

# **BRAIN TUMOR**

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## ***Classification***

By Derik Vo  
Last updated 6/11/2023

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# 1

## — *Introduction* —

# *Introduction*

## **MRI**

Used to diagnose brain tumors.



## **Tumors**

No tumor, Meningioma, Glioma,  
pituitary tumors



## **Workload**

Radiologist need to review 1 image  
every 2-4 seconds



# Stakeholders



## Data Scientist

Develop and train the model



## Legal Team

Ensure we are following legal procedure.



## Medical Staff

Domain expertise



## Regulatory bodies

Ensure we are in compliance with regulation requirements



## Data Team

Collects, cleans, and provides the right data



## Administrators

Decide how and if we implement the model



2

— *Problem statement* —

# **Problem**

Because of the difficulty of manual classification of a brain tumor and the workload put on radiologist, building a classification model would greatly reduce the workload of a radiologist. As well as improve quality of care.

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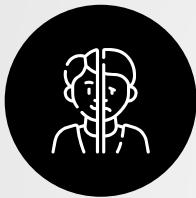
3

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# *Exploratory Data Analysis*

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# **BRAIN TUMOR CLASS COUNT**



**No Tumor**

**1,595**

**Meningioma**

**1,339**



**Glioma**

**1,321**

**Pituitary**

**1,457**

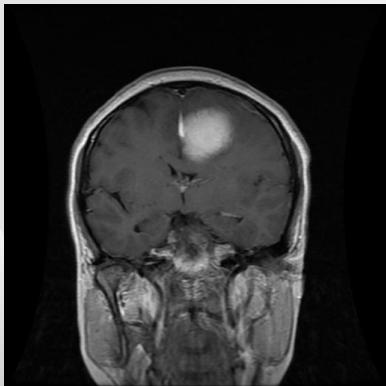


**Graphic images**  
**warning**

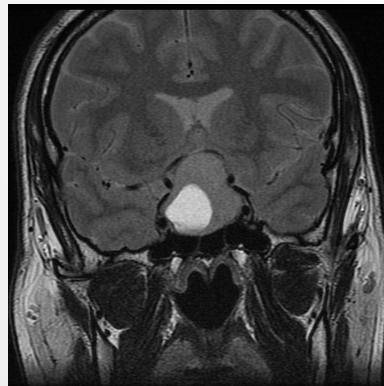


# *Image class preview*

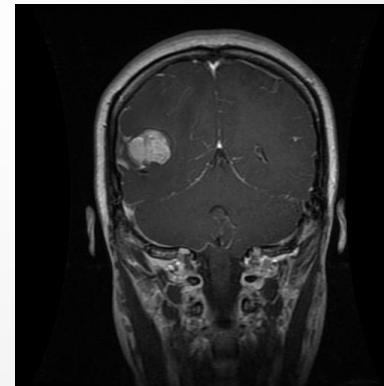
**Meningioma**



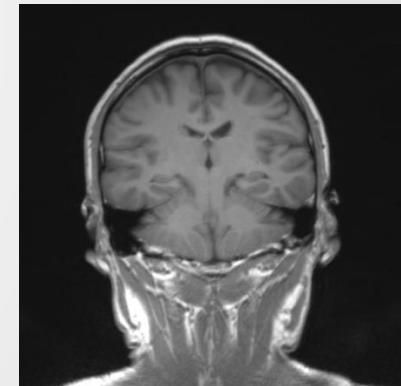
**Pituitary**



**Glioma**

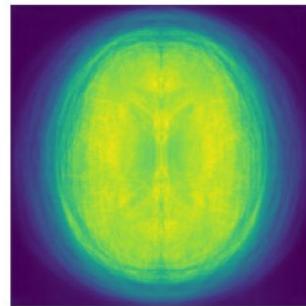


**No Tumor**

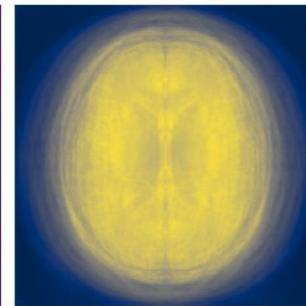


Pixel average: no tumor

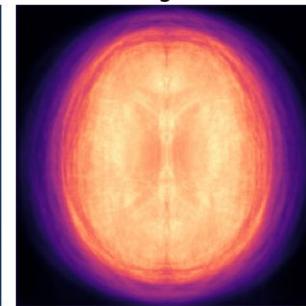
Viridis



cividis

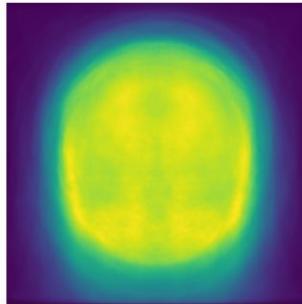


magma

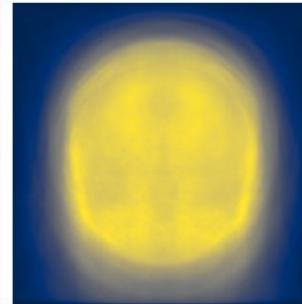


Pixel average: Meningioma

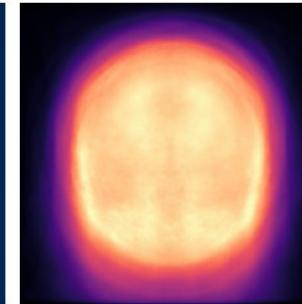
Viridis



cividis

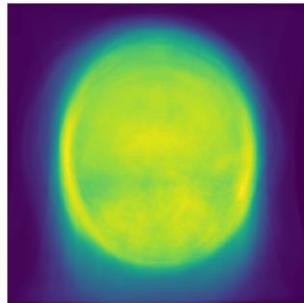


magma

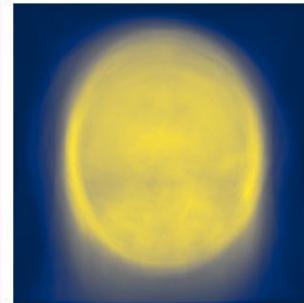


Pixel average: Glioma Tumor

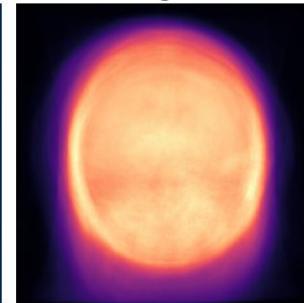
Viridis



cividis

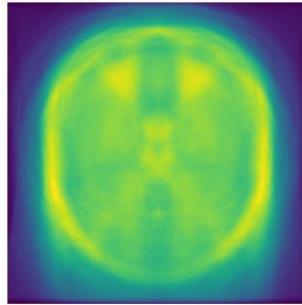


magma

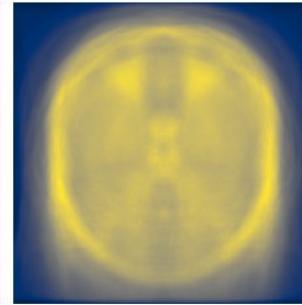


Pixel average: pituitary tumor

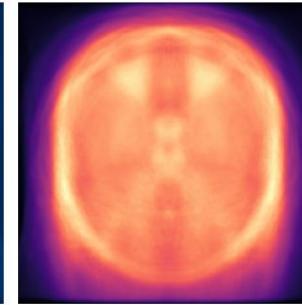
Viridis



cividis

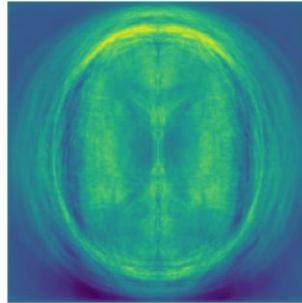


magma

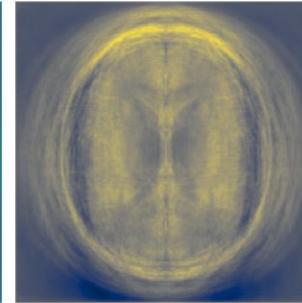


Pixel average: meningioma contrast

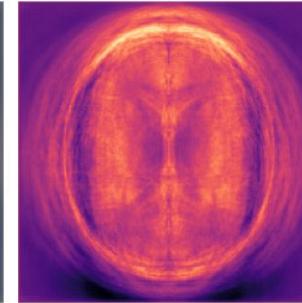
Viridis



cividis

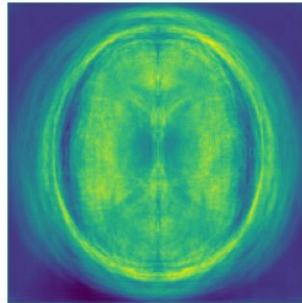


magma

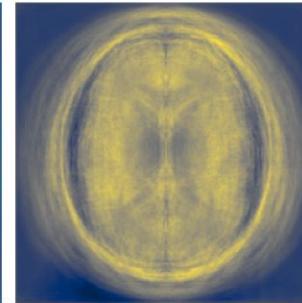


Pixel average: glioma contrast

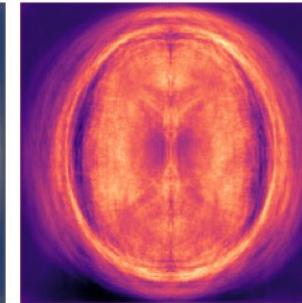
Viridis



cividis

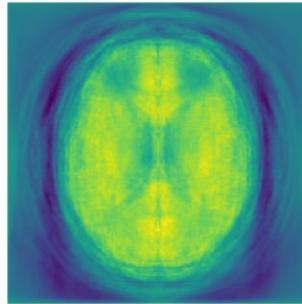


magma

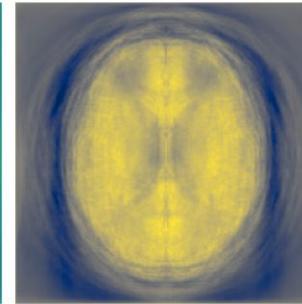


Pixel average: Pituitary contrast

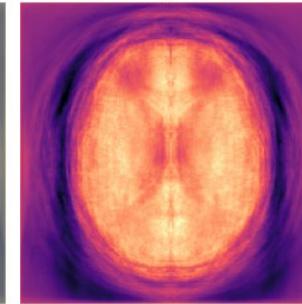
Viridis



cividis



magma





4

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# ***Modeling and Evaluation***

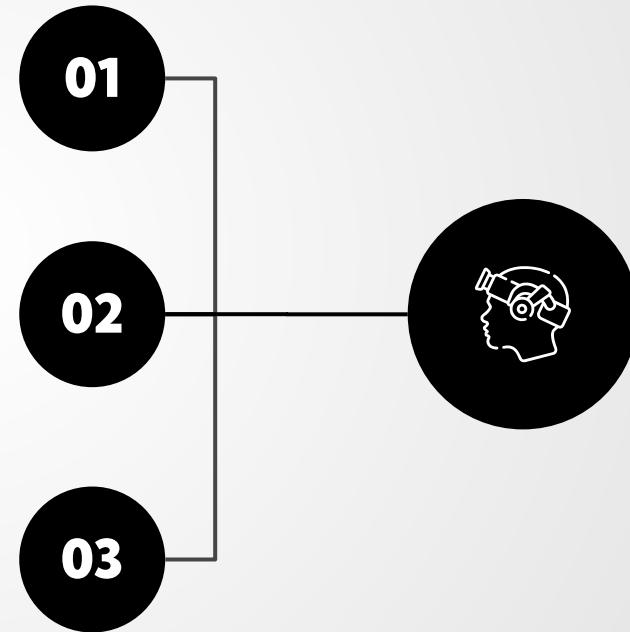
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# *Models Built*

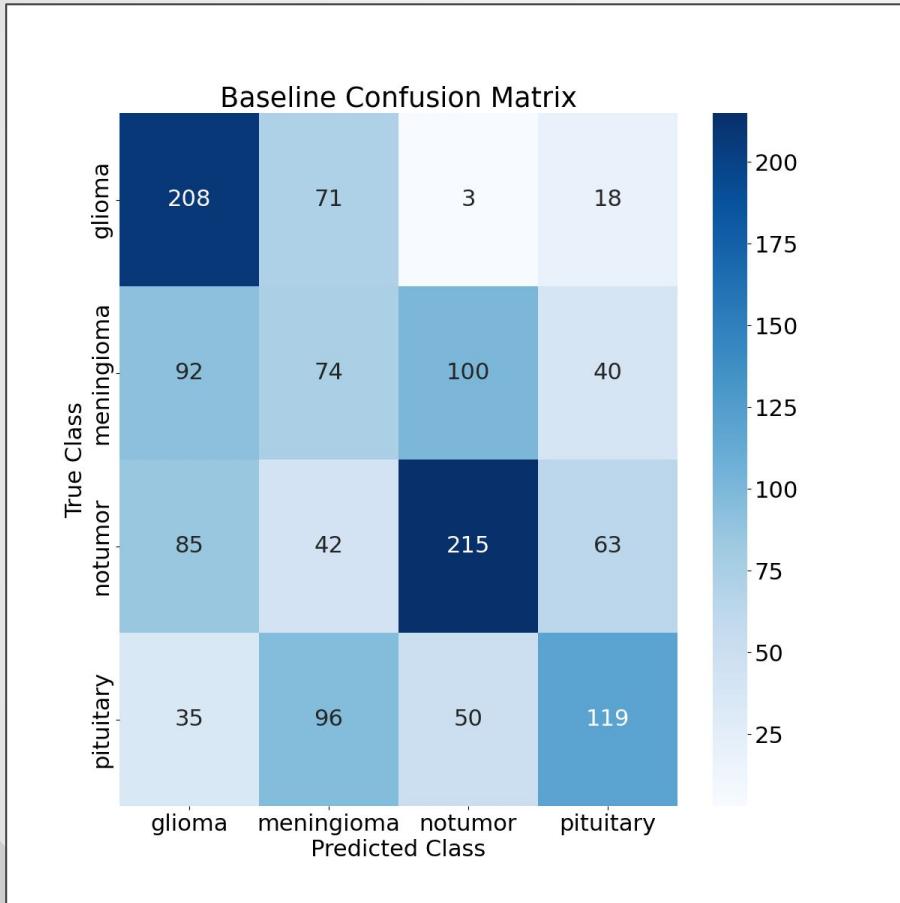
**Baseline**

**Convolutional  
Neural Network**

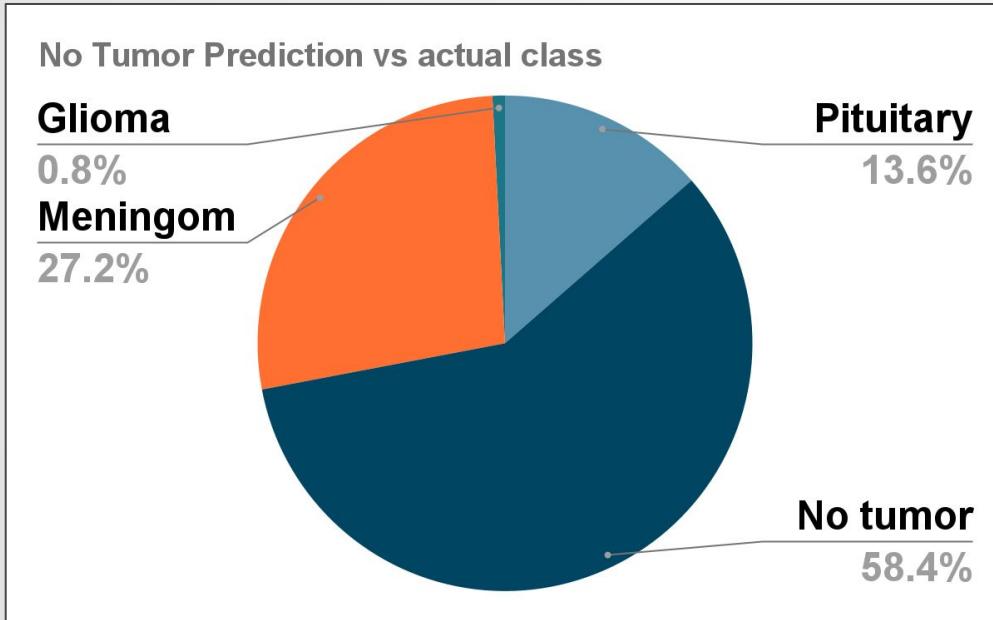
**Convolutional  
Neural Network  
With Regularization**



# Baseline Model



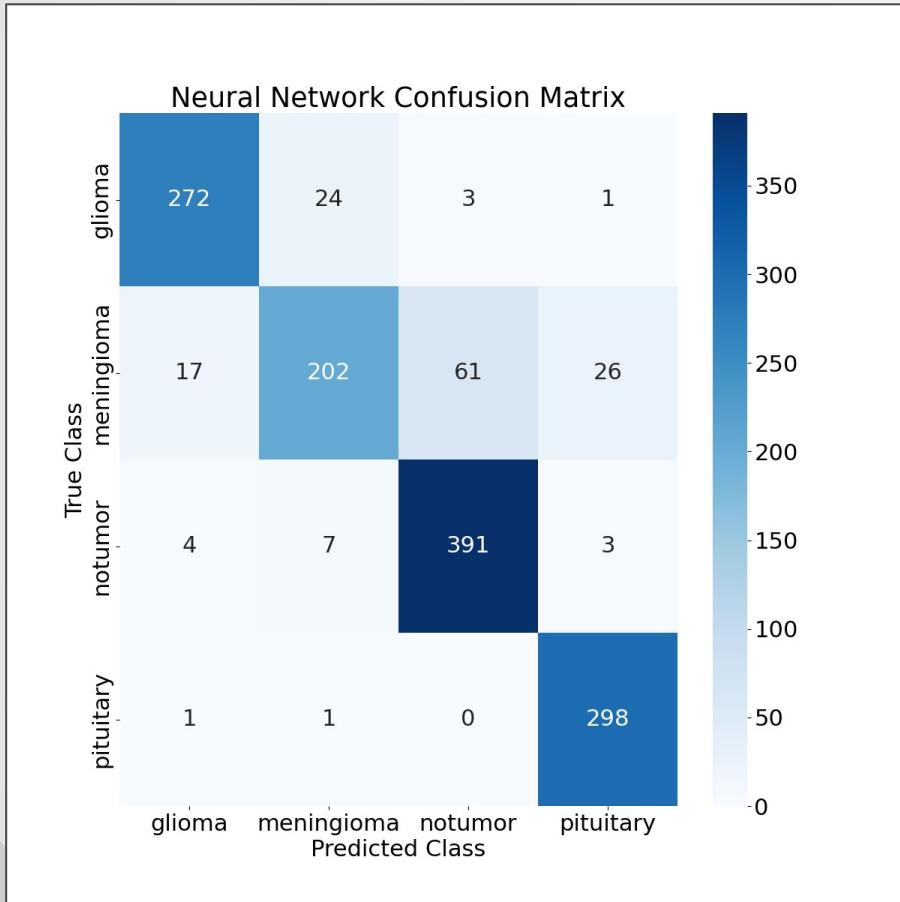
# Baseline Model



## Metrics:

**No Tumor:** 215  
**Pituitary:** 50  
**Meningioma:** 100  
**Glioma:** 3

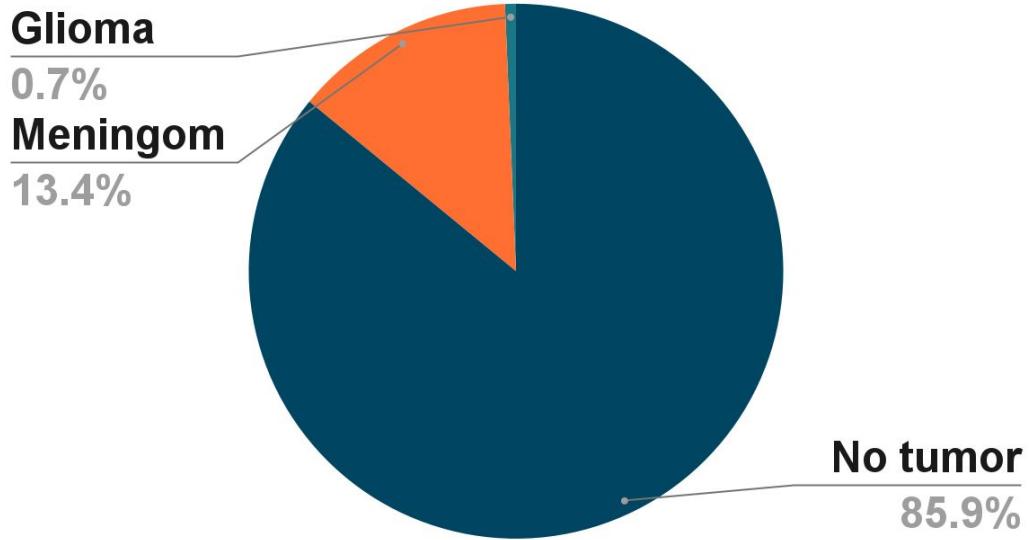
# CNN Model



**Metrics:**  
**Accuracy: 89%**  
**Precision: 89%**  
**Recall: 89%**  
**F1: 88%**

# CNN Model

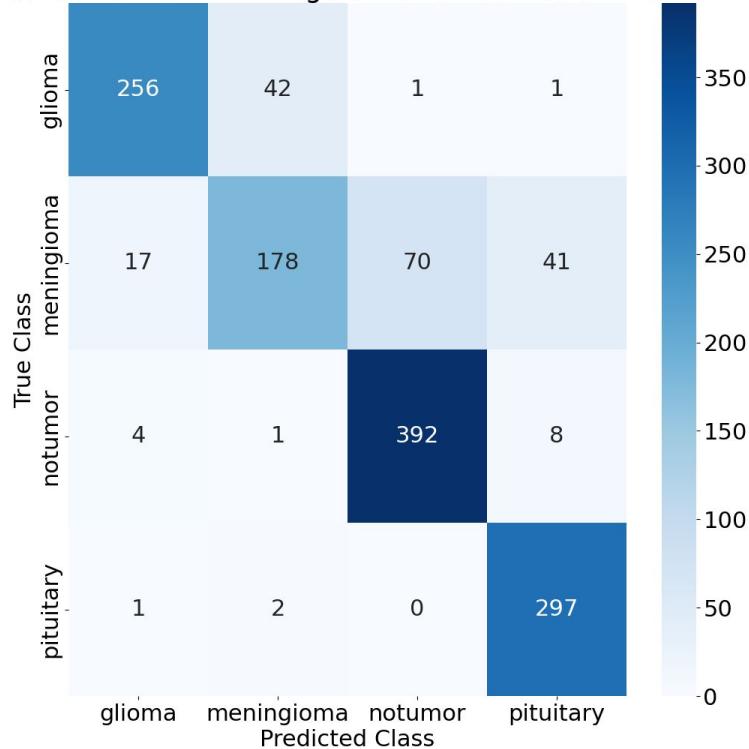
No Tumor Prediction vs actual class



**Metrics:**  
**No Tumor:** 391  
**Pituitary:** 0  
**Meningioma:** 61  
**Glioma:** 3

# CNN with regularization

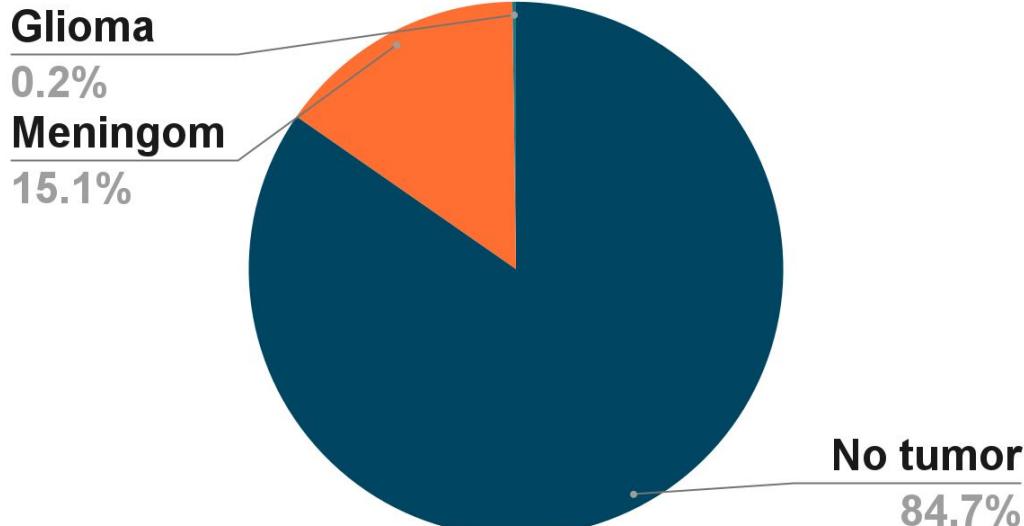
Neural Network with regularization Confusion Matrix



**Metrics:**  
**Accuracy: 86%**  
**Precision: 85%**  
**Recall: 86%**  
**F1: 85%**

# CNN regularization Model

No Tumor Prediction vs actual class



**Metrics:**  
**No Tumor:** 392  
**Pituitary:** 0  
**Meningioma:** 70  
**Glioma:** 1



5

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— *Conclusion* —

# ***Conclusion***



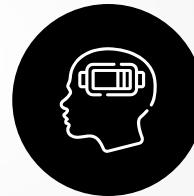
**CNN did well**



**Struggled with  
meningioma**



**Can be used  
to assistant**



**The preliminary  
website has been  
built**



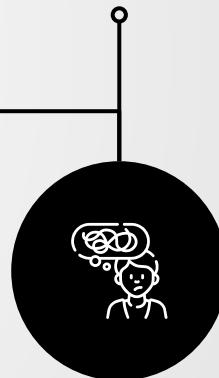
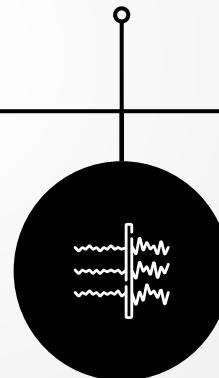
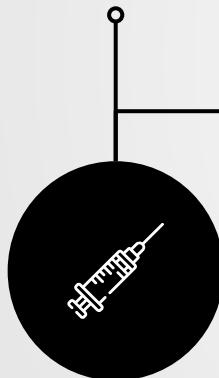
# ***Recommendations***

**MRI  
Machine  
type**

**Identify  
data  
leakage**

**Build an  
anomaly  
detector**

**Consult  
with  
experts**



# THANKS!

Do you have any questions?

Derikvosanjose@gmail.com

<https://derikvo.github.io/Portfolio/>



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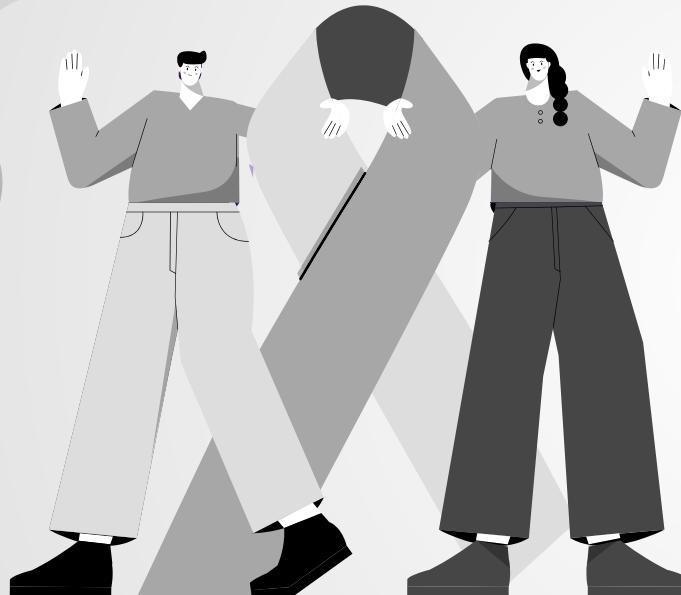
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# WHOA!

This can be the part of the presentation where you introduce yourself, write your email...

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# **ABOUT BRAIN TUMOR**

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!

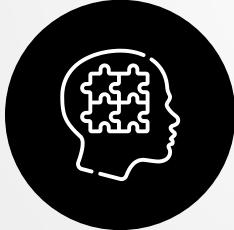
And the most important thing: the audience won't miss the point of your presentation



# ***Types of Tumors***



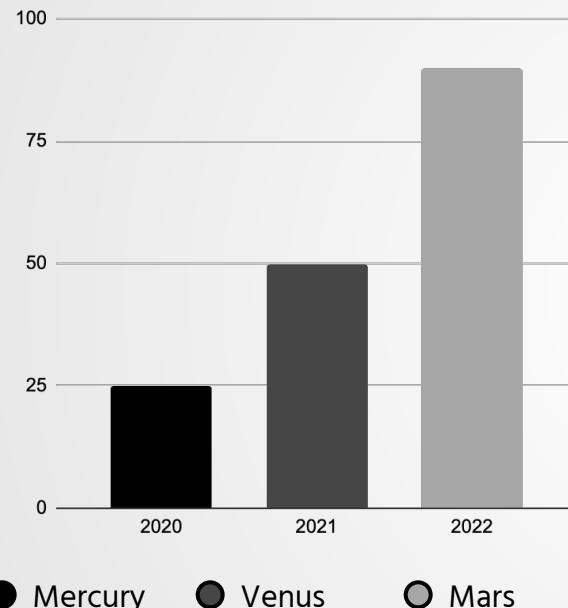
**Mercury**



**Venus**

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

# NUMBER OF NEW CASES



- **25%**

Mercury is the closest planet to the Sun and the smallest one in the Solar System

- **50%**

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

- **90%**

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

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

# **BRAIN TUMORS DIAGNOSED**

**Jupiter**

Jupiter is the biggest planet

**Saturn**

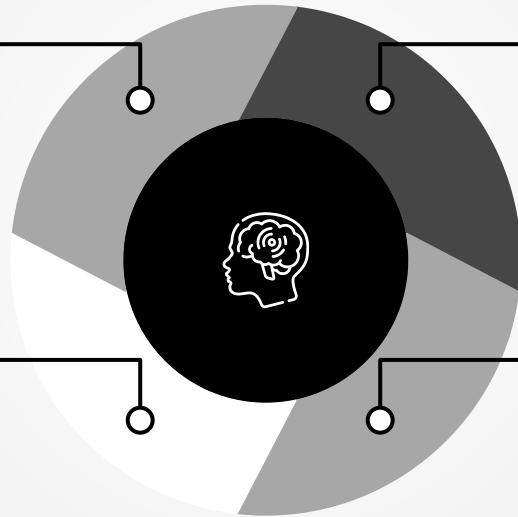
Saturn is the ringed planet

**Mercury**

Mercury is the smallest planet

**Venus**

Venus has a beautiful name



# **AWESOME WORDS**

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

—**SOMEONE FAMOUS**



---

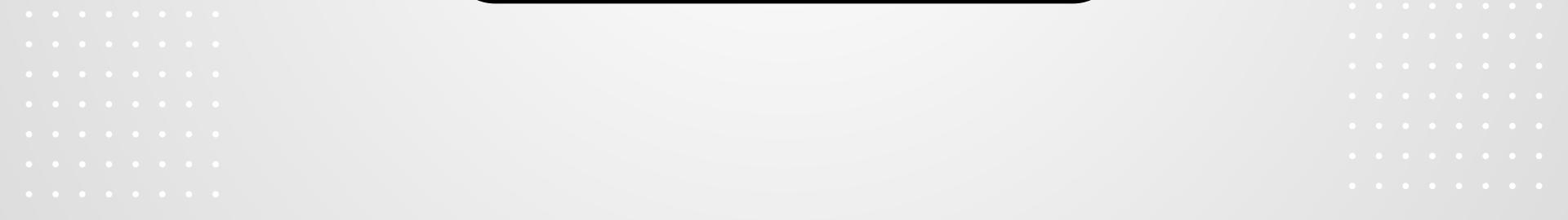
**A PICTURE ALWAYS  
REINFORCES THE CONCEPT**

---

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



**150,000**



Big numbers catch your audience's attention

**9h 55m 23s**

Jupiter's rotation period

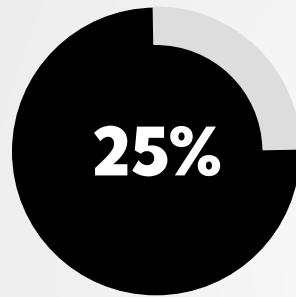
**333,000**

The Sun's mass compared to Earth's

**386,000 km**

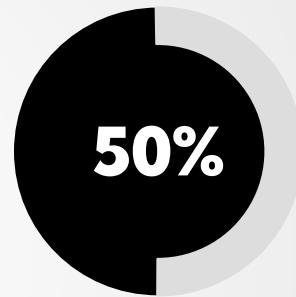
Distance between Earth and the Moon

# **STATS OF PATIENTS**



## **Mercury**

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



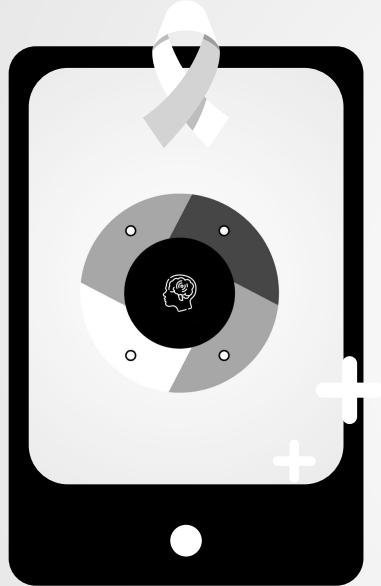
## **Venus**

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

# **DESKTOP APP**

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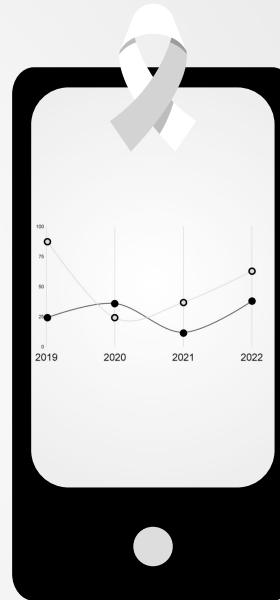


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# **MOBILE APP**

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# **OUR PRINCIPAL DOCTORS**



**Peter Smith**

You can speak a bit about this person here



**Jenna Jameson**

You can speak a bit about this person here

# **MALIGNANT TUMORS**

## **Mars**

Mars is actually a  
very cold place



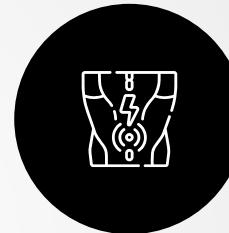
## **Neptune**

Neptune is very  
far away from us

## **Mercury**

It's the closest  
planet to the Sun

# **COMPARING DISEASES**



## **Brain tumor**

Mercury is quite a small planet

**2,500**

## **Lungs tumor**

Venus has a beautiful name

**130,000**

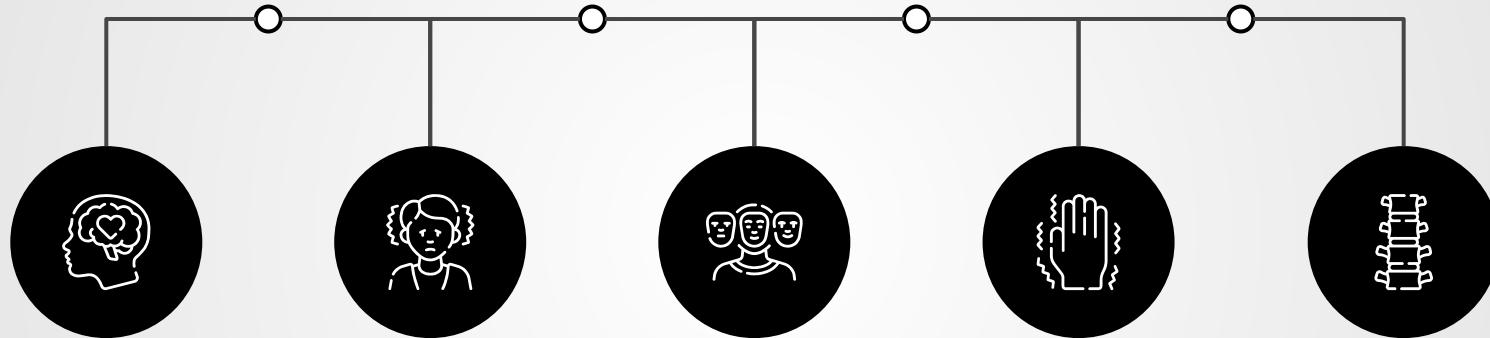
# **HEALTHCARE CENTERS**



## **○ Saturn**

Saturn, the ringed planet, is composed mostly of hydrogen and helium. It was named after a Roman god

# **EXPOSURE TO RADIATION**



## **Mercury**

Mercury is the smallest planet

## **Mars**

Mars is a very cold place

## **Venus**

Venus has a beautiful name

## **Neptune**

Neptune is far away from us

## **Jupiter**

Jupiter is the biggest planet

# ***ABOUT THE DAY***

<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>	<b>Fri</b>	<b>Sat</b>	<b>Sun</b>
	1	2	3	4	5	6
7	<b>8</b>	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



## **○ Mercury**

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

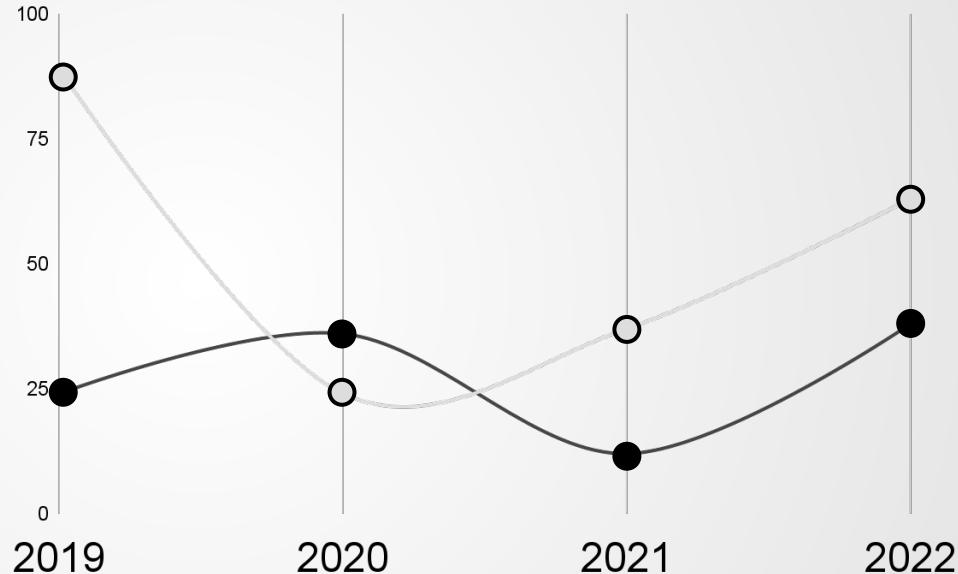
# DISEASE GROWTH

## ○ Pluto

Pluto is now considered a dwarf planet

## ● Ceres

Ceres is located in the main asteroid belt



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

2

# **RESEARCH**

You can enter a subtitle here if you need it

# **TREATMENT OF BRAIN TUMORS**



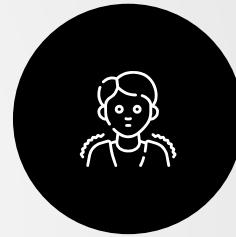
## **Mercury**

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



## **Venus**

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

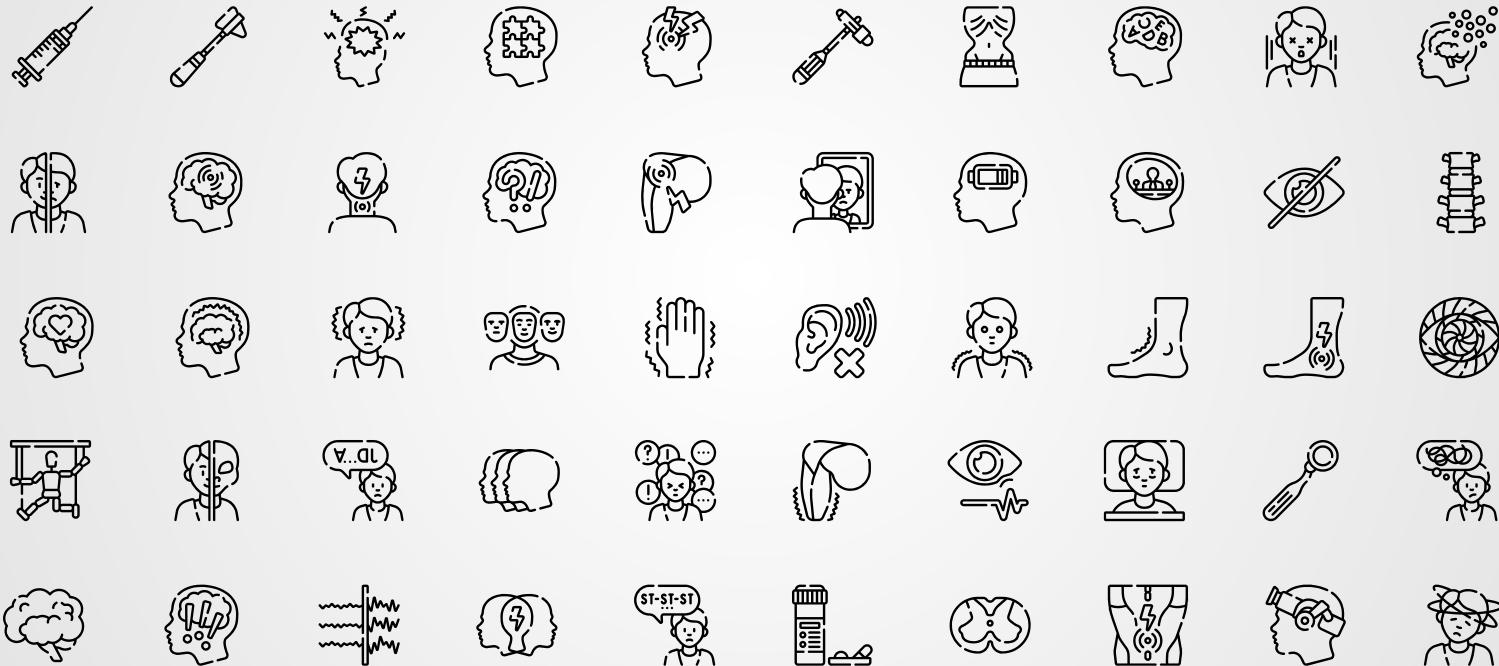


## **Mars**

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



# ICON PACK: NEUROLOGICAL DISORDERS



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

- Flat world cancer day vertical poster template
- Flat world cancer day brochure template



# **RESOURCES**

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## **Vectors:**

- Hand drawn minimal background
- Gradient world cancer day horizontal banners

## **Photos:**

- Doctor getting patient ready for ct scan
- Medium shot smiley doctor holding clipboard
- Medium shot smiley doctor wearing coat
- Different doctors doing a surgical procedure on a patient

## **Icons:**

- Icon pack: Neurological Disorders

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#ffffff

#464646

#dddddd

#a7a7a7

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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



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Bro



Rafiki



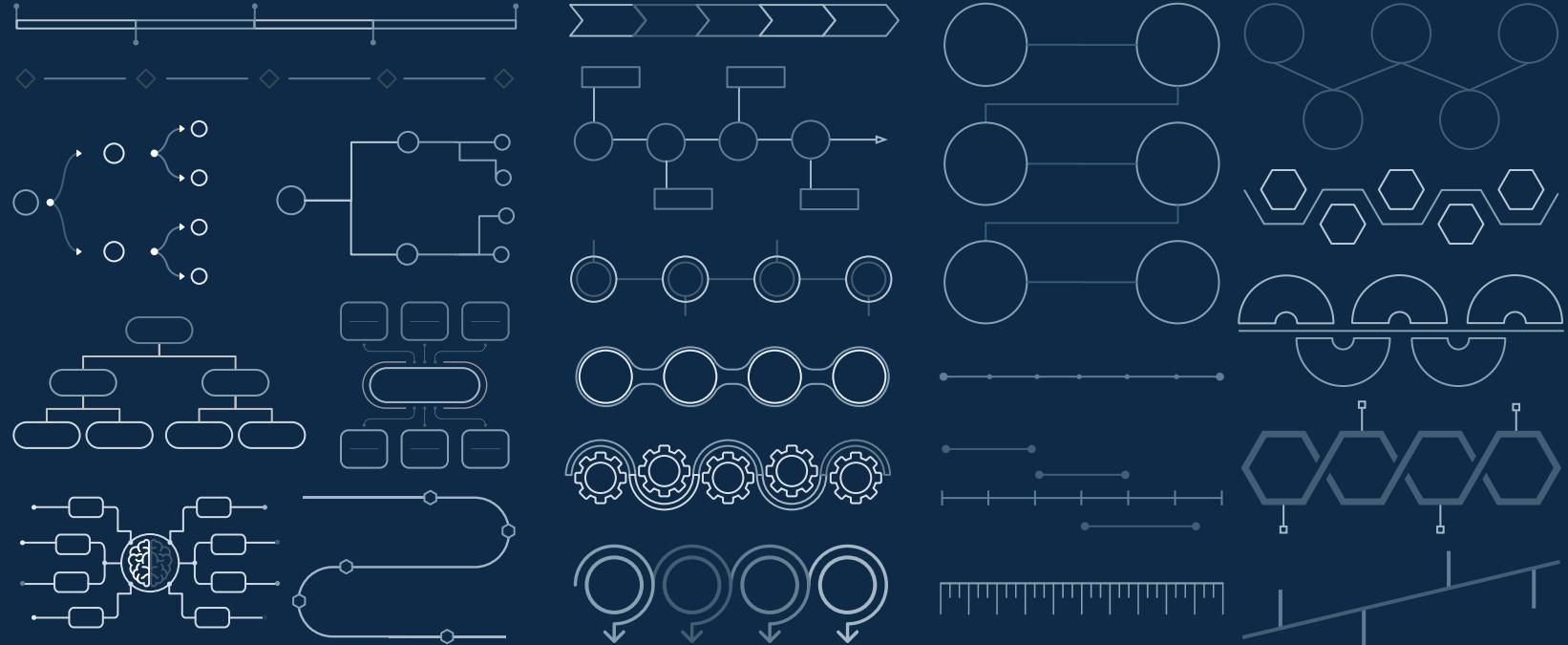
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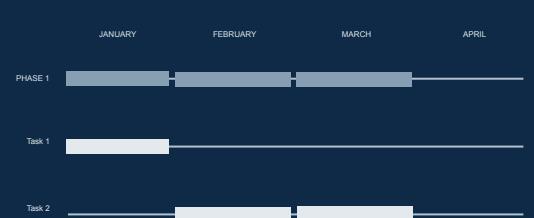
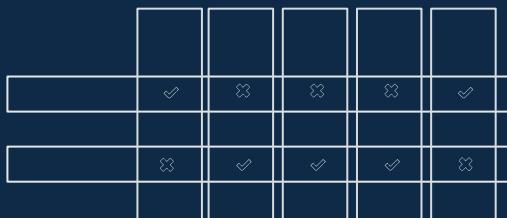
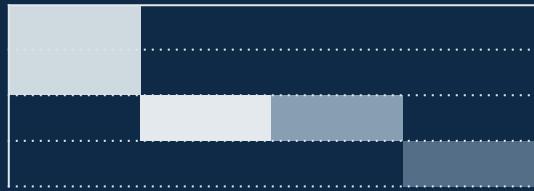
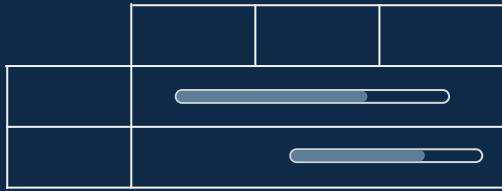
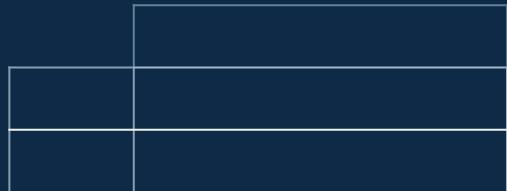
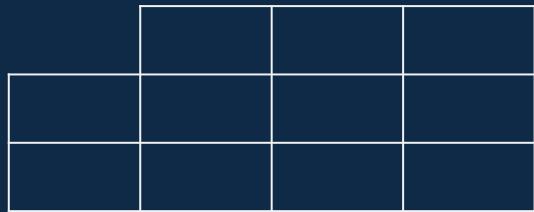
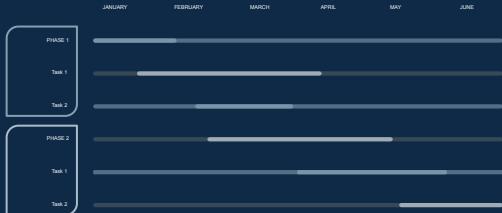
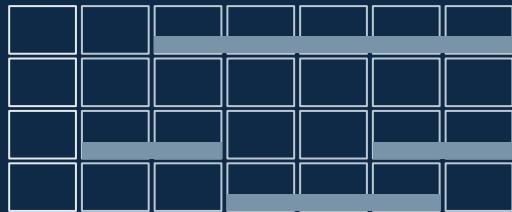
# Use our editable graphic resources...

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.

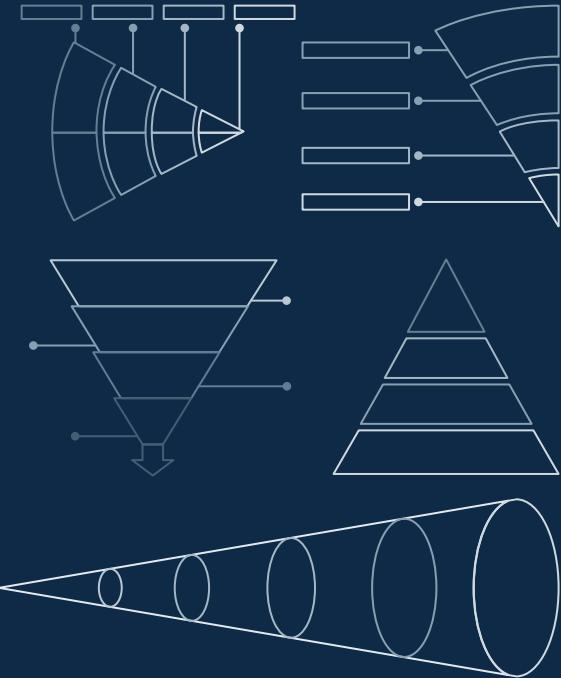
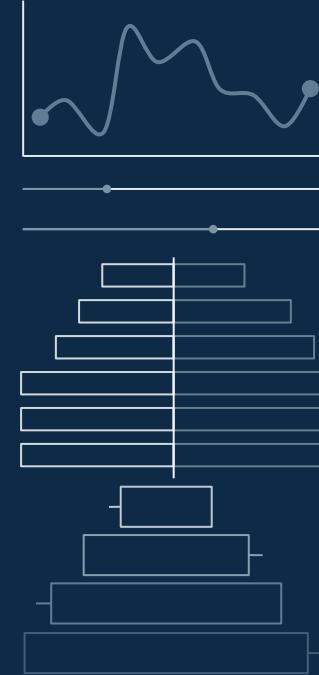
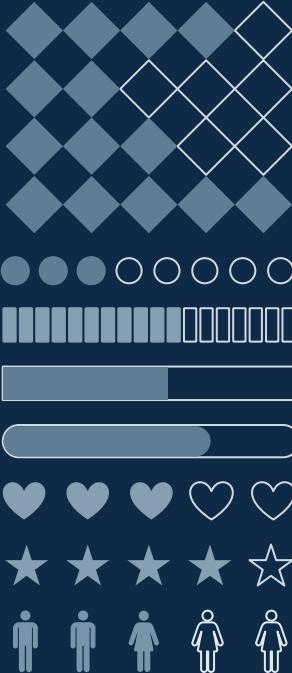
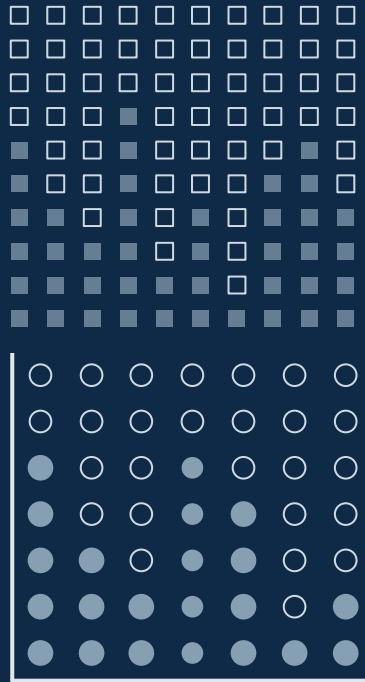












# ...and our sets of editable icons

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

