

# Visión por computadora 2

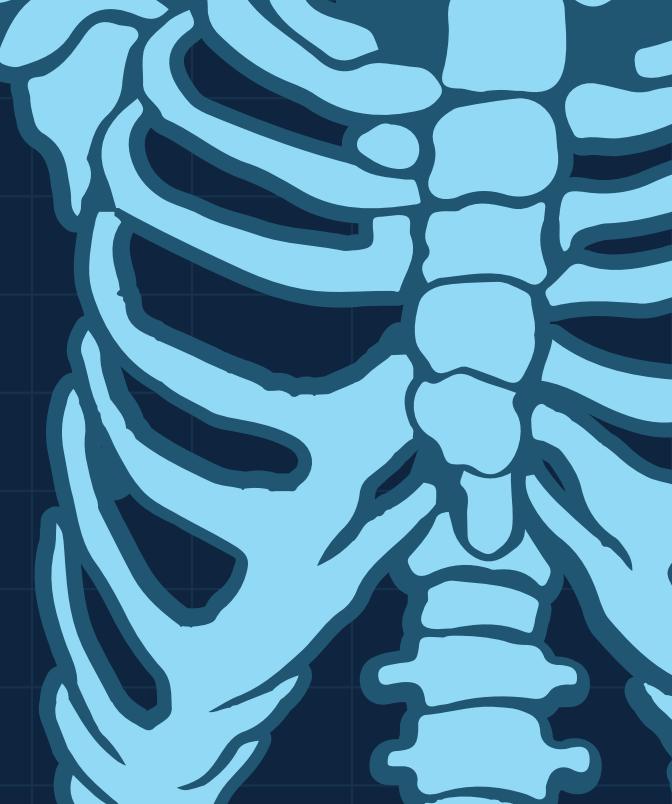
Grupo:

- Avalos Ribas, Gonzalo
- Silva, Victor David

Docentes:

- Juan Ignacio Cavalieri
- Juan Ignacio Cornet
- Seyed Pakdaman

10cm





# Descripción del problema

Las ciencias médicas cada vez se ven más complementadas por la IA.

El impacto del uso de IA comprende un aumento de la precisión, reducción de errores, eficiencia en el diagnóstico, sin dejar de lado la experiencia del profesional médico.

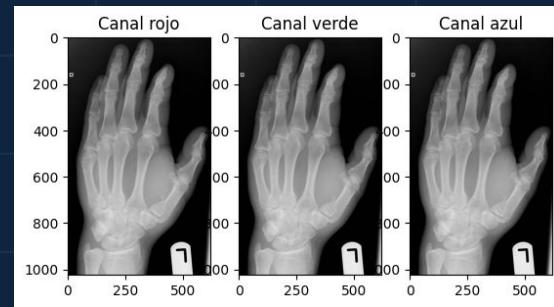
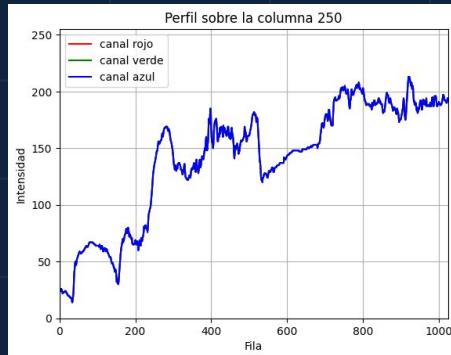
Por esto nuestro dataset consiste en radiografías de distintas partes del cuerpo y se quiere detectar si hay una fractura o no en la misma.

Dataset “Bone Fracture Multi-Region X-ray” (kaggle)

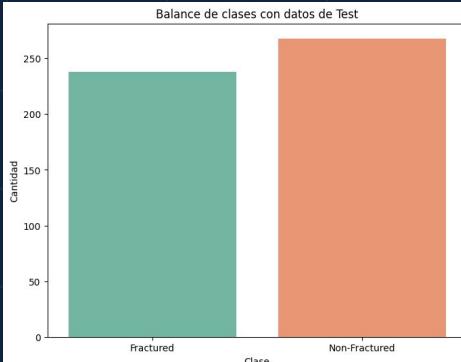
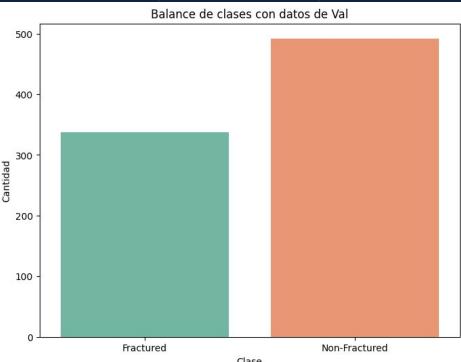
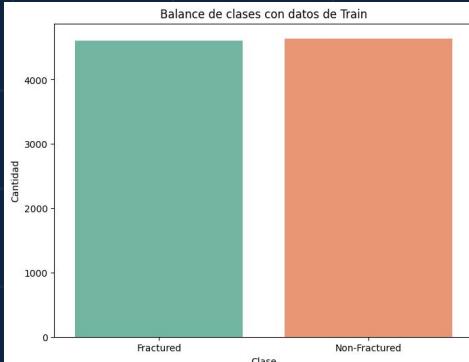
# Análisis exploratorio de los datos



Tamaño imagen: (1024, 617, 3)  
La imagen tiene 3 canales.



## Balance de clases



Imágenes:

- 9246 train.
- 829 val.
- 506 test.

# Tarea de visión por computadora y métricas

## Tarea

Clasificación binaria:

- Fractured (0)
- Non-fractured (1)

## Métricas

- BCEWithLogitsLoss
- Accuracy
- F1-score

## Data augmentation

- RandomHorizontalFlip()
- RandomVerticalFlip()

## Imágenes transformadas

## Reescalado

IMG\_HEIGHT = 180

IMG\_WIDTH = 180

10cm



# Modelos utilizados



## Convolucional

5 capas convolucionales  
Filtros de 3x3  
Stride 1

10cm



## Resnet 18

Modelo preentrenado con  
ImageNet

## Hiperparámetros:

50 Epocas (early stop)  
Adam ( $lr= 5e-4$  -  $weight\_decay= 1e-4$  ( $l2$ ))



## MobileNet v3

Modelo preentrenado con  
ImageNet

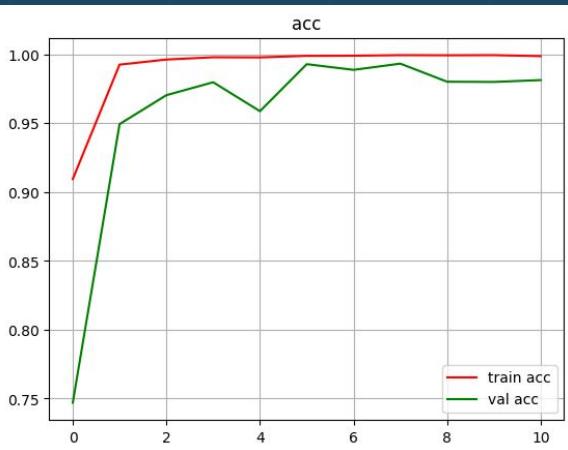
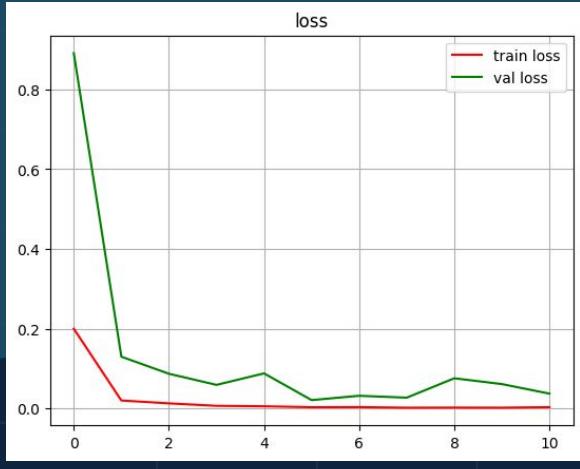
# 01

## Modelo

### ResNet Fine tuning



Total params: 11,177,025  
Trainable params: 11,177,025  
Non-trainable params: 0

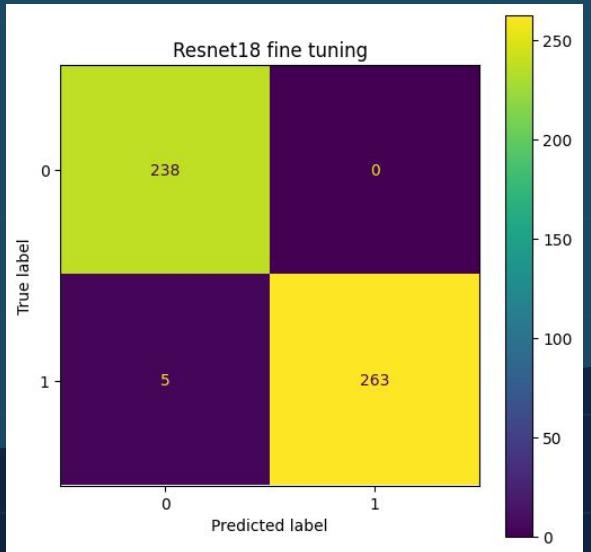


train loss: 0.00347  
val loss: 0.02128  
train acc: 0.99897  
val acc: 0.99294

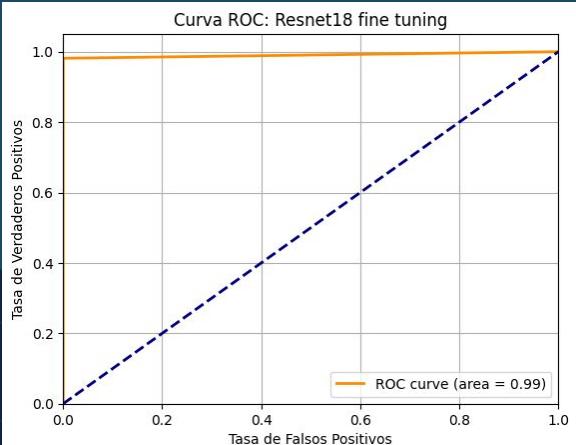
# 01

## Modelo

ResNet Fine tuning



El acc es : 0.99012  
El f1-score es : 0.99058

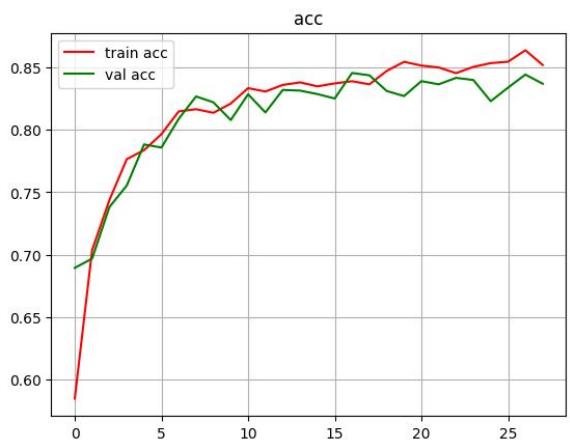
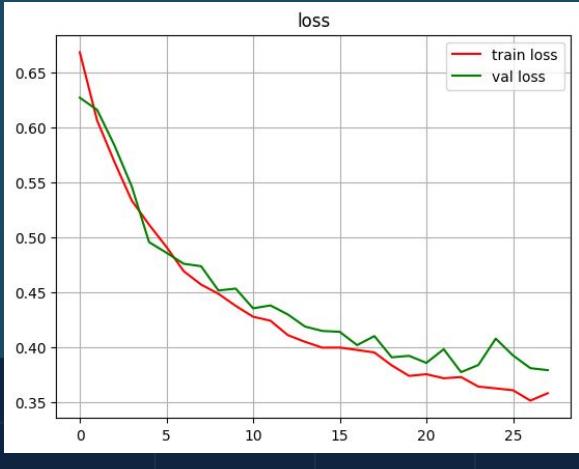


# 02 Modelo

## ResNet18 - Feature extractor



Total params: 11,177,025  
Trainable params: 513  
Non-trainable params: 11,176,512

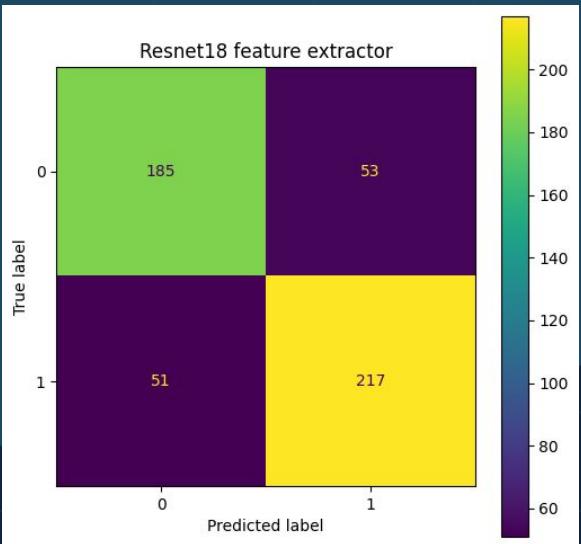


train loss: 0.37255  
val loss: 0.37701  
train acc: 0.84534  
val acc: 0.84158

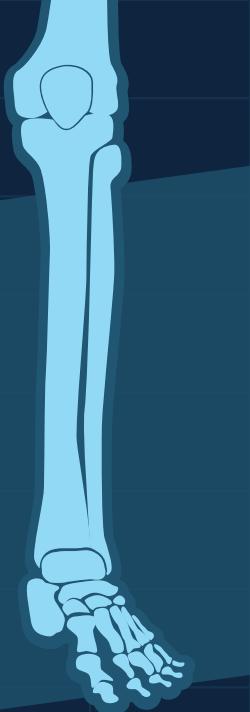
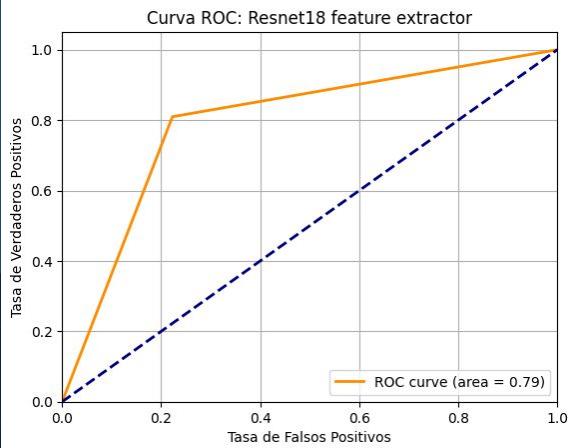
# 02

## Modelo

ResNet18 - Feature extractor



El acc es : 0.79447  
El f1-score es : 0.80669



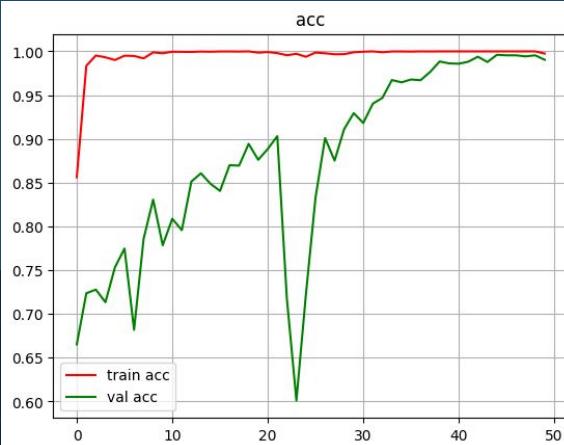
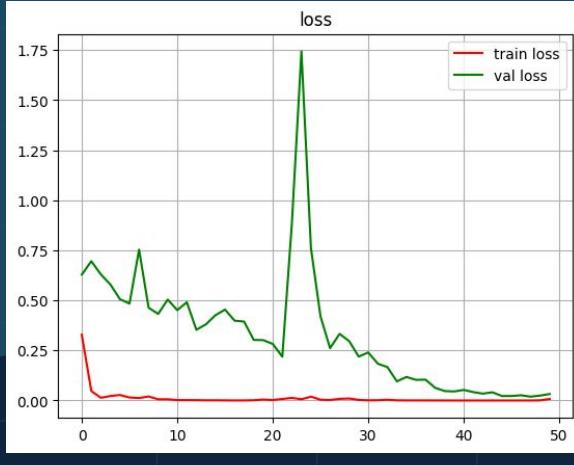
# 03

## Modelo

MobileNetV3 Small - Fine Tune



Total params: 1,518,881  
Trainable params: 1,518,881  
Non-trainable params: 0



train loss: 0.00016  
val loss: 0.01923  
train acc: 1.0  
val acc: 0.994297

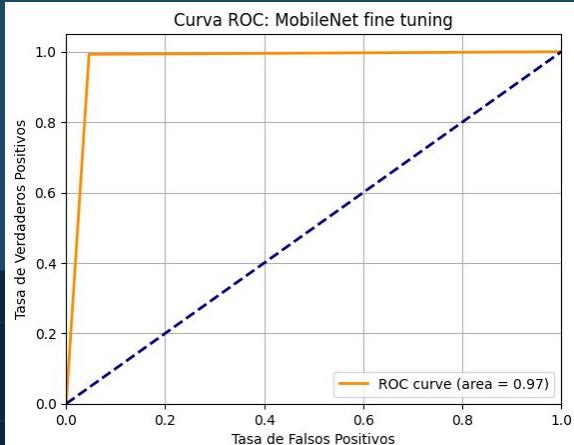
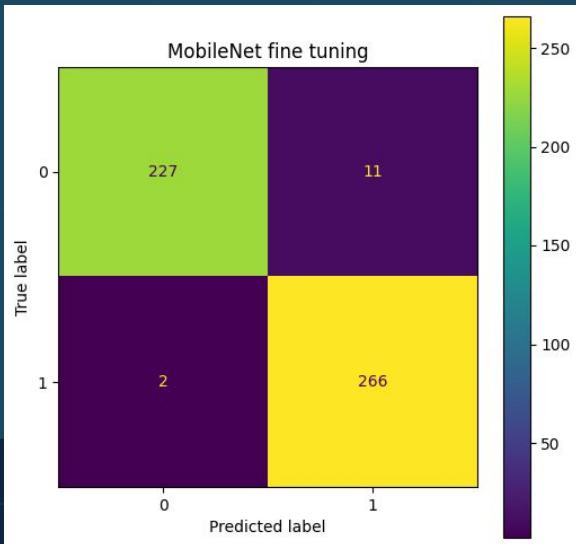
# 03

## Modelo

MobileNetV3 Small - Fine Tune



Accuracy : 0.97431  
F1-score: 0.97615



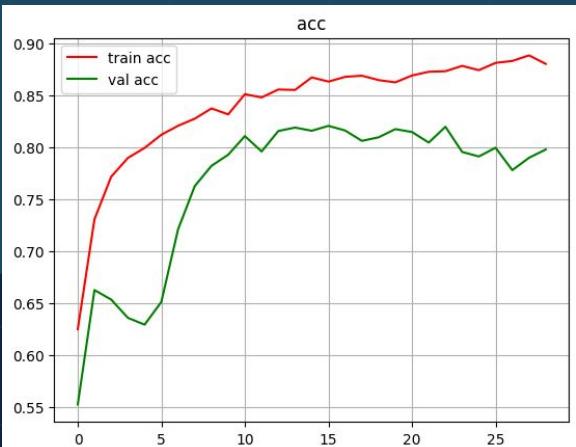
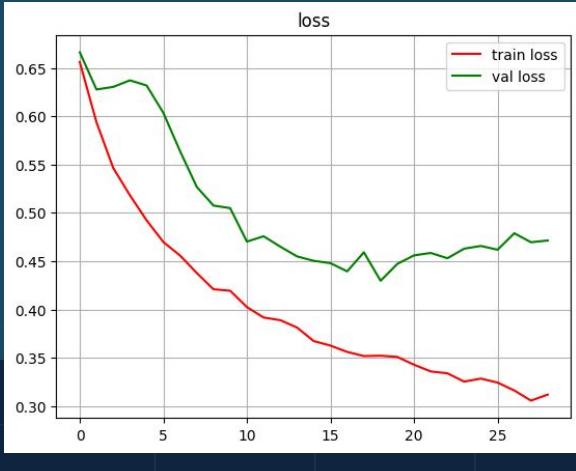
# 04

## Modelo

MobileNetV3 Small - Feature Extractor



Total params: 1,518,881  
Trainable params: 1,025  
Non-trainable params: 1,517,856

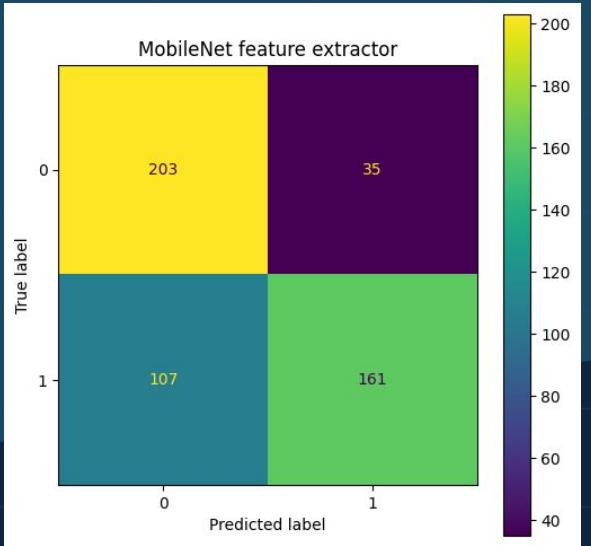


train loss: 0.35215  
val loss: 0.42966  
train acc: 0.86469  
val acc: 0.80966

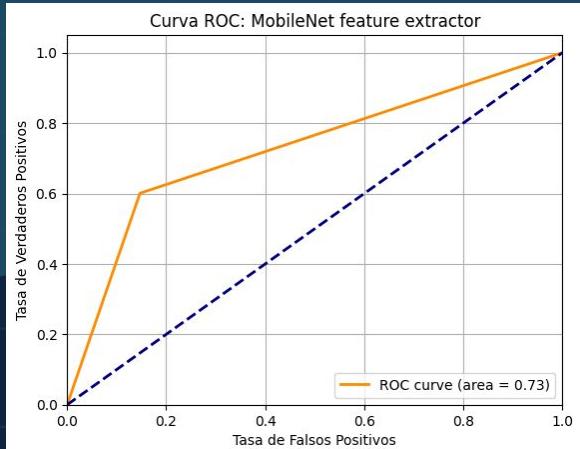
# 04

## Modelo

MobileNetV3 Small - Feature Extractor



Accuracy : 0.71937  
El F1-score es : 0.69397



# 05

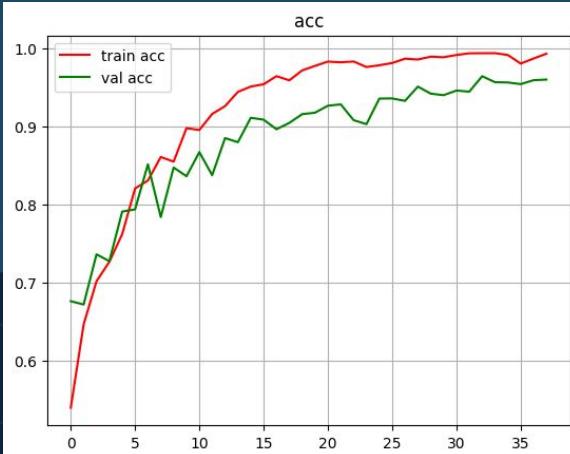
## Modelo

5 capas convolucionales  
Filtros de 3x3  
Stride 1

Total params: 3,670,433

Trainable params: 3,670,433

Non-trainable params: 0

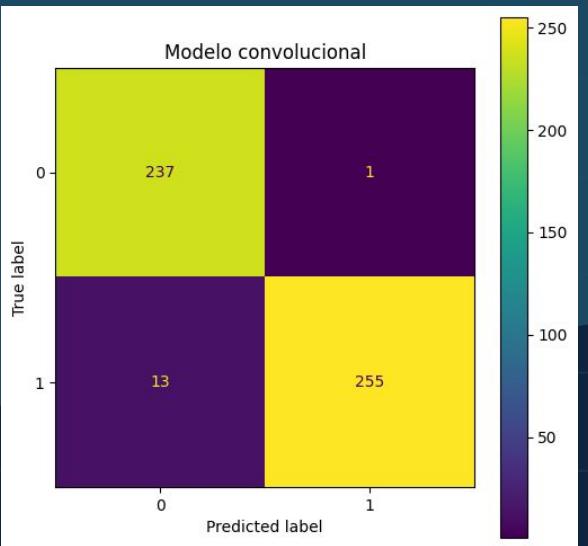


train loss: 0.02548  
val loss: 0.139282  
train acc: 0.99332  
val acc: 0.96019

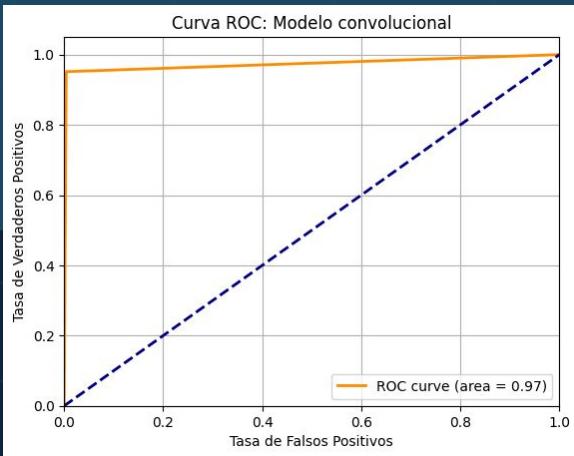
# 05

## Modelo

5 capas convolucionales  
Filtros de 3x3  
Stride 1



Accuracy : 0.97233  
F1-score es : 0.97328



# Comparación de modelos - Train

	Train loss	Val. Loss	Train Accuracy	Val. Accuracy	Total params.	Trainable params.	Non trainable params.
5 capas conv	0.0255	0.1393	0.9933	0.9602	3,670,433	3,670,433	0
ResNet18 - Fine tuning	<b>0.0035</b>	<b>0.0213</b>	<b>0.9990</b>	<b>0.9929</b>	<b>11,177,025</b>	<b>11,177,025</b>	0
ResNet18 - Feature extractor	0.3726	0.3770	0.8453	0.8416	11,177,025	513	11,176,512
MobileNet V3 Small - Fine Tune	<b>0.0002</b>	<b>0.0192</b>	<b>1.0</b>	<b>0.9943</b>	<b>1,518,881</b>	<b>1,518,881</b>	0
MobileNetV3 Small - Feature extractor	0.3522	0.4297	0.8647	0.8097	1,518,881	1,025	1,517,856

10cm

16/19

# Comparación de modelos - Test

	Accuracy	F1-score	Total params.	Trainable params.	Non trainable params.
5 capas conv	0.97233	0.97328	3,670,433	3,670,433	0
ResNet18 - Fine tuning	<b>0.99012</b>	<b>0.99058</b>	<b>11,177,025</b>	<b>11,177,025</b>	0
ResNet18 - Feature extractor	0.79447	0.80669	11,177,025	513	11,176,512
MobileNetV3 Small - Fine Tune	<b>0.97431</b>	<b>0.97615</b>	<b>1,518,881</b>	<b>1,518,881</b>	0
MobileNetV3 Small - Feature extractor	0.71937	0.69397	1,518,881	1,025	1,517,856



# Conclusiones

- Podemos aplicar diferentes modelos de visión por computadora a un problema real.
- Pudimos tomar decisiones considerando el dominio del problema.
- Logramos una precisión buena.

# Gracias

Preguntas?

CREDITS: This presentation template was created by  
[Slidesgo](#), including icons by Flaticon, and  
infographics & images by [Freepik](#)

10cm



# About the disease



## Mercury

It's the closest planet to the Sun and the smallest in the Solar System

10cm



## Venus

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



## Mars

Despite being red, Mars is actually a cold place. It's full of iron oxide dust

# 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 that

10cm



Ref X-Ray Exp / 21

# The disease

Venus

Venus is the second planet from the Sun

Mars

Despite being red, Mars is a cold place

Jupiter

It's the biggest planet in the Solar System

Saturn

Saturn is a gas giant and has several rings



# Concepts and typology



## Type A

Venus is the second planet from the Sun



## Type B

It's the biggest planet in the Solar System



## Type C

Despite being red, Mars is a cold place



## Gestational

Saturn is a gas giant and has several rings



150,000

Pathologies are cured by X-ray every day in the world

# Recommendations

## Should do

1. Here you can describe what the patient should do
2. Here you can describe what the patient should do
3. Here you can describe what the patient should do
4. Here you can describe what the patient should do

## Should not do

1. Here you can describe what the patient shouldn't do
2. Here you can describe what the patient shouldn't do
3. Here you can describe what the patient shouldn't do
4. Here you can describe what the patient shouldn't do

# Symptoms of the disease

01

**Mercury**

It's the closest planet  
to the Sun



03

**Mars**

Mars is actually a very  
cold place

02

**Venus**

Venus is the second  
planet from the Sun

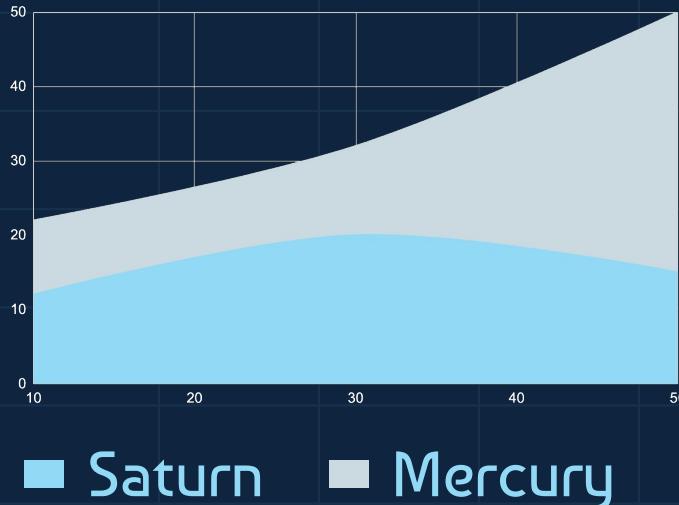
04

**Jupiter**

Jupiter is the biggest  
planet of them all

# Risk factory

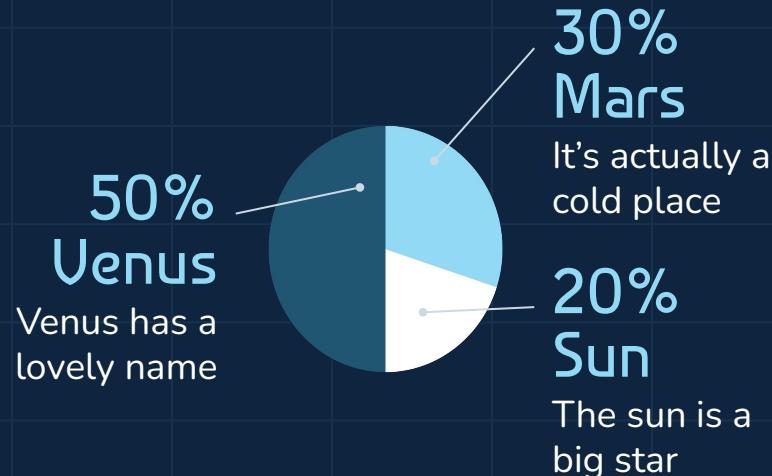
## Evolution



\* To modify this graphs, click on them, follow the link, change the data and paste the new graph here, replacing this one

10cm

## Prevalence



# 01

## The disease

You could enter a subtitle  
here if you need it

10cm



206

Bones we have in our bodies

8,545,244

Daily X-rays around the world

85%

Of people have at some point had their X-rays taken

“This is a quote. Words full of wisdom  
that someone important said and can  
make the reader get inspired”

—SOMEONE FAMOUS

# Diagnosis



## Mercury

It's the closest planet to the Sun



## Jupiter

Jupiter is the biggest planet of them all



## Venus

Venus is the second planet from the Sun



## Saturn

It's composed of hydrogen and helium



## Mars

Mars is actually a very cold place



## Neptune

It's the farthest planet from the Sun

# Prevention

## Mercury

Do you know what helps you make your point clear?

Lists like this one:

- They're simple
- You can organize your ideas clearly
- You'll never forget to buy milk!

And the most important thing: the audience won't miss the point of your presentation

10cm



# Diagnostic process

## Mercury

It's the closest planet to the Sun



## Venus

Venus is the second planet from the Sun



## Mars

Mars is actually a very cold place



## Jupiter

Jupiter is the biggest planet of them all



10cm

# Treatment

	Detention	Operation	Infiltration
Treatment A			
Treatment B			

10cm

# Prevalence

## Mercury

Mercury is the closest planet to the Sun

## Jupiter

It's a gas giant and the biggest planet

## Venus

Planet Venus has a beautiful name

## Mars

Despite being red, Mars is a cold place

# Our team



Jenna Doe

Here you can talk a bit  
about this person



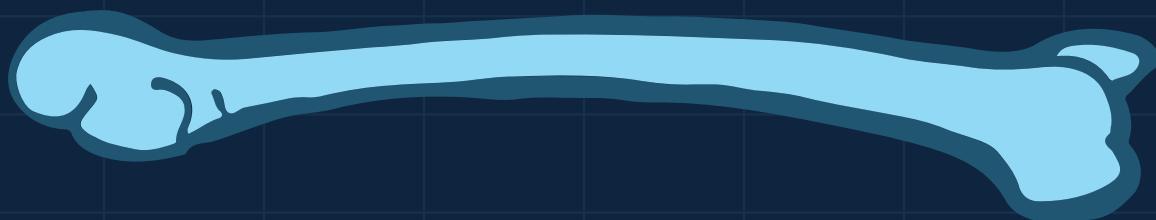
Anne Jimmy

Here you can talk a bit  
about this person

# References

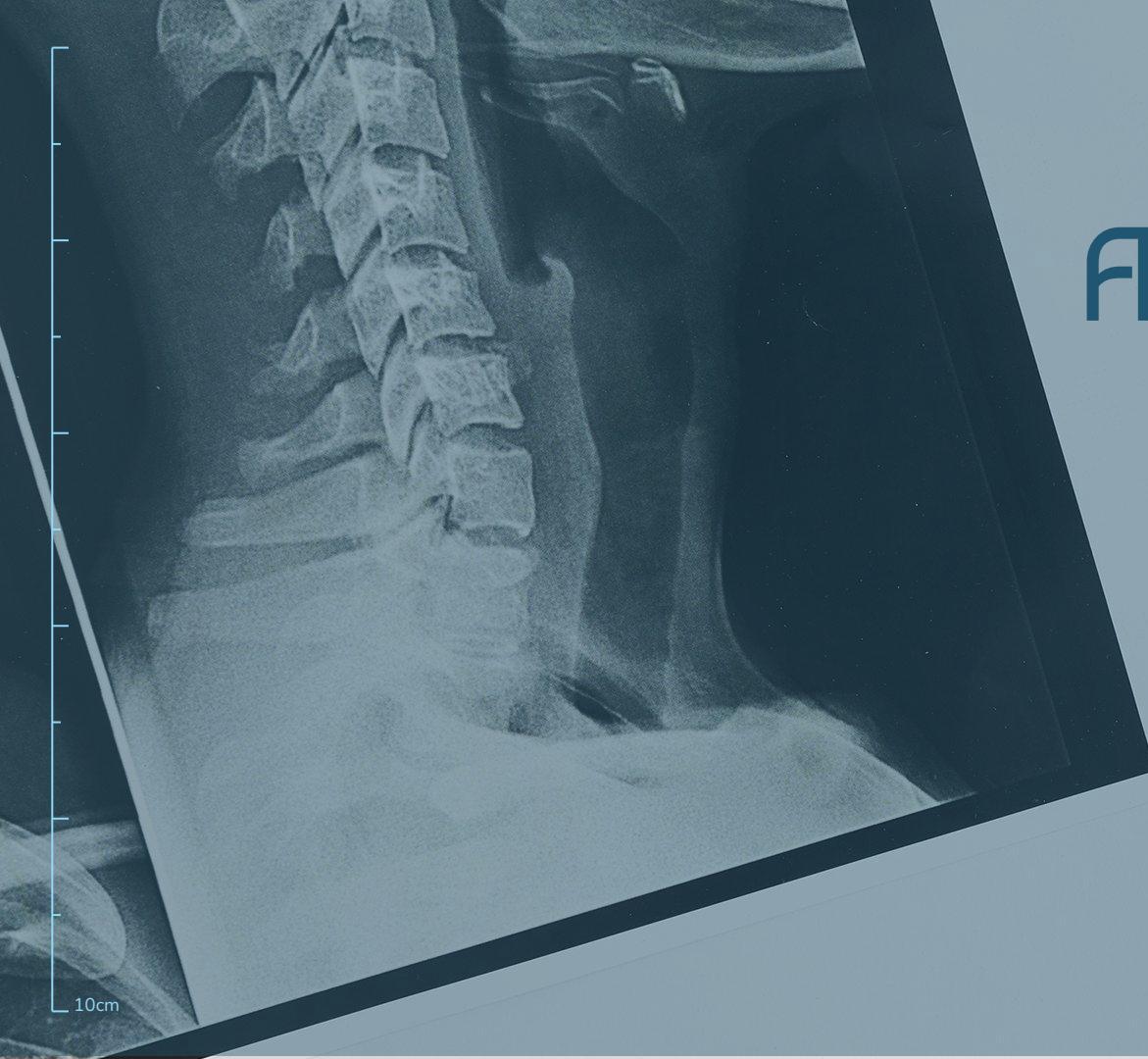
- AUTHOR (YEAR). Title of the publication. Publisher

Awesome  
words



10cm

Ref X-Ray Exp / 38



A picture is  
worth a  
thousand  
words

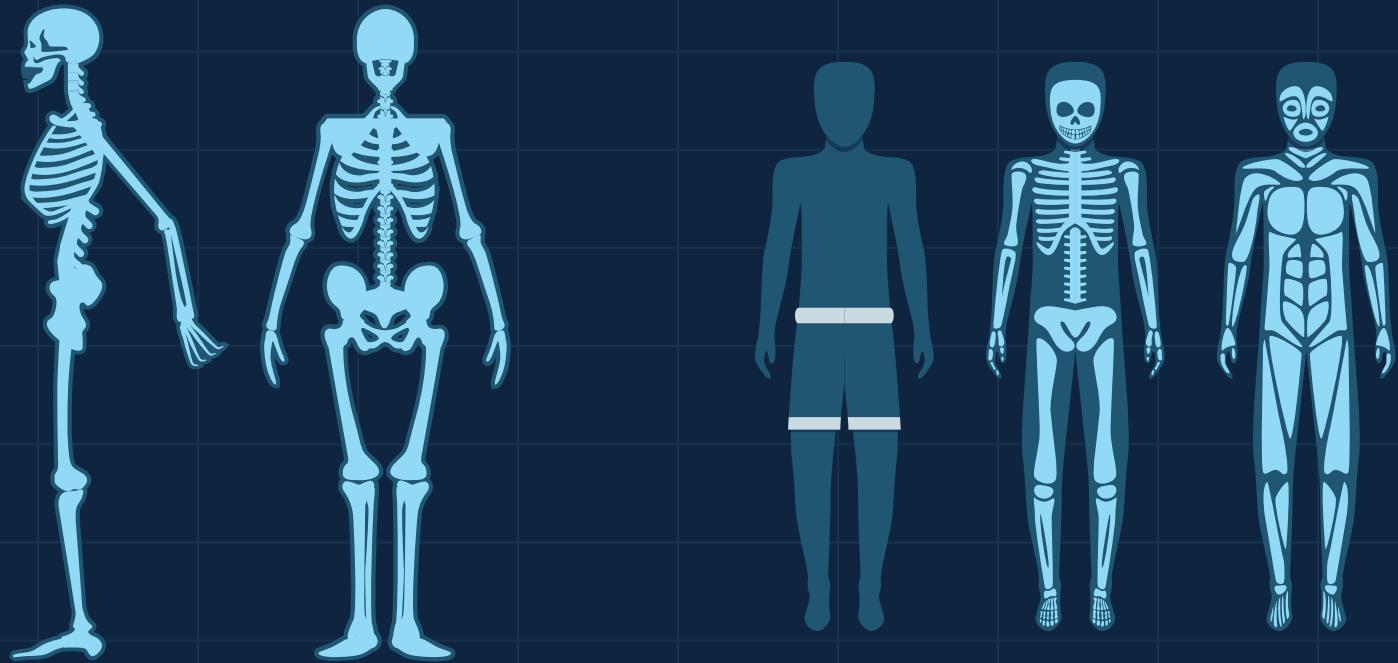
# Mobile app

You can replace the image on the screen with your own work. Right-click on it and then choose "Replace image" (in Google Slides) or "Change Picture" (in PPT) so you can add yours

10cm



# Alternative resources



10cm

# Resources

## Vectors

- Flat body skeleton
- Human skeleton back
- Human skeleton profile
- Hand drawn profile skeleton
- Sketchy osseous system
- Human body system collection
- Parts of skeleton

## Photos

- X ray scan
- X ray of a vertebral column
- Cheerful young doctors at hospital
- Doctors looking at x-ray in hallway
- Woman medic wearing stethoscope and red uniform

# Instructions for use (free users)

In order to use this template, you must credit **Slidesgo** by keeping the Thanks slide.

## You are allowed to:

- Modify this template.
- Use it for both personal and commercial purposes.

## You are not allowed to:

- Sublicense, sell or rent any of Slidesgo Content (or a modified version of Slidesgo Content).
- Distribute this Slidesgo Template (or a modified version of this Slidesgo Template) or include it in a database or in any other product or service that offers downloadable images, icons or presentations that may be subject to distribution or resale.
- Use any of the elements that are part of this Slidesgo Template in an isolated and separated way from this Template.
- Delete the “Thanks” or “Credits” slide.
- Register any of the elements that are part of this template as a trademark or logo, or register it as a work in an intellectual property registry or similar.

For more information about editing slides, please read our FAQs or visit Slidesgo School:

<https://slidesgo.com/faqs> and <https://slidesgo.com/slidesgo-school>

# Instructions for use (premium users)

In order to use this template, you must be a Premium user on [Slidesgo](#).

## You are allowed to:

- Modify this template.
- Use it for both personal and commercial purposes.
- Hide or delete the “Thanks” slide and the mention to Slidesgo in the credits.
- Share this template in an editable format with people who are not part of your team.

## You are not allowed to:

- Sublicense, sell or rent this Slidesgo Template (or a modified version of this Slidesgo Template).
- Distribute this Slidesgo Template (or a modified version of this Slidesgo Template) or include it in a database or in any other product or service that offers downloadable images, icons or presentations that may be subject to distribution or resale.
- Use any of the elements that are part of this Slidesgo Template in an isolated and separated way from this Template.
- Register any of the elements that are part of this template as a trademark or logo, or register it as a work in an intellectual property registry or similar.

For more information about editing slides, please read our FAQs or visit Slidesgo School:

<https://slidesgo.com/faqs> and <https://slidesgo.com/slidesgo-school>

# Fonts & colors used

This presentation has been made using the following fonts:

## **Nunito**

(<https://fonts.google.com/specimen/Nunito>)

## **Baumans**

(<https://fonts.google.com/specimen/Baumans>)

#92d9f5

#0f253f

#ffffff

#205672

#cbdae1

# Storyset

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

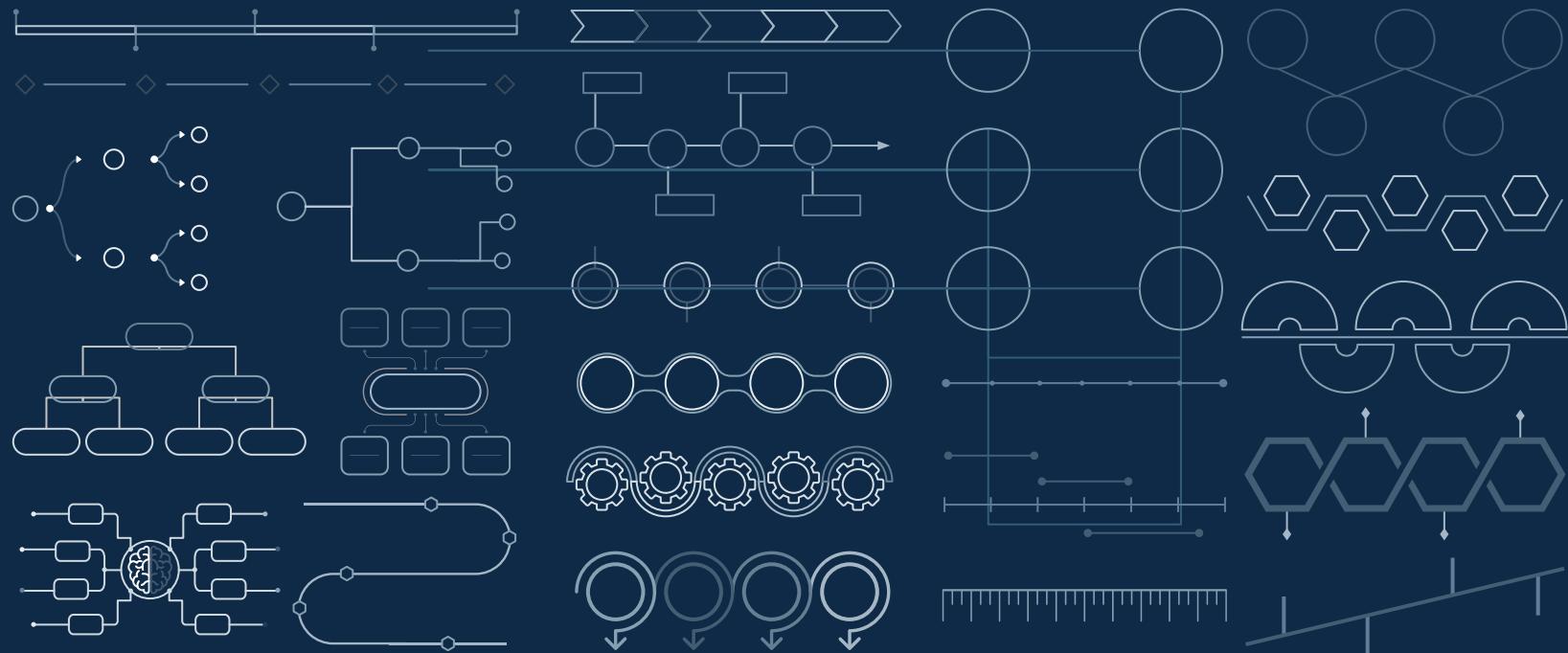
# Use our editable graphic resources...

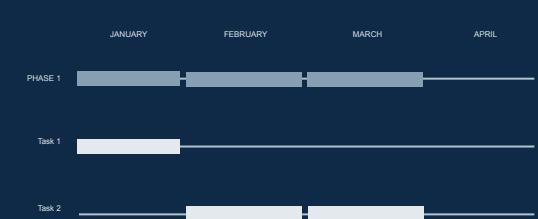
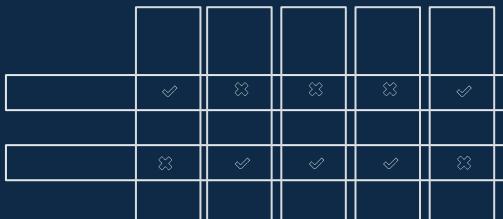
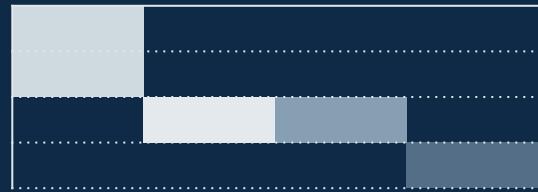
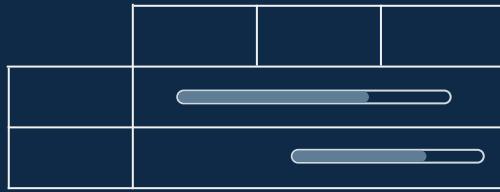
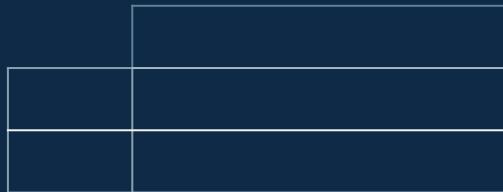
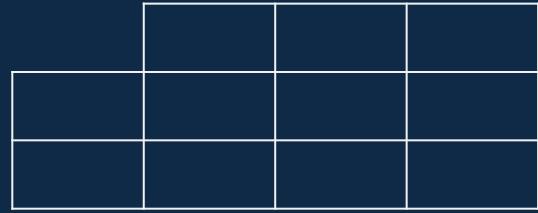
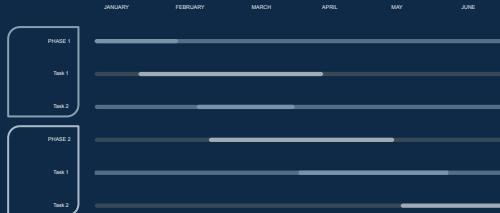
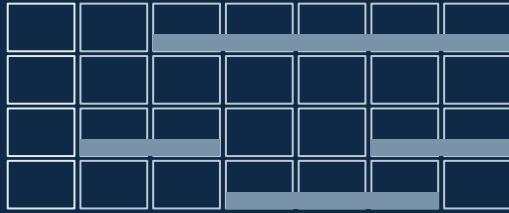
You can easily resize these resources without losing quality. To change the color, just ungroup the resource and click on the object you want to change. Then, click on the paint bucket and select the color you want.

Group the resource again when you're done. You can also look for more infographics on Slidesgo.

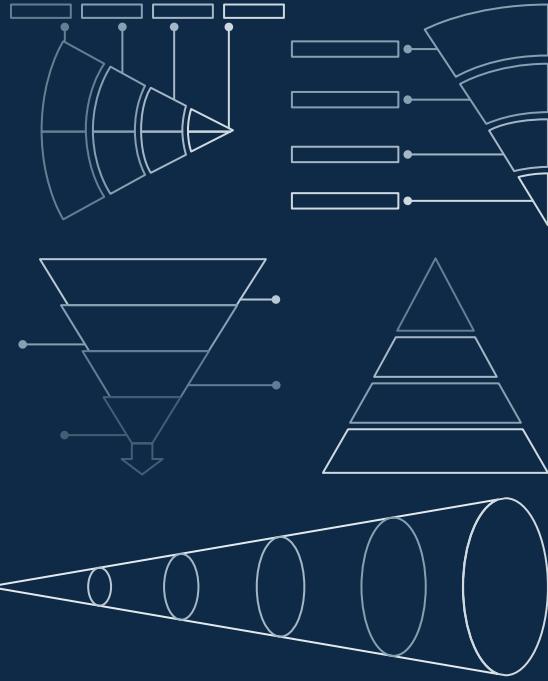
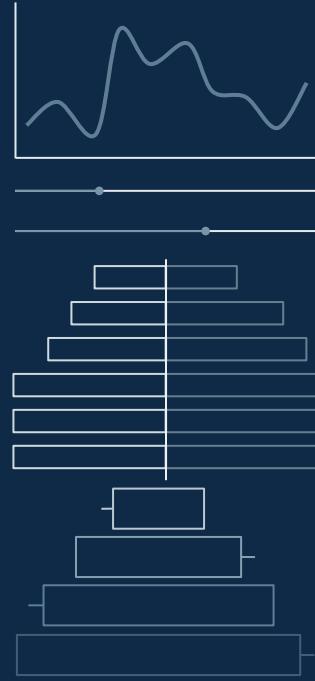
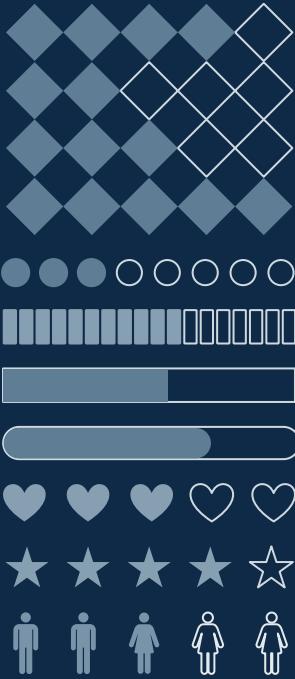
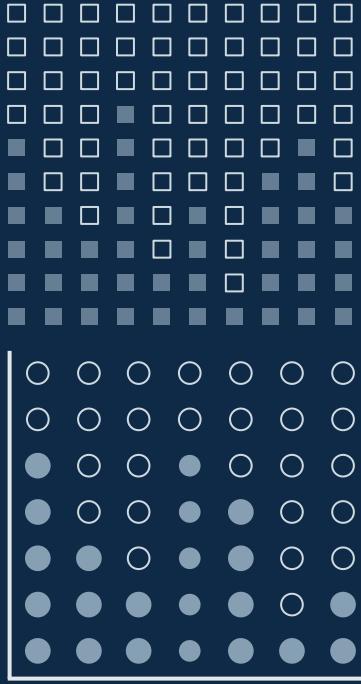




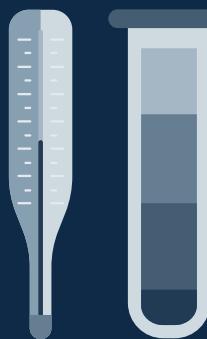
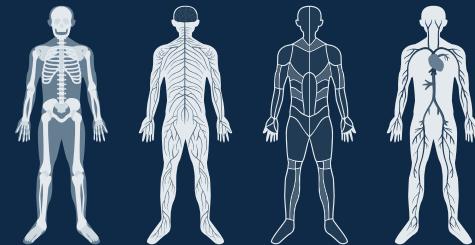
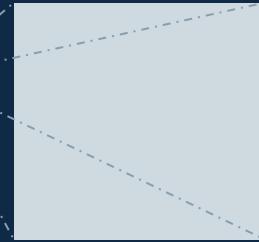
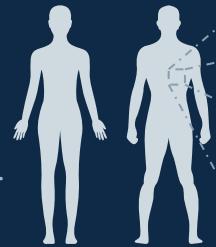
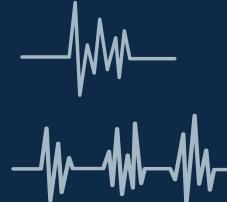
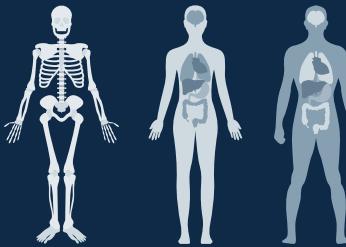
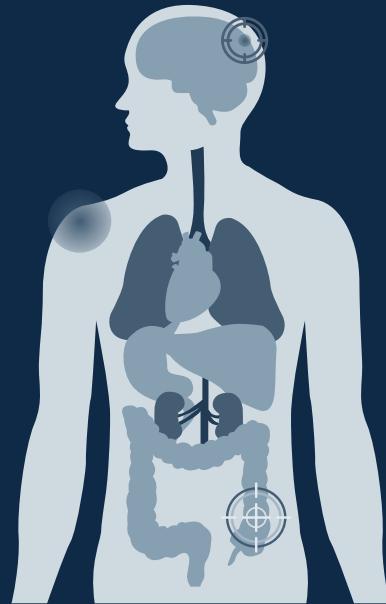


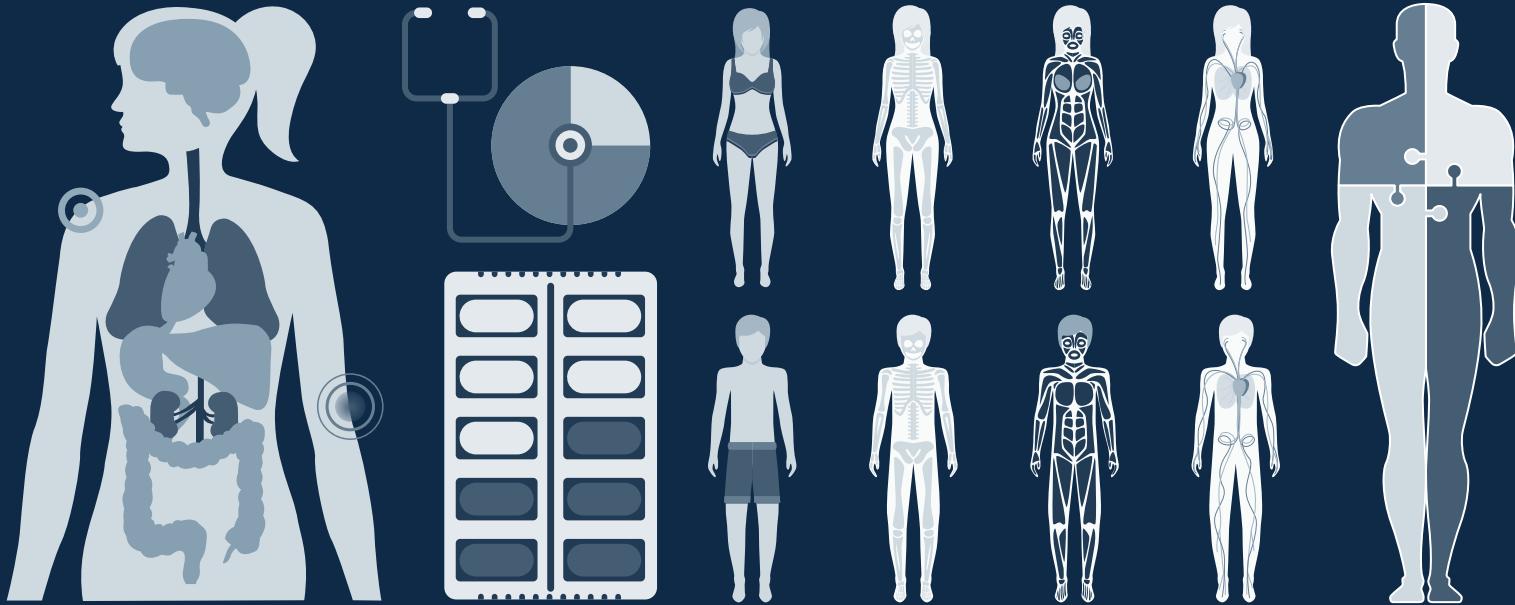






# Medical Infographics







# ...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



