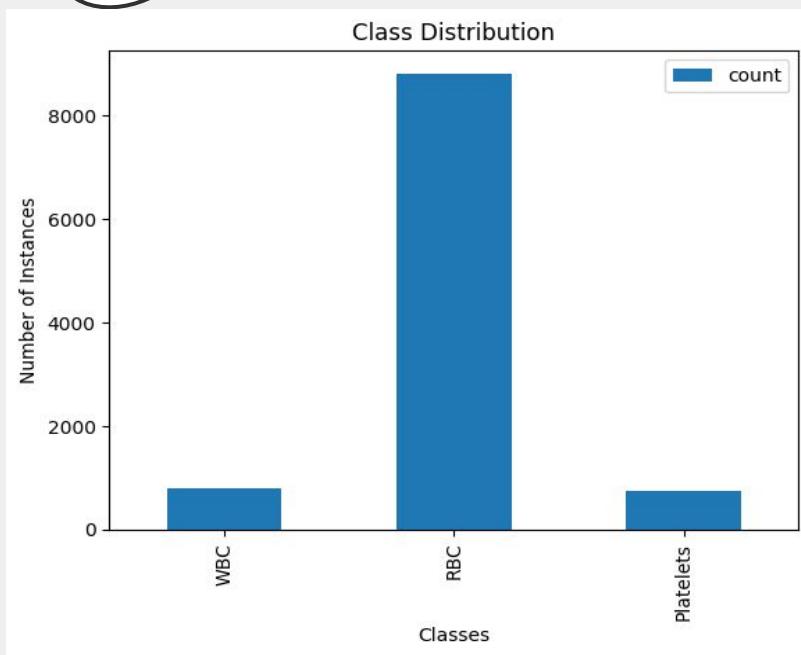
- + 87% training
- + 9% validation
- + 4% testing

The training, testing and validation are further classified as IMAGES AND LABELS.



+

+



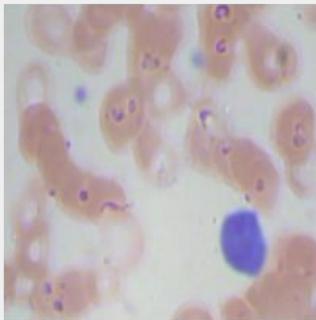
03

Data Preprocessing



Image Resizing

Original Image
Shape: (416, 416)



Resized Image (256x256)
Shape: (256, 256)

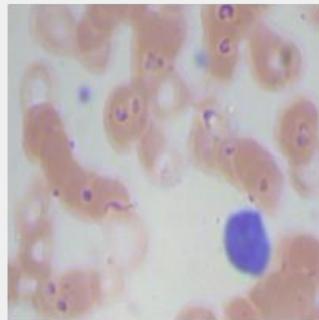
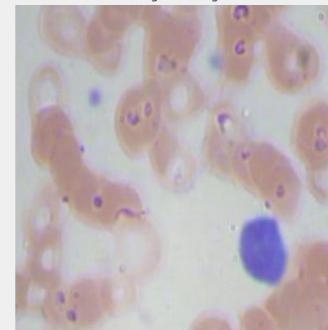
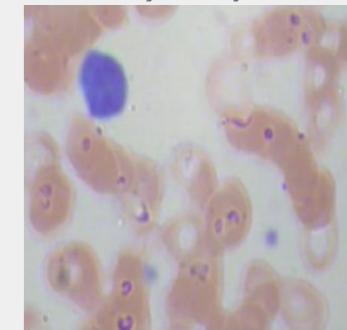


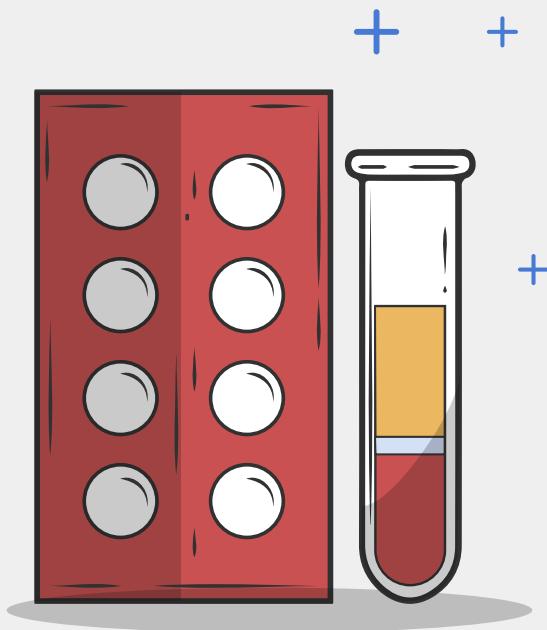
Image Augmentation

Original Image



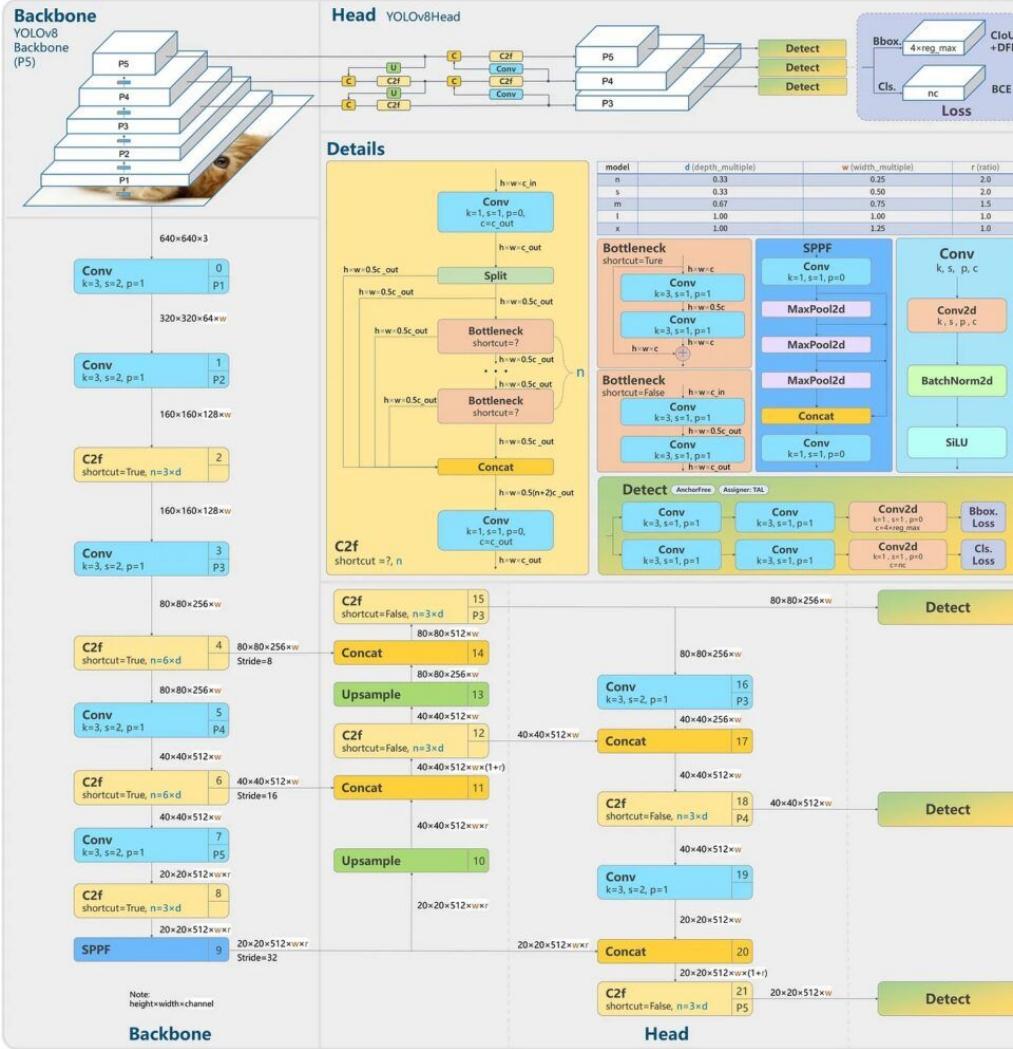
Augmented Image





04

Model Architecture



Yolo v8

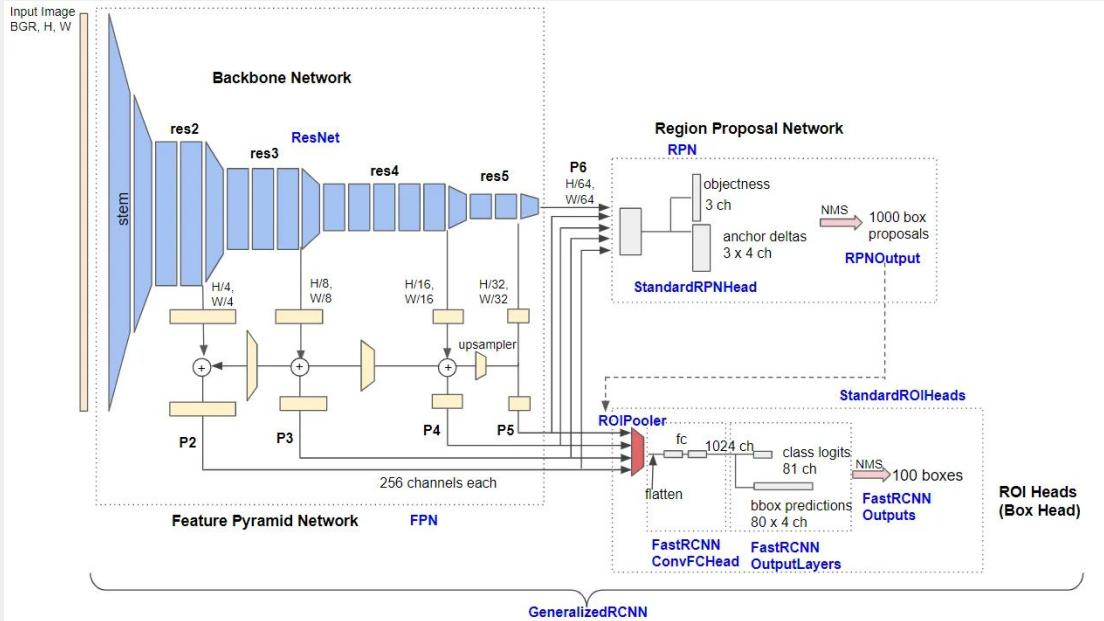
Input size: 416 x 416

Output size: 416 x 416

Number of layers: 268 layers

Number of parameters:
68126457 parameters

Detectron2



Input size: 256 x 256
Output size: 256 x 256
Number of layers: 83 layers
Number of parameters:
41699936 parameters

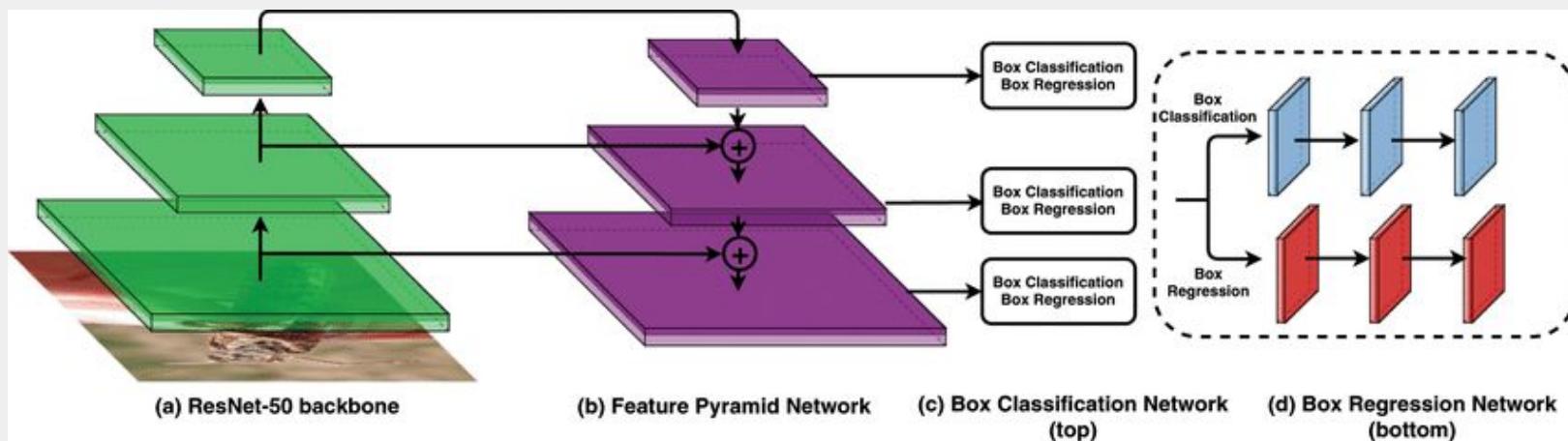
Retinanet

Input size: 640 x 640

Output size: 640 x 640

Number of layers: 160

Number of parameters: 36,394,120



Evaluation Metrics

Precision

$$Precision = \frac{TP}{TP + FP}$$

Recall

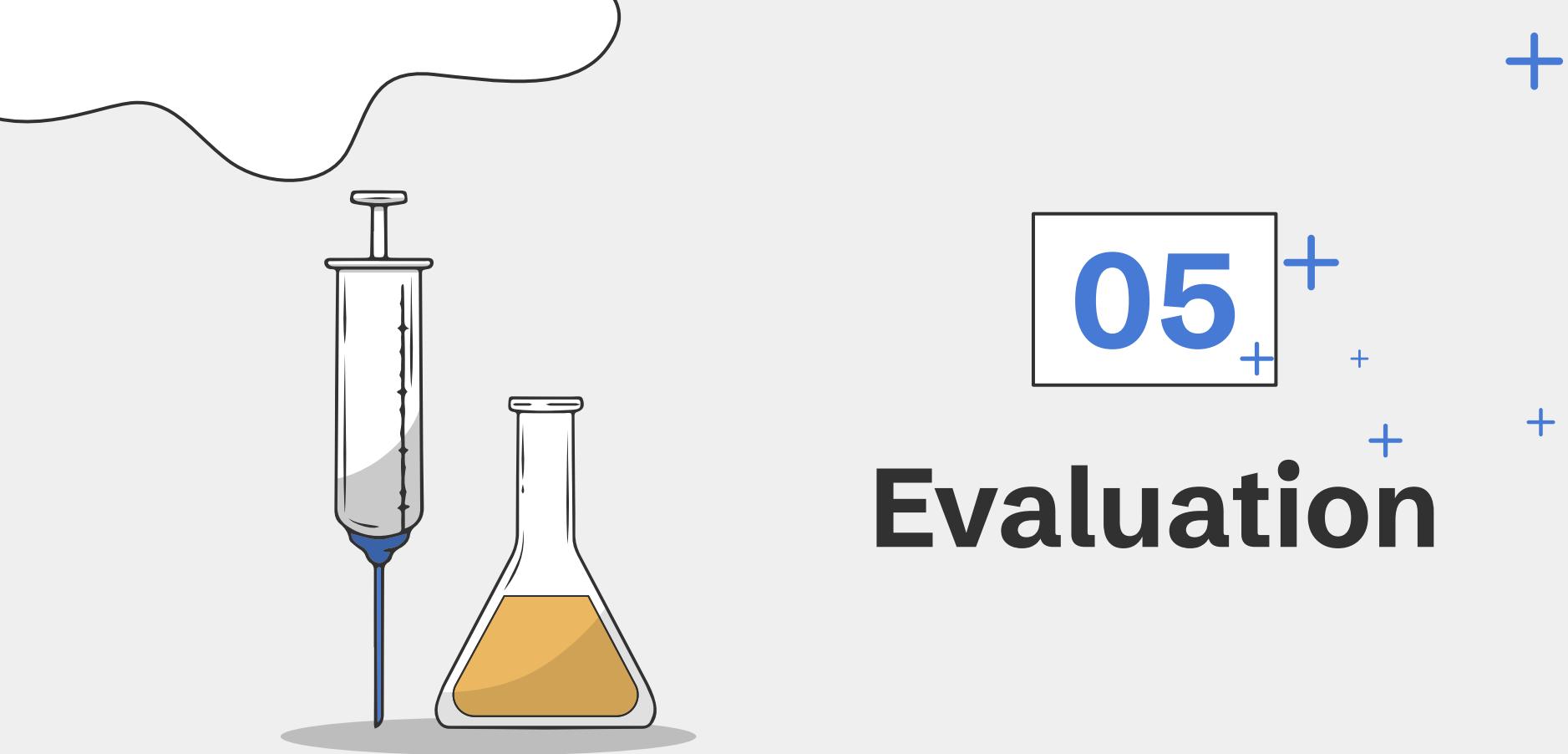
$$Recall = \frac{TP}{TP + FN}$$

Mean Average Precision

$$mAP = \frac{1}{n} \sum_{k=1}^{k=n} AP_k$$

$AP_k = \text{the AP of class } k$

$n = \text{the number of classes}$

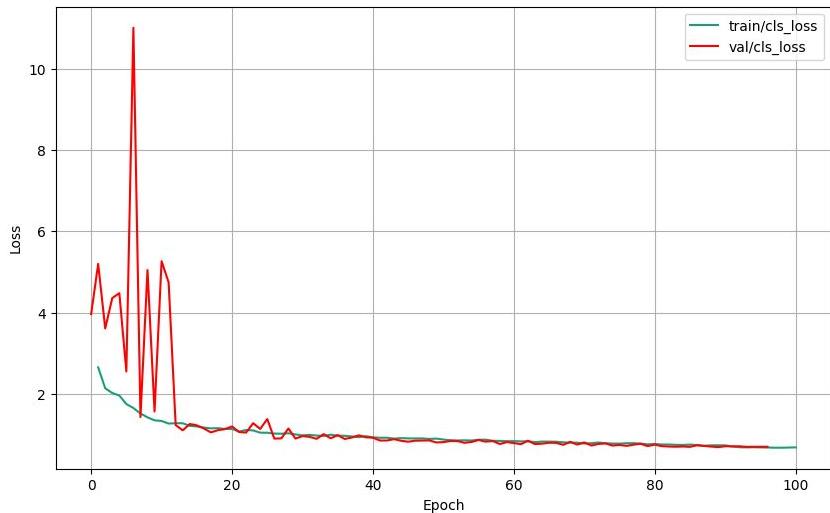


05

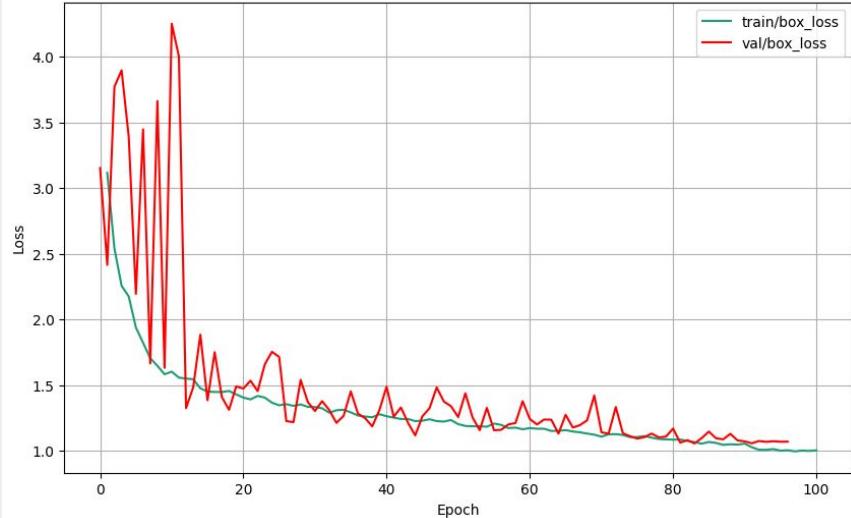
Evaluation

Yolo v8

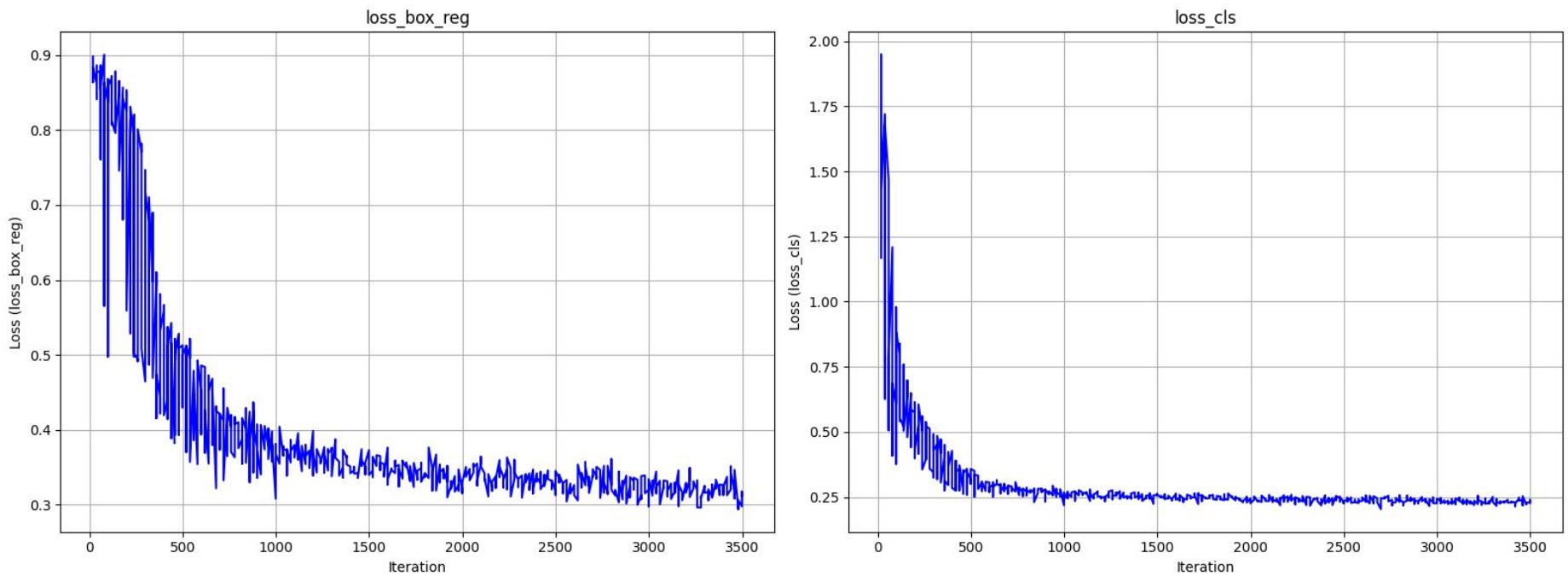
Train and Validation Classification Loss



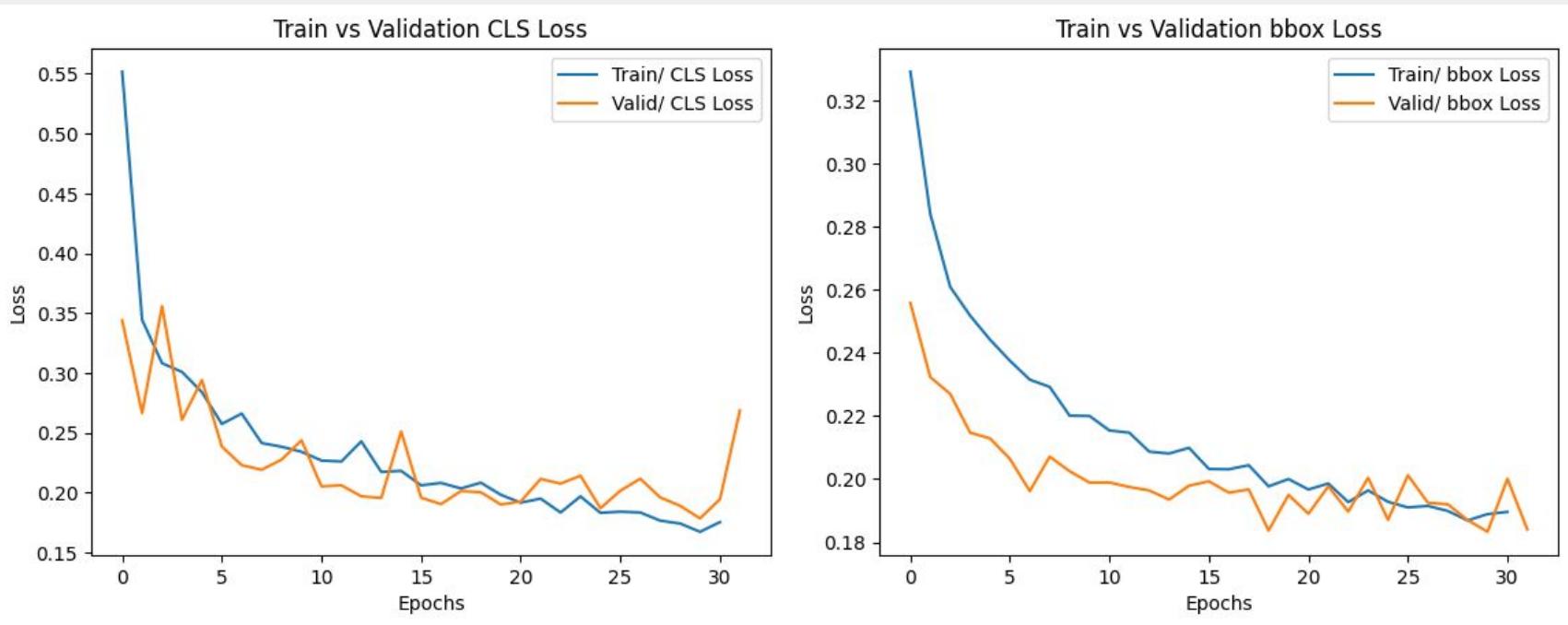
Train and Validation Box Loss



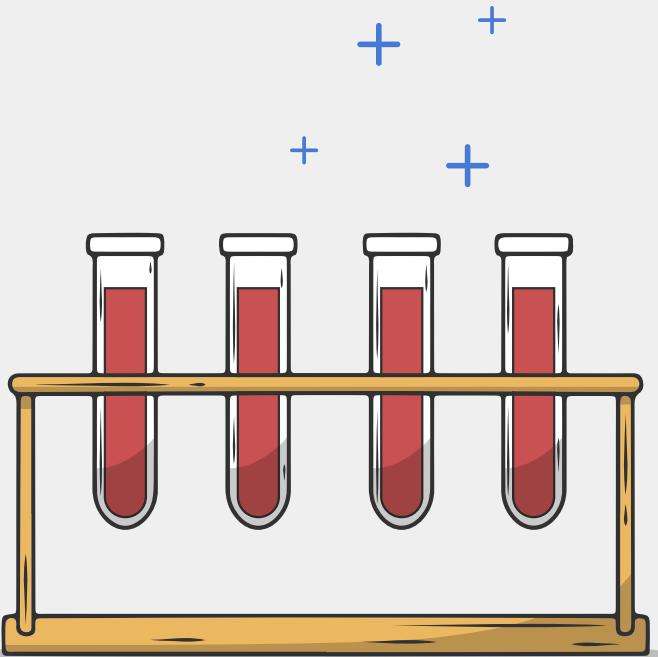
Detectron2



Retinanet



Models	Evaluation metrics		
	mAP	Recall	Precision
Yolo V8	0.631	0.879	0.85
Detectron 2	0.555	0.641	0.899
Retinanet	0.83	0.941	0.953



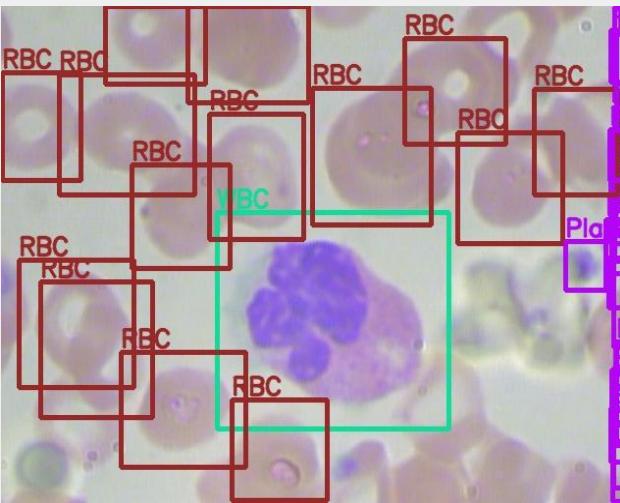
06

Results

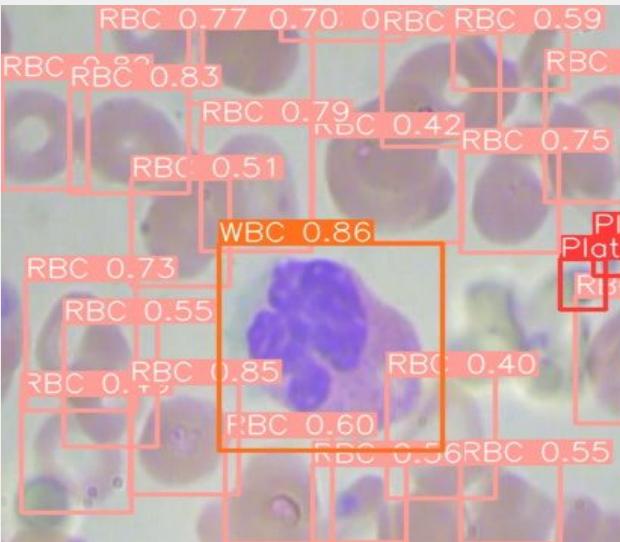
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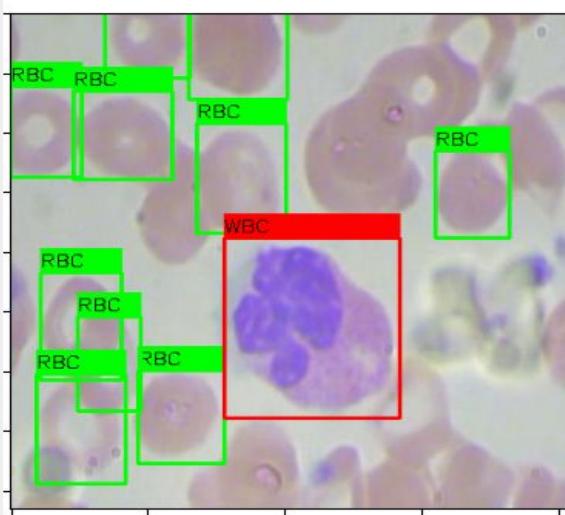
Retinanet



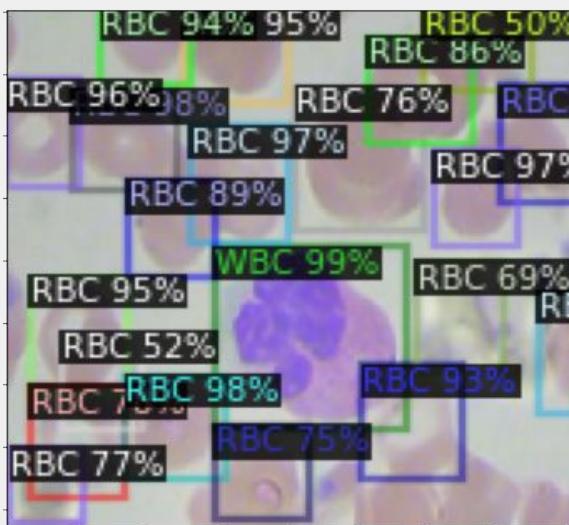
Yolo v8

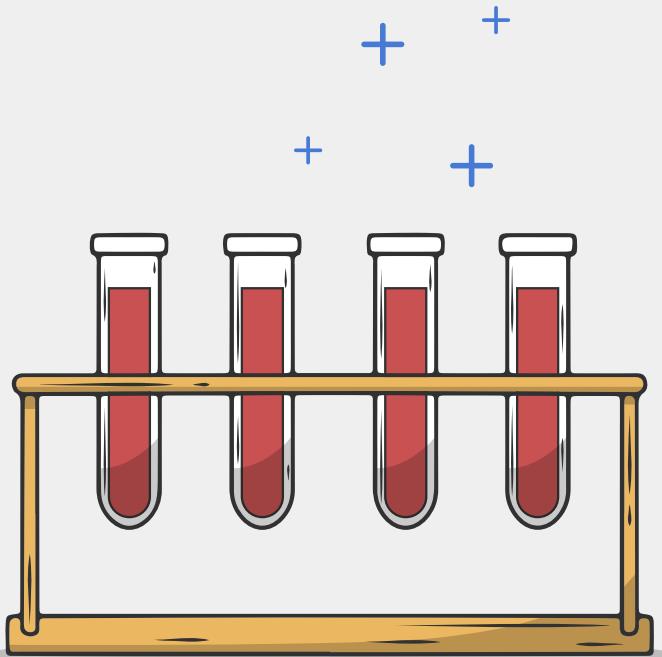


Ground
Truth



Detectron2





07

Conclusion

- Study on blood cell detection, employing YOLO v8, Detectron2, and RetinaNet models, demonstrates promising results.
- Identified these models' effectiveness in detecting blood cells within images.
- Improved efficiency and accuracy in blood cell analysis, with potential applications in medical diagnostics and biomedical research.





Limitations

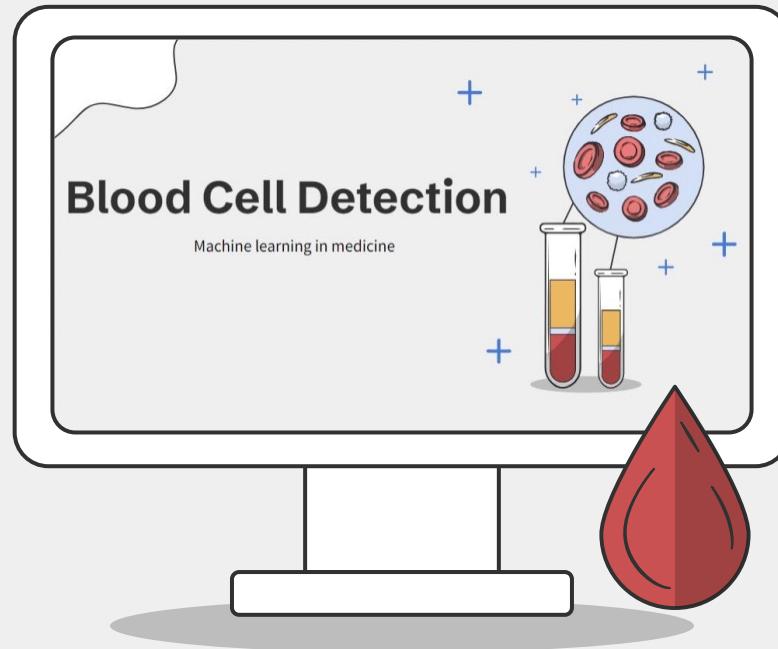
- Lack of computational resources
- Limited Dataset Availability
- Validation Challenges
- High Training Time

Future work



- Model Optimization
- Transfer Learning
- Clinical Validation
- Calculational Process Optimization

Thank you for listening

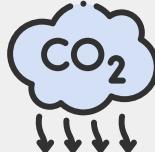


What do red blood cells do?



**Transport
oxygen**

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon



**Remove
carbon dioxide**

Venus has a beautiful name and is the second planet from the Sun. It's hot and has a poisonous atmosphere



Functions of white blood cells



Fight infections

Mercury is the closest planet to the Sun and the smallest of them all



Foreign particles

Earth is the third planet from the Sun and has life



Provide immunity

Venus has a beautiful name, but also high temperatures



Immune responses

Jupiter is a gas giant and has around eighty moons



All blood cells provide the following



Oxygenation

Despite being red, Mars is actually a cold place



Recycling

Mercury is the closest planet to the Sun



Defense

Venus is the second planet from the Sun



Healing

Saturn is a gas giant with several rings



Differentiation

Neptune is the farthest planet from the Sun



Regeneration

Jupiter is the biggest planet of them all

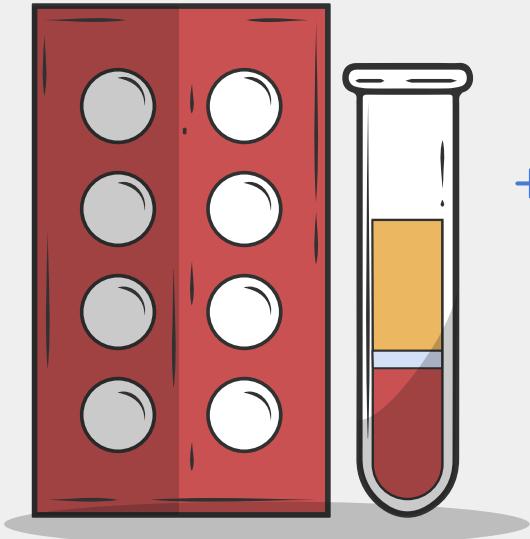
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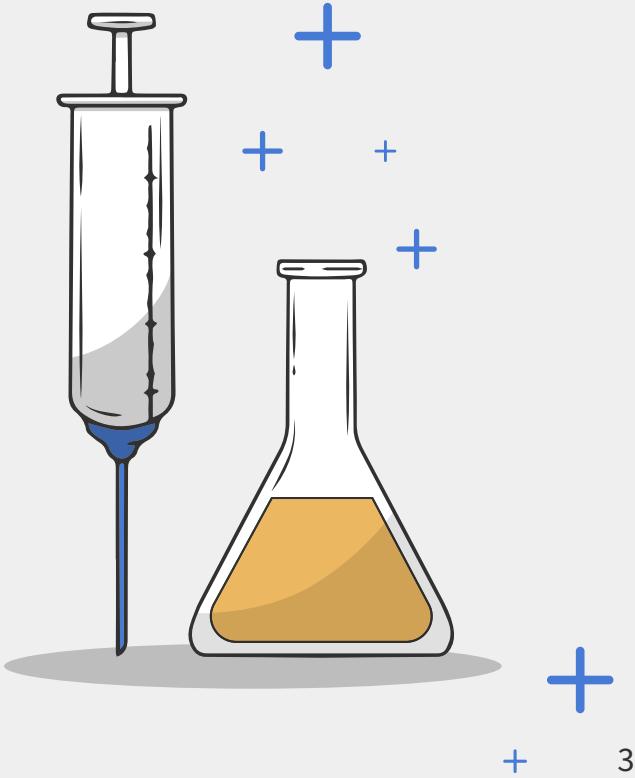
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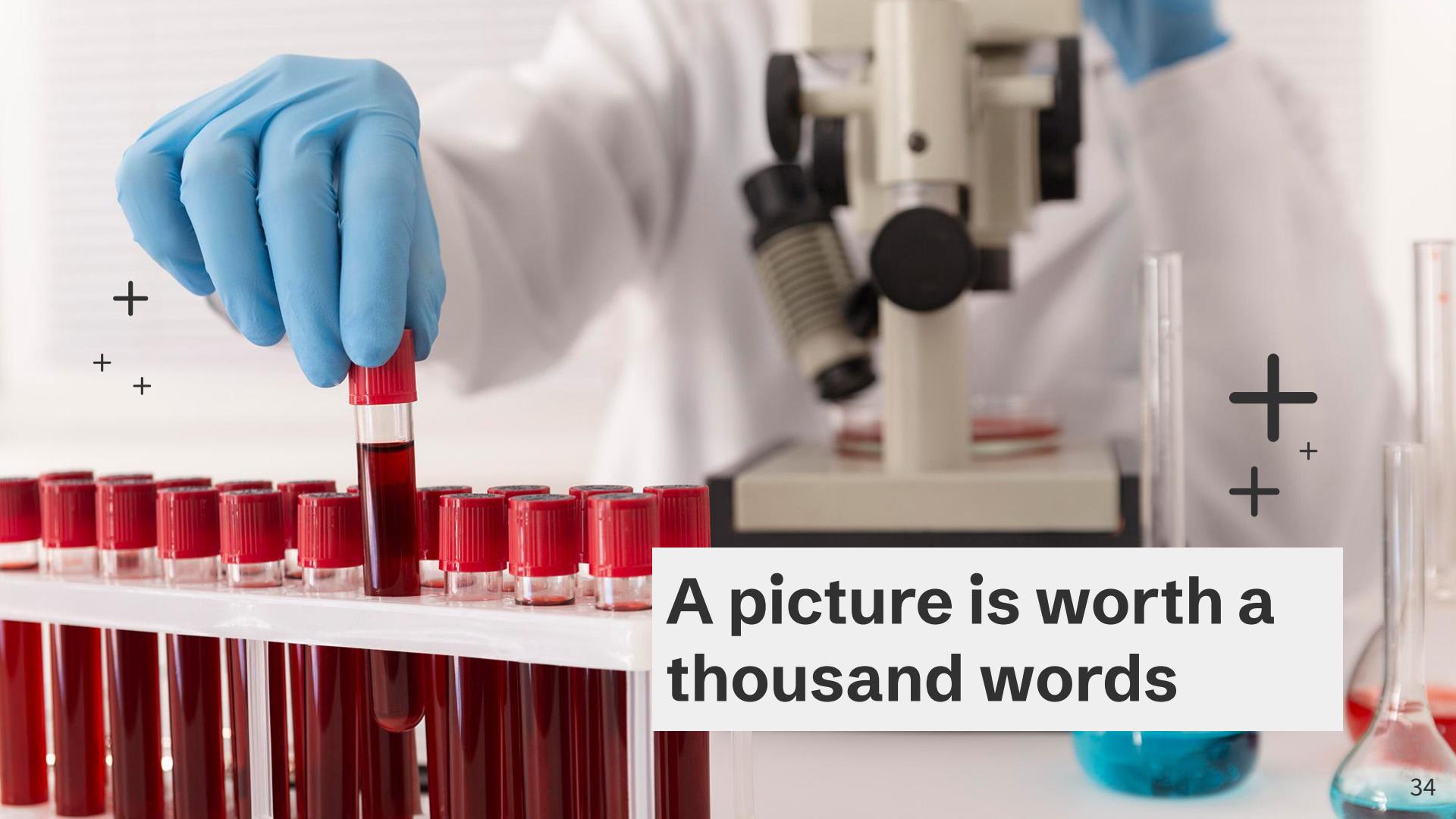
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Awesome words



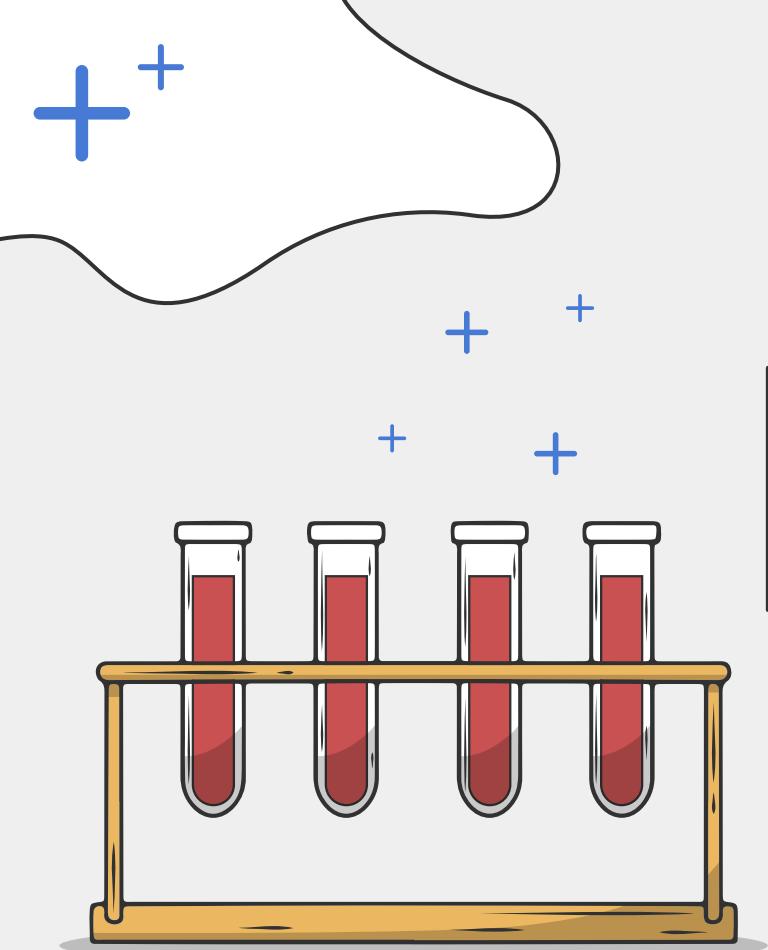


A picture is worth a thousand words

A picture always reinforces the concept

Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it





98,300,000

Big numbers catch your audience's attention

9h 55m 23s

Jupiter's rotation period

333,000

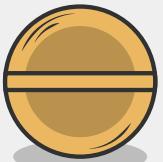
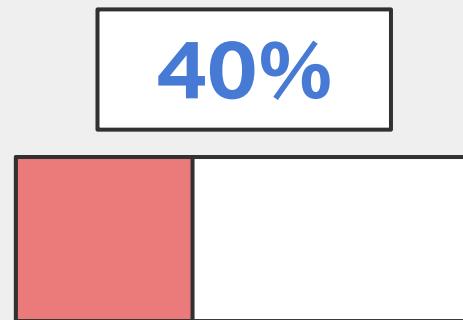
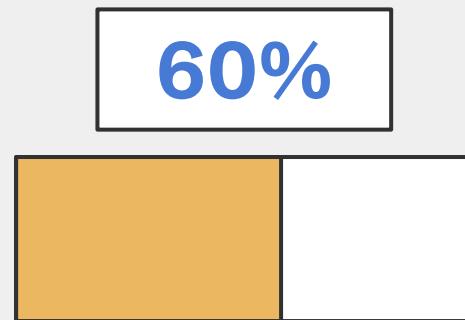
The Sun's mass compared to Earth's

386,000 km

Distance between Earth and the Moon



Hematocrit composition

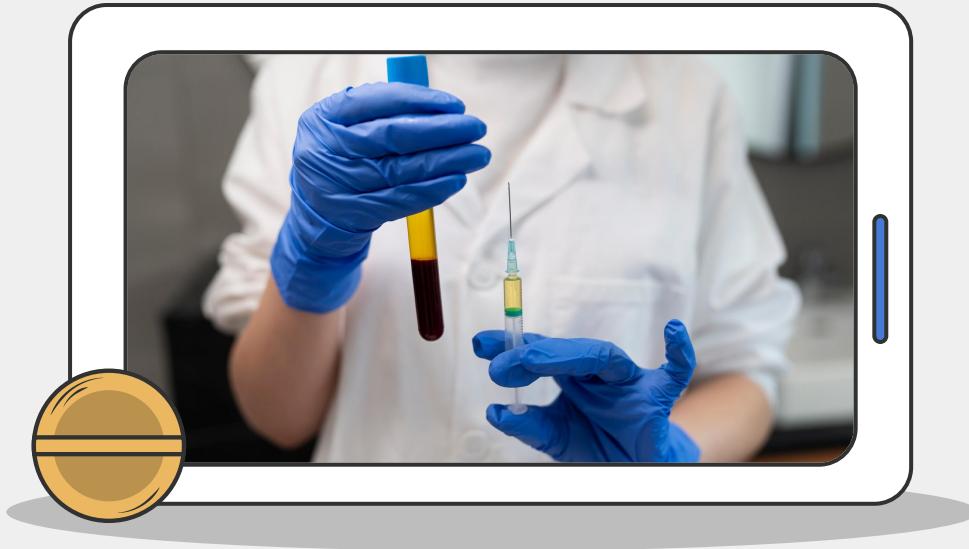


Mercury is the closest planet to the Sun and the smallest of them all

Venus has a beautiful name and is the second planet from the Sun

Tablet mockup

You can replace the image on the screen with your own work. Just right-click on it and select “Replace image”





40

Highest levels of blood donation

+

+

Austria

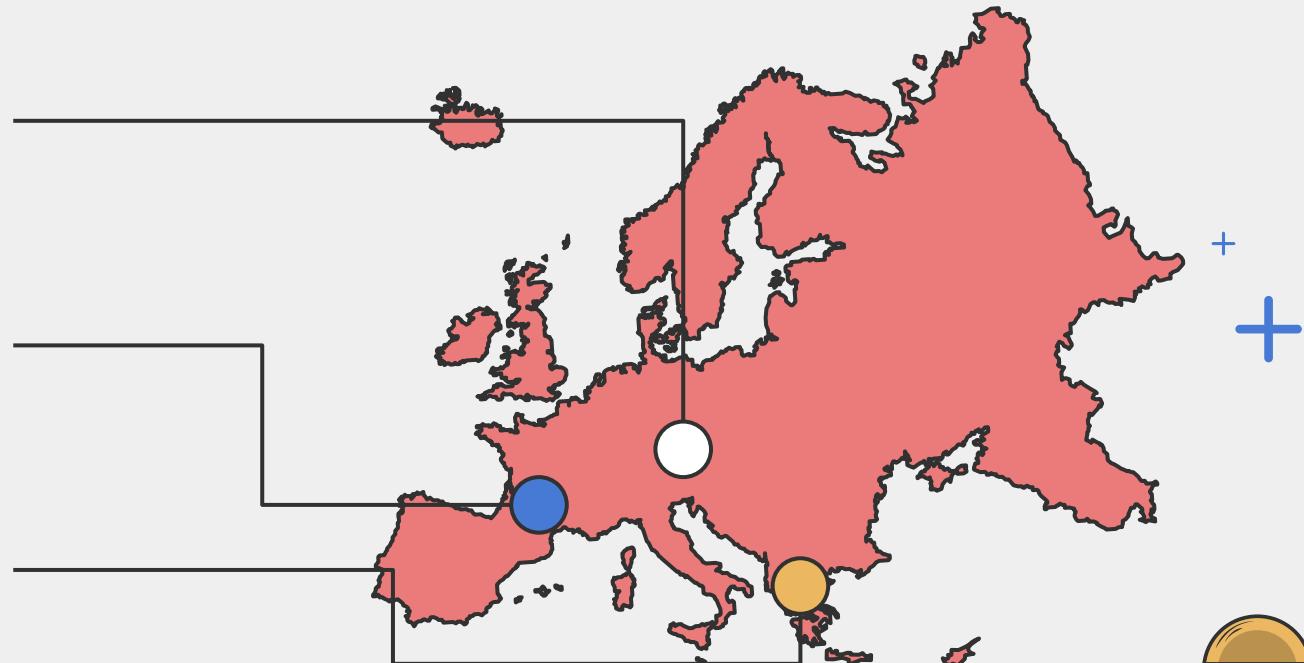
Mercury is the closest planet to the Sun

France

Earth is the only planet known to harbor life

Greece

Venus is extremely hot, even more than Mercury



History of blood cell discovery

Venus is the second planet from the Sun

Blood cells

1700

1600

Microscope

Earth is the only planet known to harbor life

Despite being red, Mars is actually a cold place

Classification

1901

1842

Transfusion

Mercury is the closest planet to the Sun

1937

Blood bank

Jupiter is the biggest planet of them all

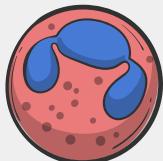


White blood cells types

White cells

Neutrophil

Venus is the second planet from the Sun



Basophil

Mercury is the closest planet to the Sun



Eosinophil

Earth is the only planet known to harbor life



Lymphocyte

Jupiter is the biggest planet of them all



Monocyte

Saturn was named after a Roman god



Discovery timeline game!

Teach your students about the **history of blood cell discoveries and their significant milestones** through a very useful timeline activity

- 01** Divide students into small groups and provide each group with a large sheet of paper or a whiteboard
- 02** Instruct the groups to create a timeline of blood cell discoveries, starting from early discoveries to recent advancements
- 03** Once the timelines are complete, ask each group to present their timelines to the class, explaining the significance of each discovery



Red blood cell compatibility



Recipient	O-	O+	A-	A+	B-	B+	AB-	AB+
O-	Yes	No						
O+	Yes	Yes	No	No	No	No	No	No
A-	Yes	No	Yes	No	No	No	No	No
A+	Yes	Yes	Yes	Yes	No	No	No	No
B-	Yes	No	No	No	Yes	No	No	No
B+	Yes	Yes	No	No	Yes	Yes	No	No
AB-	Yes	No	Yes	No	Yes	No	Yes	No
AB+	Yes							

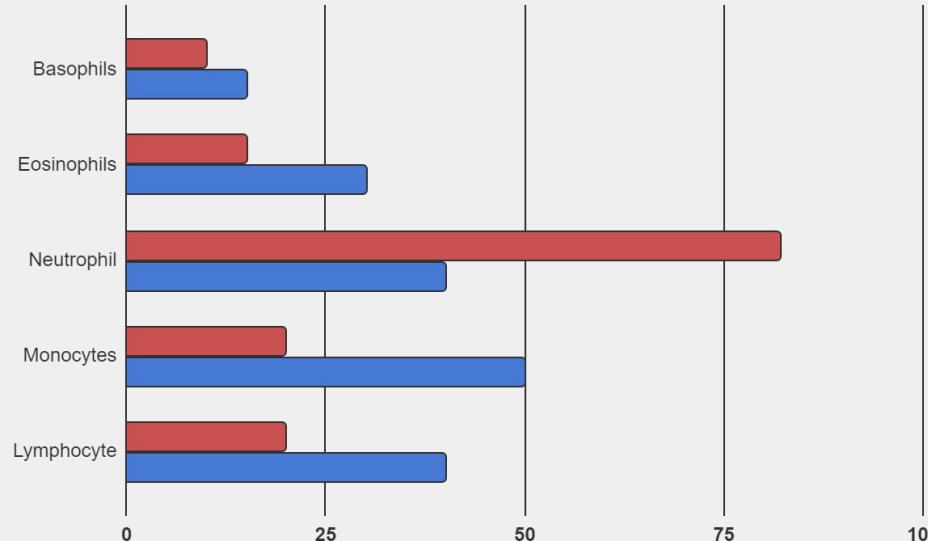
White blood cell distribution

Maximum

Mercury is the closest planet to the Sun

Minimum

Jupiter is the biggest planet of them all



Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)

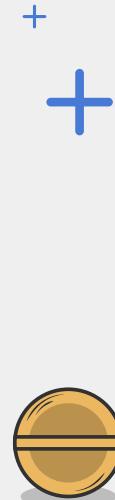
True or false: White blood cells

+

+

According to what you have read, **indicate if the following statements are true or false and justify your answer**

Statement	True or false
White blood cells are responsible for fighting against infections and foreign invaders in the body	True. White blood cells, help defend the body against infections by identifying and neutralizing pathogens, producing antibodies, etc
White blood cells are only found in the bloodstream and are not present in other tissues or organs of the body	Write your own answer...
There is only one type of white blood cell, and they all have the same function in fighting infections	Write your own answer...



Techniques for blood separation



Centrifugation

Mercury is the closest planet to the Sun and the smallest of them all



Filtration

Venus has a beautiful name and is the second planet from the Sun



Apheresis

Jupiter is a gas giant and the biggest planet in the Solar System



What about the immune system?



◦ Pathogen recognition

The immune system can recognize and identify various types of pathogens

◦ Inflammation response

Triggers an inflammatory response to isolate and remove pathogens or damaged tissues

◦ Autoimmune regulation

The immune system maintains self-tolerance, distinguishing between self and non-self



Complete this text!

+
+

Students must read the following text carefully and complete the missing words in the brackets. To do so, **they should drag and drop the words below**

Blood cells

Bleeding

Anemia

Immune system

+

+

Abnormalities in (_____) can lead to various health conditions.

(_____), caused by low red blood cell count or inadequate hemoglobin, results in fatigue and reduced oxygen supply. Disorders affecting white blood cells weaken the

(_____), making individuals more susceptible to infections. Platelet disorders can cause abnormal (_____) and impaired clotting



+

Our team



Mark Jones

You can speak a bit about this person here

+

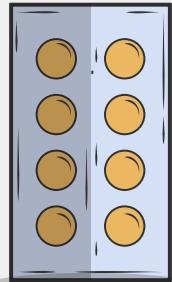


Kaliyah Harris

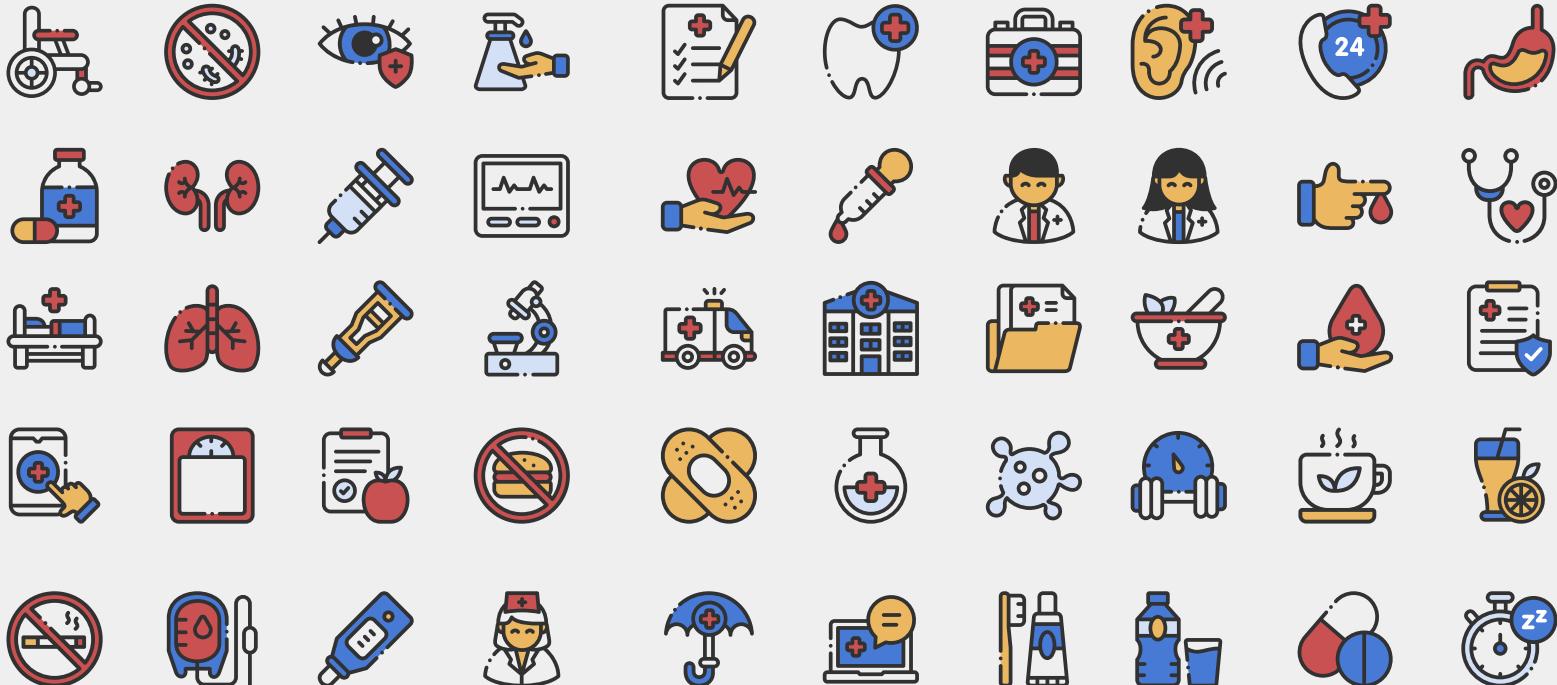
You can speak a bit about this person here

+

+



Icon pack

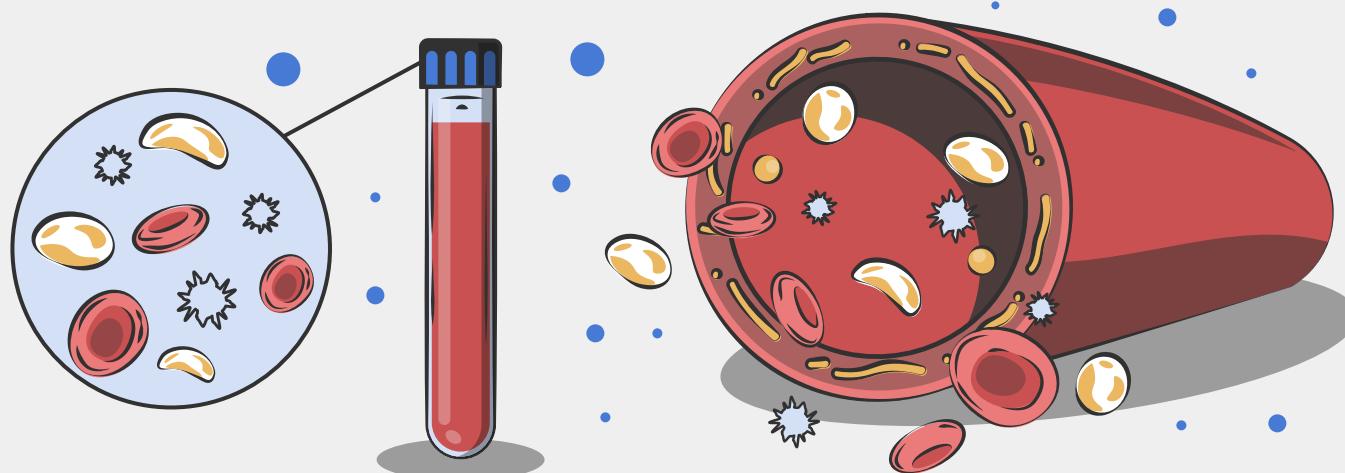


Alternative resources

Here's an assortment of alternative resources whose style fits the one of this template:

Vectors

- + [Composition of blood infographic](#)
- + [Flat design blood infographic](#)



Resources

Did you like the resources on this template? Get them for free at our other websites:

Vectors

- + [Blood infographic in hand drawn](#)
- + [Hand drawn blood infographic](#)
- + [Hand-drawn science lab theme](#)
- + [Medicine elements background](#)
- + [Flat european map with blue background](#)

Icons

- + [Icon Pack: Health | Lineal color](#)
- + [Co2 Emission free icon](#)
- + [O2 free icon](#)

Photos

- + [Coronavirus blood samples arrangement in lab](#)
- + [Doctor holding syringe and prp vial](#)
- + [Doctor holding vial for prp treatment front view](#)
- + [Front view smiley woman looking at injection](#)
- + [Portrait of bearded man holding documents](#)
- + [Portrait of smiley businesswoman sitting](#)

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#ffffff

#d4e0f6

#ebb861

#eb7a7a

#ca5151

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Create your Story with our illustrated concepts. Choose the style you like the most, edit its colors, pick the background and layers you want to show and bring them to life with the animator panel! It will boost your presentation. Check out [how it works](#).



Pana



Amico



Bro



Rafiki

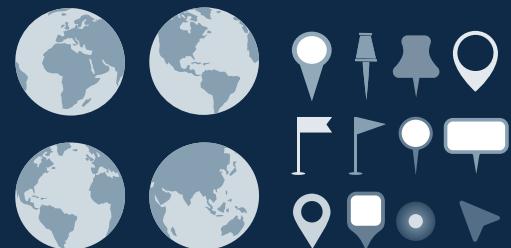


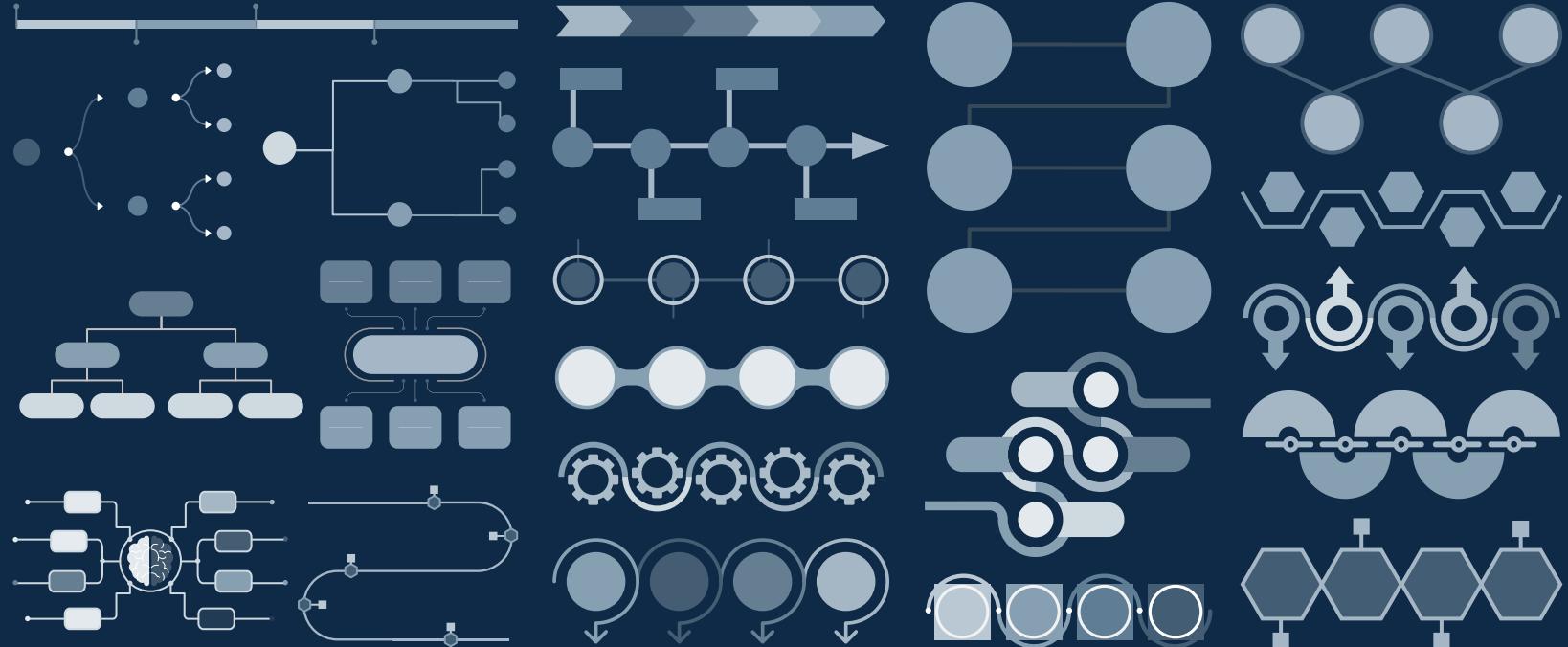
Cuate

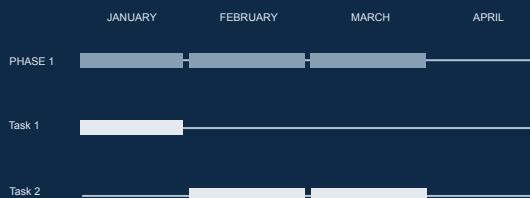
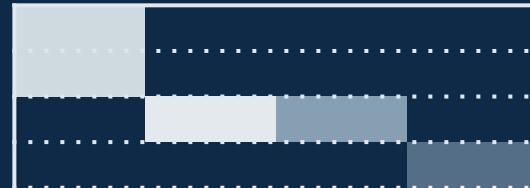
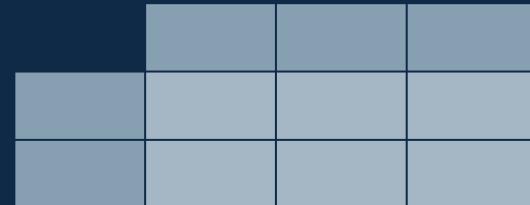
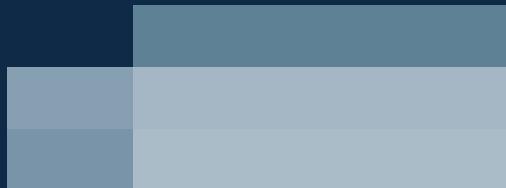
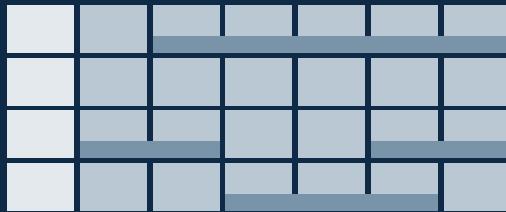
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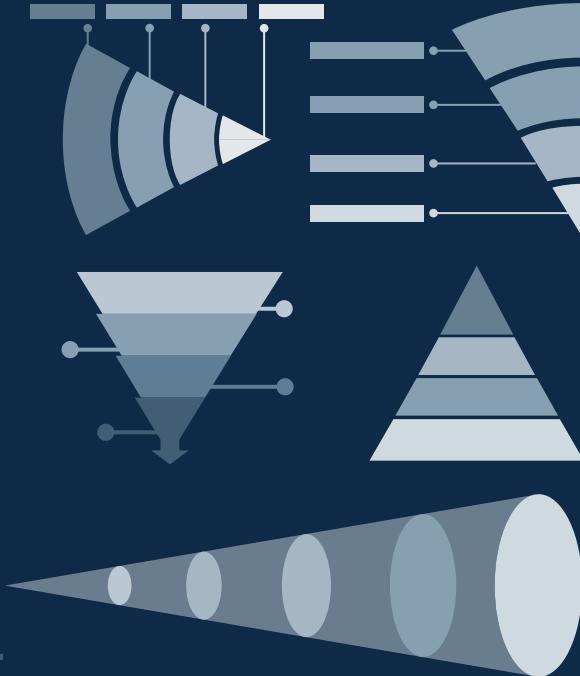
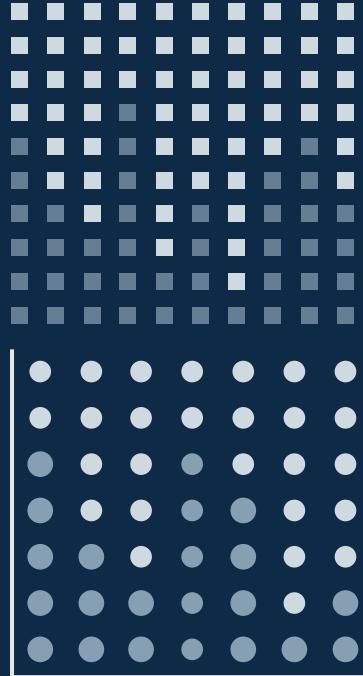












...and our sets of editable icons

You can **resize** these icons without losing quality.

You can **change the stroke and fill color**; just select the icon and click on the **paint bucket/pen**.

In Google Slides, you can also use **Flaticon's extension**, allowing you to customize and add even more icons.



Educational Icons



Medical Icons



Business Icons



Teamwork Icons



Help & Support Icons



Avatar Icons



Creative Process Icons



Performing Arts Icons



Nature Icons



SEO & Marketing Icons



