

# EDOT (AI)

## Engagement Detection in Online Teaching

Fabio Fiori | Taylor Lucero | Paloma Domínguez Sánchez



# POV:

# YOU ARE TEACHING

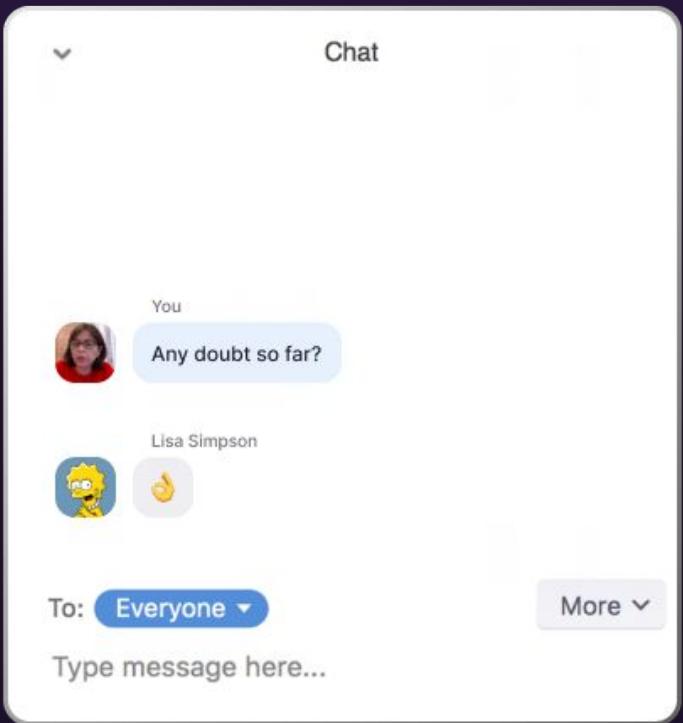
● Recording

	Vasisht Ishwar	Justin Greenzaid	Bernard Jin	Mariam Coulibaly
Cameron Tanner Pd.2	Laura Bruno	Carly Casten	Jonathan Kim	Nadine Twombly
Bella Zoll	Caroline Derringer	Irene Haramis	Dylan Rosen	Kaiden Youssefieh
Avery Max	Casey Meretta	Jake Rood	Jaden Selby	Jordyn Feldman
Jenna Bergman	Shiv Puri	Camila Ton	Collin Chen	Winston Zhang

◀ 1/2 ▶ 1/2



# YOU ARE ASKING FOR FEEDBACK



# YOU WANT TO IMPROVE

LISA SIMPSON

ita eng

Reserved area

Logout

Change password

Community

Questionari

Autocertificazione

Student opinion survey on exams

Student opinion survey on teaching and learning

Attività Didattiche	Peso in crediti
155026 - Bridging HCI to Computer Science	6
155011 - Design epistemology and ethics	6
155024 - Visual brain and design	6
155004 - Affective computing	6
155013 - Internship	18
155014 - Master Thesis	18
155023 - Project work	6
155019 - Prototyping interactive systems	6

Q.Val.

# REAL-TIME FEEDBACK

HOW WE IMAGINED IT

Recording

	Vasisht Ishwar	Justin Greenzaid	Bernard Jin	Mariam Coulibaly
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# REAL-TIME FEEDBACK

## HOW IT SHOULD WORK



The multicolor box is an index.

Each color represents a different level of engagement.

The amount of a specific color reflects the amount of students being in that state.

**POST-LESSON REVIEW >>**

# LESSON REVIEW

## HOW WE IMAGINED IT



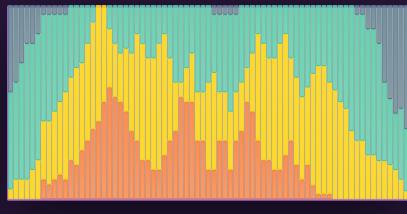
# LESSON REVIEW

HOW IT SHOULD WORK



## EDITING TOOLBAR

To clean your data and analyze only what you need



Generate graph

## STACKED BAR GRAPH

To identify patterns of engagement, or just keep track of engagement levels

Events	Topics
Event 00:12:37	
Event 00:12:37	
Event 00:12:37	

Add event

## EVENTS & TOPICS

To understand how engagement changes according to specific events or topics

**THE APPROACH >>**

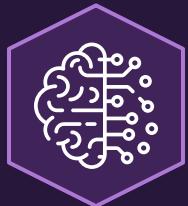
# THE APPROACH

\*



## Collection

Usage of Databases,  
Data Collection, and  
Data Processing



## Model

FERC and LSTM  
Ensemble



## Application

Output and Model  
Application

\*

\*



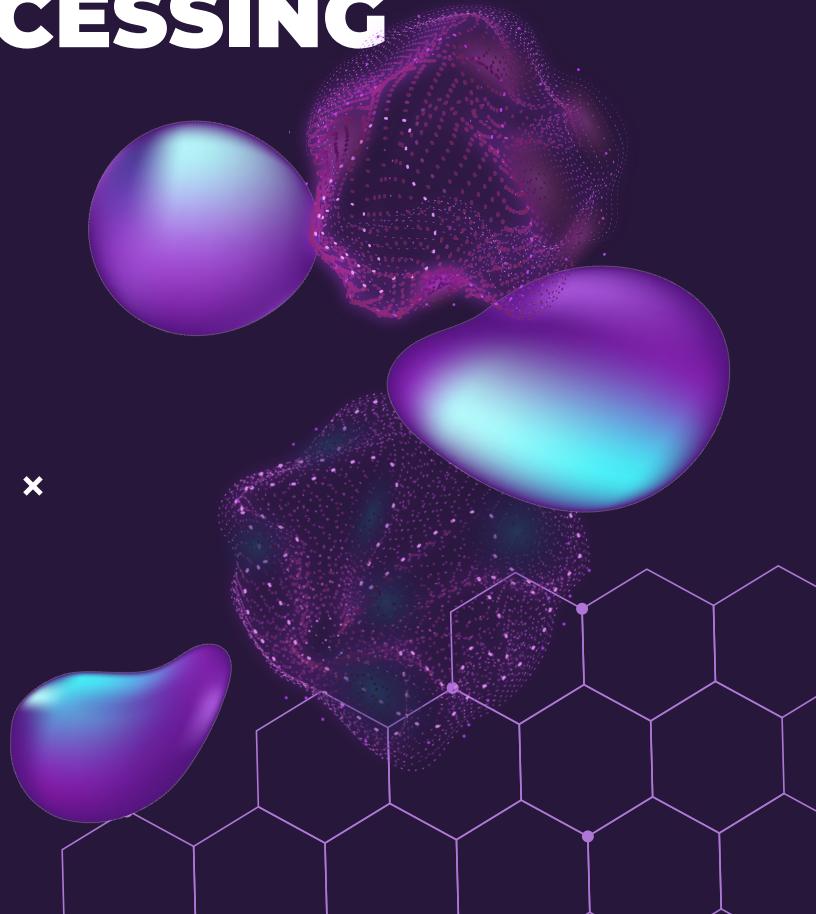
# ✗ DATA PREPROCESSING

Video data will be collected then processed:

- ◆ Video will be cut into frames
- ◆ Images will be taken from on-screen
- ◆ Labeled based on engagement scale
- ◆ Series of frames will be labeled with a set action and index

Data will then be passed through the model

✗



# REGIONS OF INTEREST



x



**FACE**



**EYES**



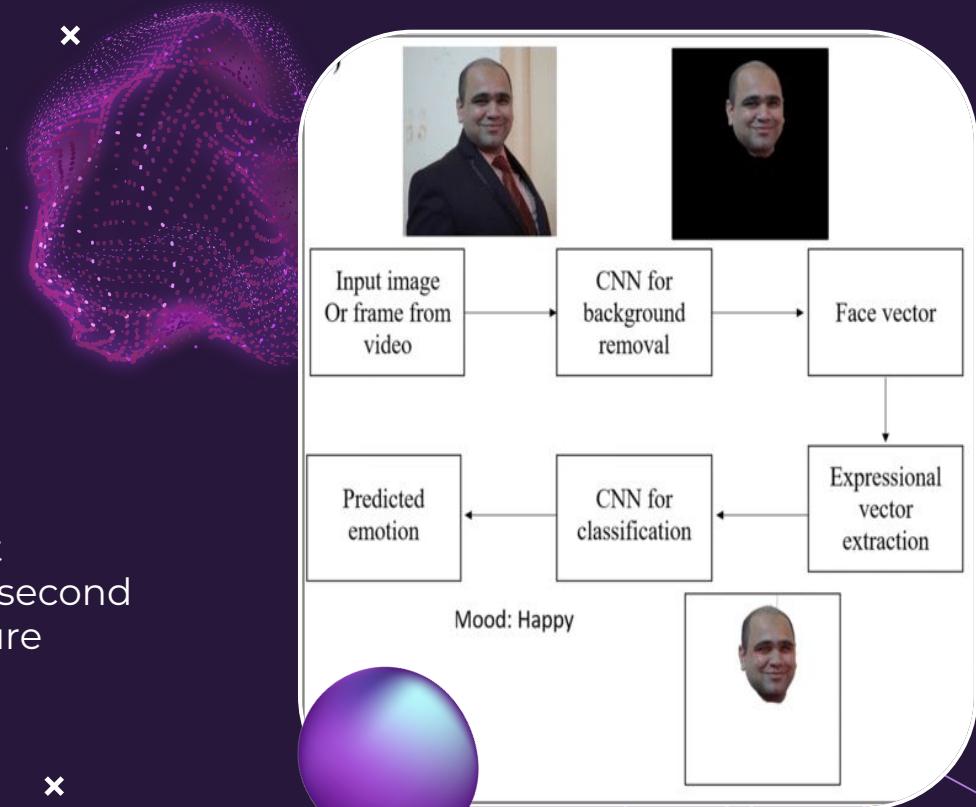
x

x

Identified to learn the intensity of the engagement and actions for classification based on facial features and movement

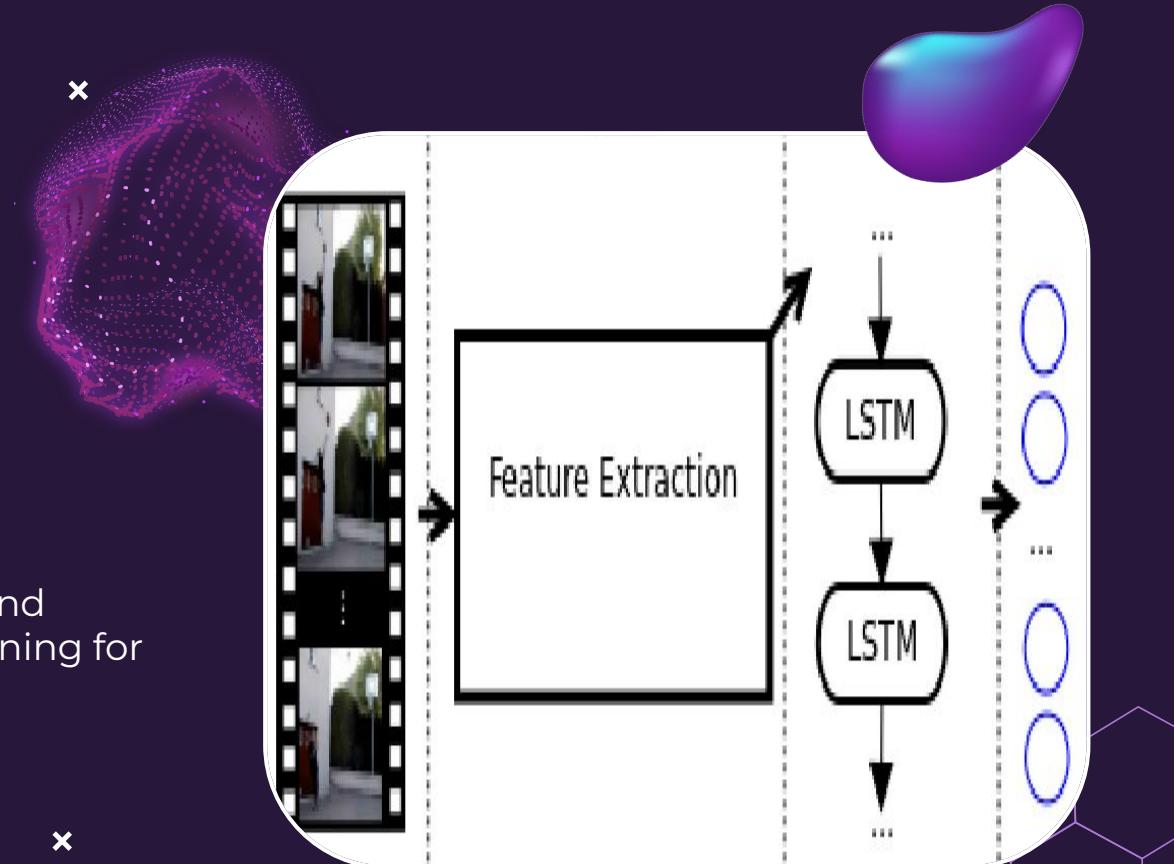
# FERC

A two-part CNN, where the first section removes noise and the second concentrates on the facial feature vector extraction.



# LSTM

LSTM is capable of long term and short term temporal event learning for action recognition.

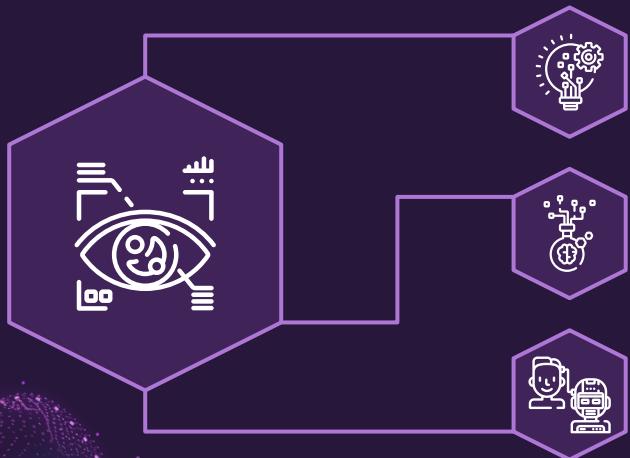


# IMPLEMENTATION

- Camera will capture an authentic image of the student
- Network will provide student's level of engagement from student actions and information present on-screen.
- This information will allow teachers to identify when student engagement decreases based on on-screen events.



# PROJECT IMPACT



**SCIENTIFIC**

Measurement of  
Student's performance

**ECONOMIC**

Public & Private schools  
and Government Grants

**EDUCATION**

Improve engagement  
to better education  
ranking

# MAJOR REQUIREMENTS

## Cameras

Logitech C920

## Computers

Logitech C920

## Database

AWS S3

## GPU

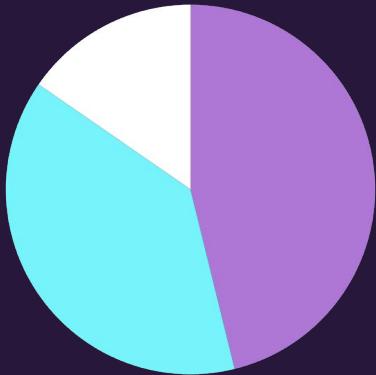
RTX 3080

## Specs

## Software

OpenCV

# COSTS



- 50%** Human Resources
- 30%** Software & Hardware
- 20%** Unexpected Costs



**307.379,87€**



**ASSEMBLE**

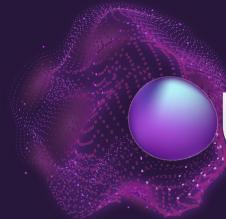


**BUILDING**



# TIMELINE





# OUR TEAM



## FABIO FIORI

Human-Computer Interaction  
University of Trento



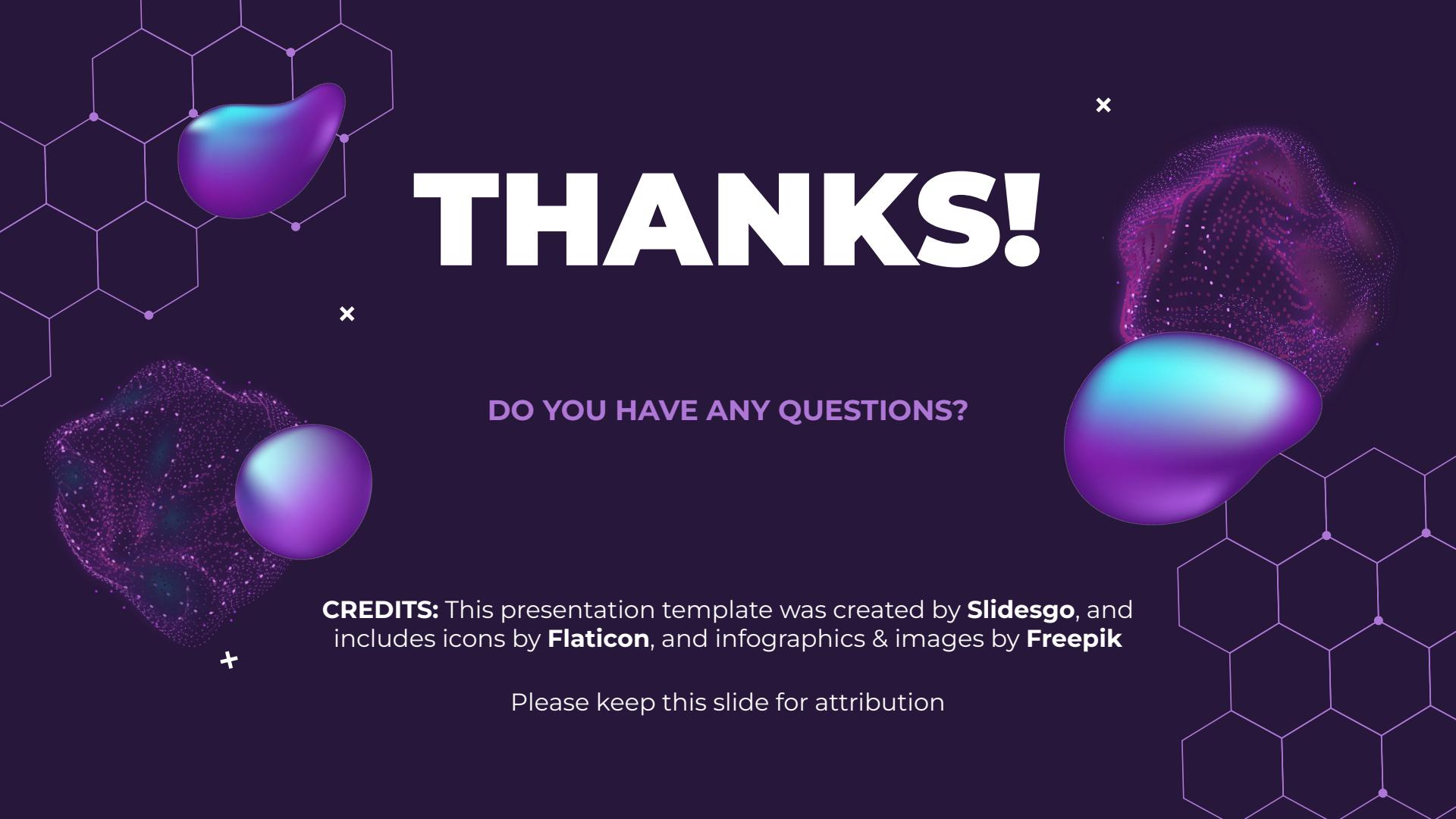
## TAYLOR LUCERO

Data Science  
University of Trento

## PALOMA DOMINGUEZ

Human-Computer Interaction  
University of Trento





# THANKS!

DO YOU HAVE ANY QUESTIONS?

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## CONSEQUENCES OF **ENGAGEMENT**

Positive achievements  
(Lei et al., 2018)

Better learning outcomes  
(Ponitz et al., 2009)

Increased curiosity and optimism  
(Fredricks et al., 2004)



## CONSEQUENCES OF **disENGAGEMENT**

A lot of boredom and frustration  
(we all know that, ∞)

Worse learning outcomes  
(Ponitz et al., 2009)

Dropout  
(Alexander et al., 1997)



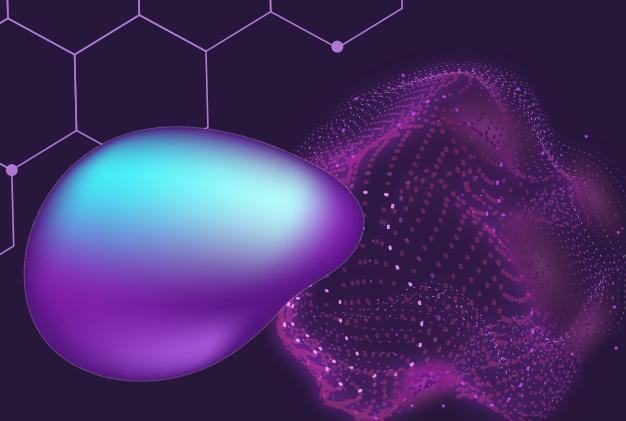
01

# THE APPROACH

??



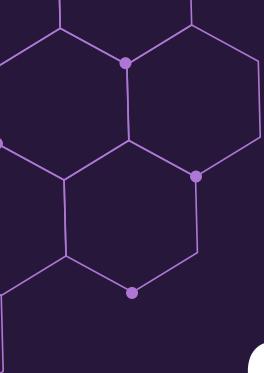
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\*

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x

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**02**

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Description of relevance (PALOMA)

**04**

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Description of timeline (PALOMA)

# OUR PROPOSAL

Mercury is the closest planet to the Sun and the smallest one in the Solar System. This planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god



# THE END

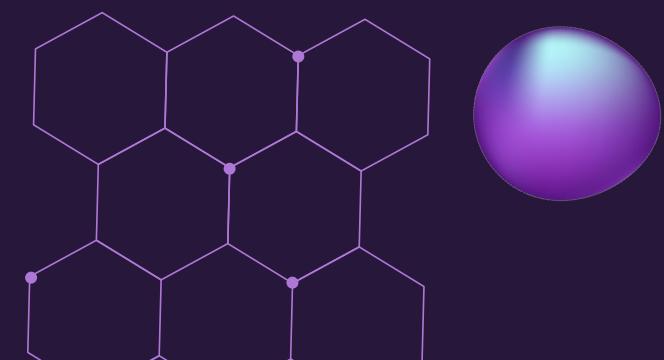
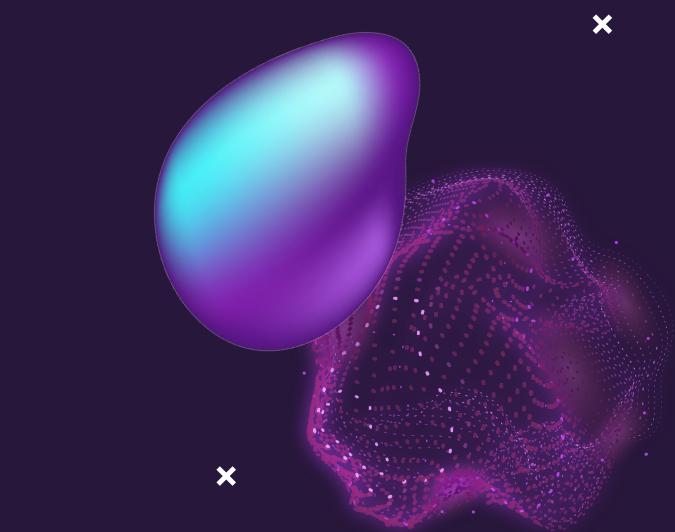
# AWESOME WORDS





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

—**SOMEONE FAMOUS**



# OUR ASPIRATIONS



x



## NOW

Earth is the third planet from the Sun and the only one that harbors life in the Solar System. This is where we all live on



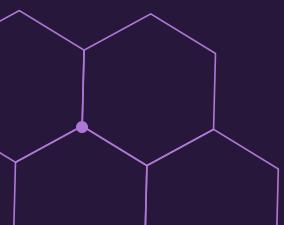
## FUTURE

Despite being red, Mars is actually a cold place. It's full of iron oxide dust, which gives the planet its reddish cast



x

x





**5,000,000**

Big numbers captivate your audience's attention

# **9h 55m 23s**

Jupiter's rotation period



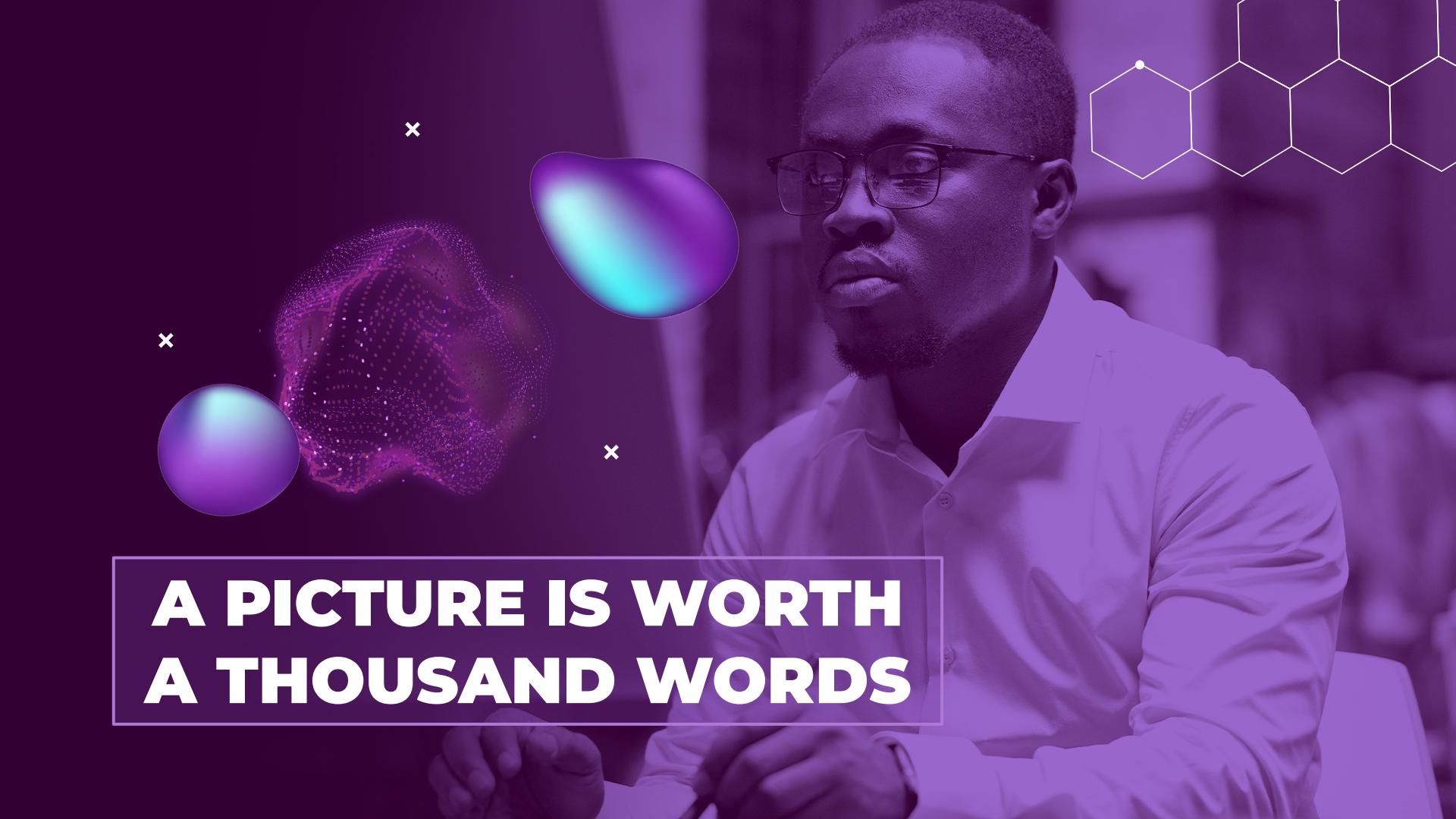
# **333,000**

The Sun's mass compared to Earth's

# **386,000 km**

Distance between Earth and the Moon



A photograph of a Black man with short hair and glasses, wearing a white lab coat, sitting in a laboratory setting. He is looking slightly to his left. Overlaid on the image are several scientific and abstract elements: a 3D wireframe model of a brain, three glowing spheres (one large blue sphere on the left, one medium purple sphere above it, and one small white sphere to the right), four small white 'x' marks scattered around the brain model, and a partial chemical structure of a polycyclic aromatic hydrocarbon (PAH) molecule in the top right corner.

**A PICTURE IS WORTH  
A THOUSAND WORDS**

# OUR NUMBERS

x



**50%**



## MANPOWER

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



**30%**



## DEVELOPMENT

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

x

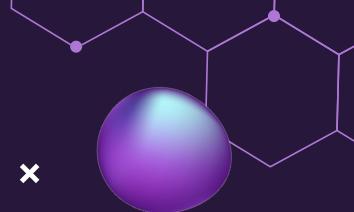


**20%**



## EXPANSION

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



# PREDICTED RESULTS

x



## 300

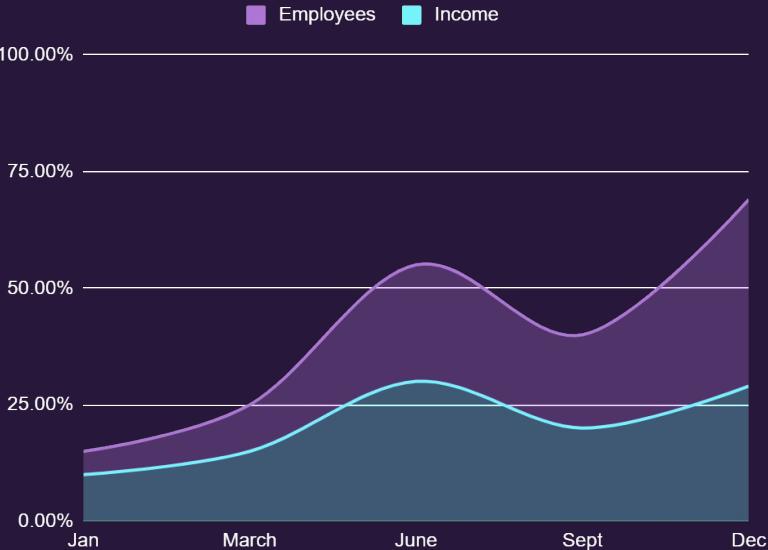
New employees next year



## \$30,000

x

Expected income for 20XX



Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

x

# AI IN A NUTSHELL

Do you know what helps you make your point crystal 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

x

x



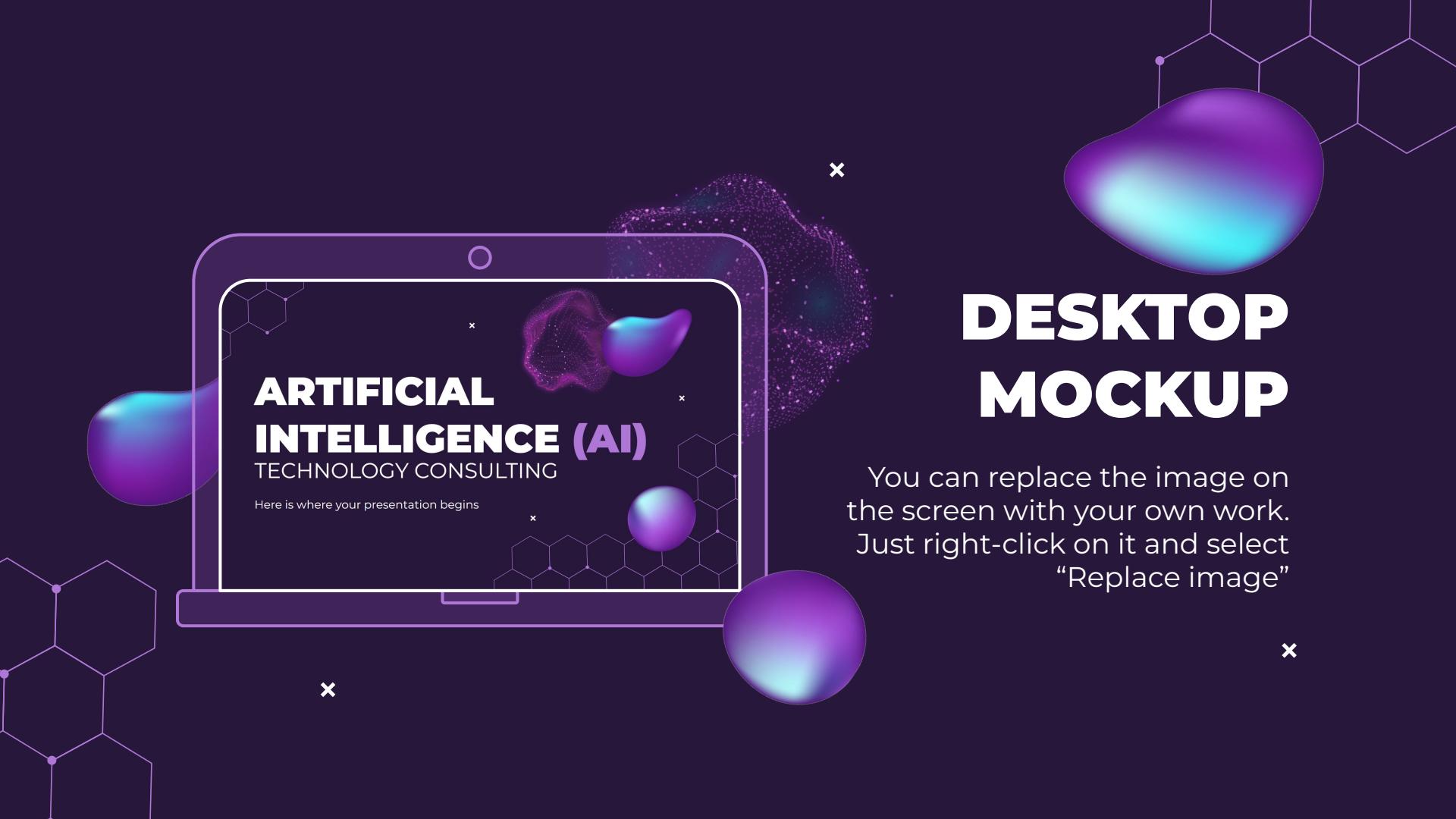
# DESKTOP MOCKUP

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## ARTIFICIAL INTELLIGENCE (AI)

TECHNOLOGY CONSULTING

Here is where your presentation begins

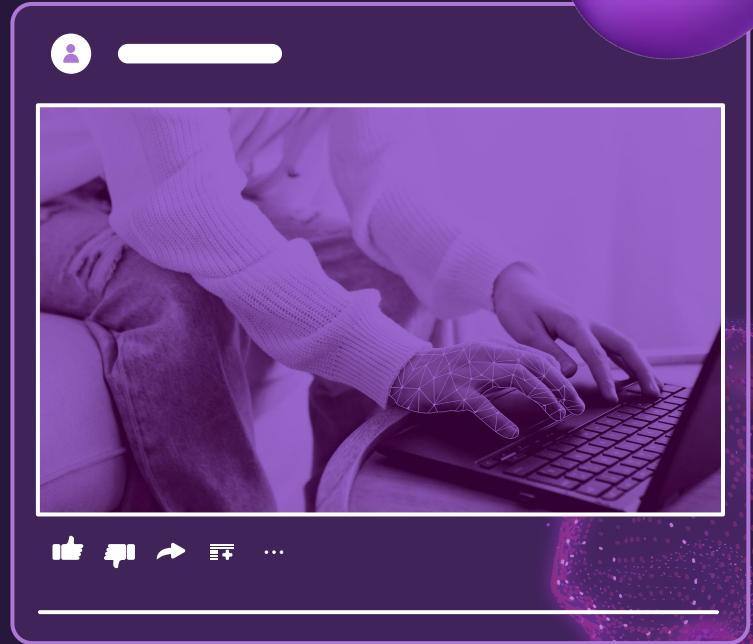




# SNEAK PEEK

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. The planet's name has nothing to do with the liquid metal, since Mercury was named after the Roman messenger god





## SNEAK PEEK

You can replace the image. Just right-click on it and select “Replace image”

# **TYPES OF AIs**

<b>NAME</b>	<b>TYPE</b>	<b>FUNCTION</b>
My Journey	Artistic	Creates images
Super Desk	Writer	Creates texts
Solver	Mathematician	Solves complex problems
Develop AI	Programmer	Programs web pages

# PROJECT STAGES

x

Venus is the second planet from the Sun

Despite being red, Mars is very cold

Jupiter was named after a Roman god



x

## STAGE 1



## STAGE 2



## STAGE 3



x



X

# OUR PARTNERS

**JOHNSON**

## The Moon is Earth's only natural satellite



**PETPER**

Jupiter doesn't have  
a solid surface

X

# TECH PEK

Earth is the planet  
where we all live

x

**DOE'S**

Mars was named after a god

# MERIDIAN

Neptune is far away  
from us

X

# OUR LOCATION



## SILICON VALLEY, SF

Despite being red, Mars is actually a cold place. It's full of iron oxide dust, which gives the planet its reddish cast



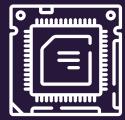
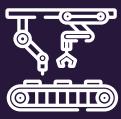


# ICON PACK

x



+

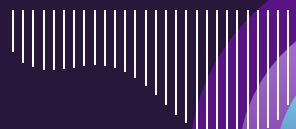
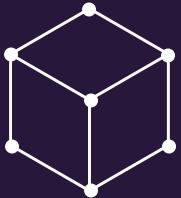


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Here's an assortment of alternative resources whose style fits the one of this creative template:

## VECTORS

- Gradient metaverse concept twitch banner



# RESOURCES

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## VECTORS

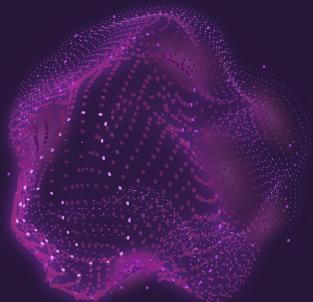
- ◆ Futuristic ai tech instagram posts collection

## ICONS

- ◆ Icon pack: Artificial intelligence

## IMAGES

- ◆ Black man working with a computer
- ◆ Male technician repairing computer motherboard on wooden desk
- ◆ Woman in dress on pink background
- ◆ Medium shot smiley man posing with glasses
- ◆ Hands typing on laptop keyboard



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Pana



Amico



Bro



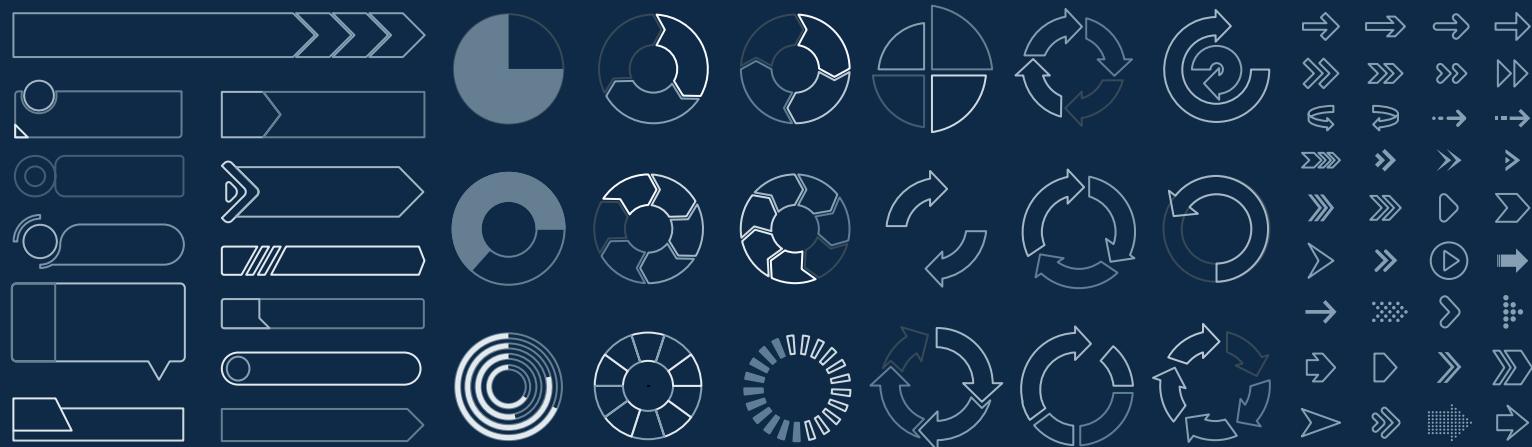
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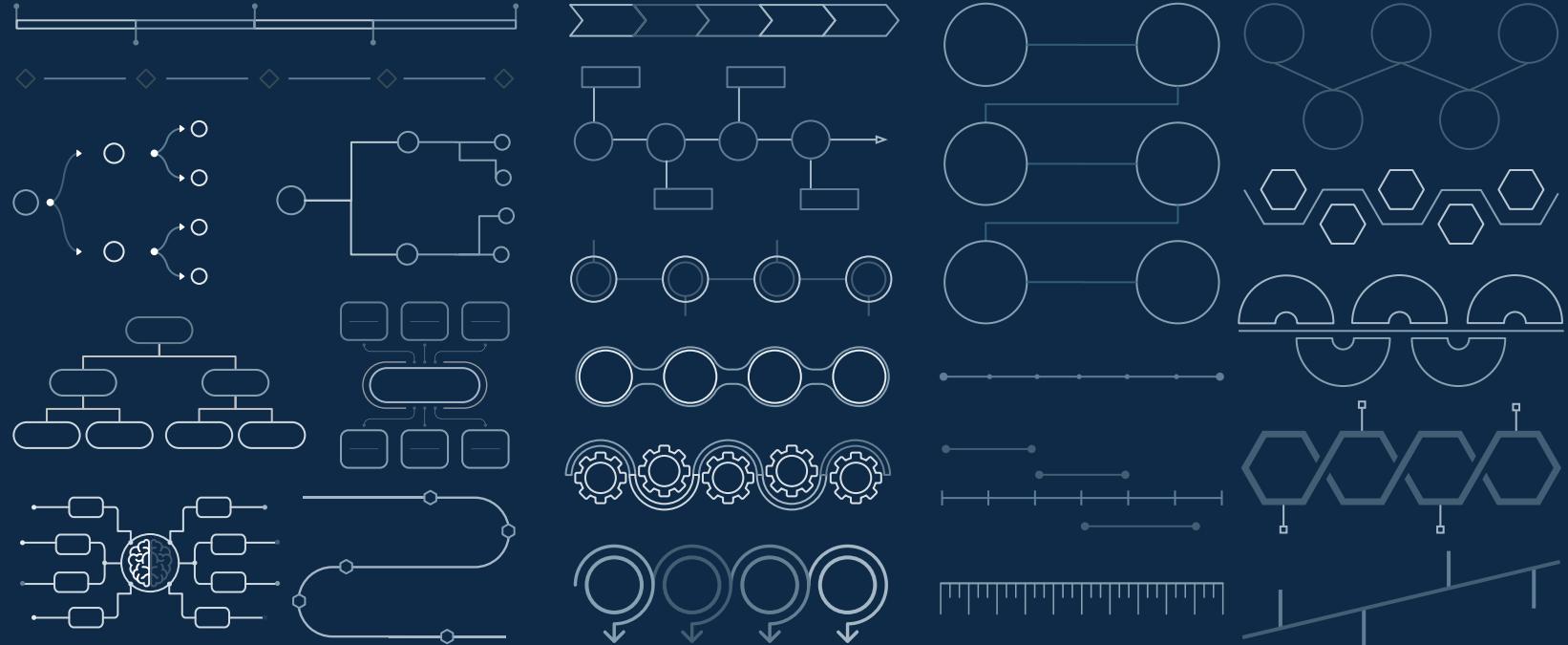
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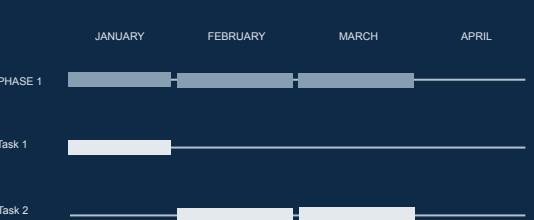
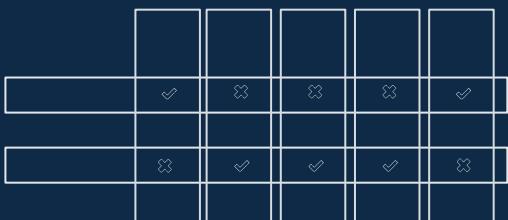
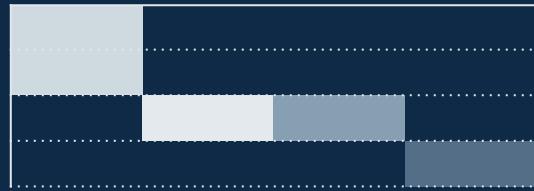
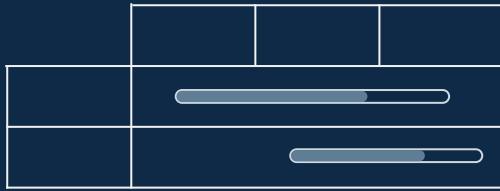
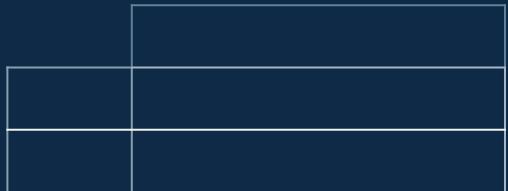
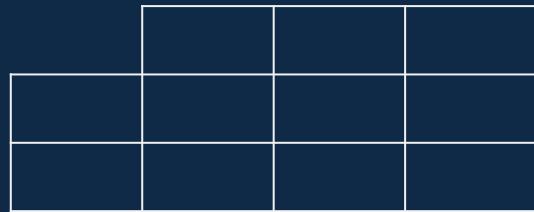
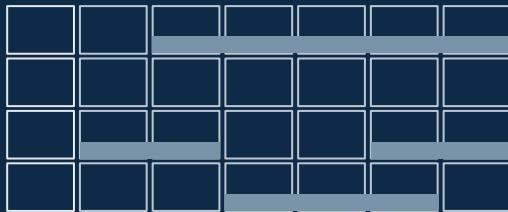
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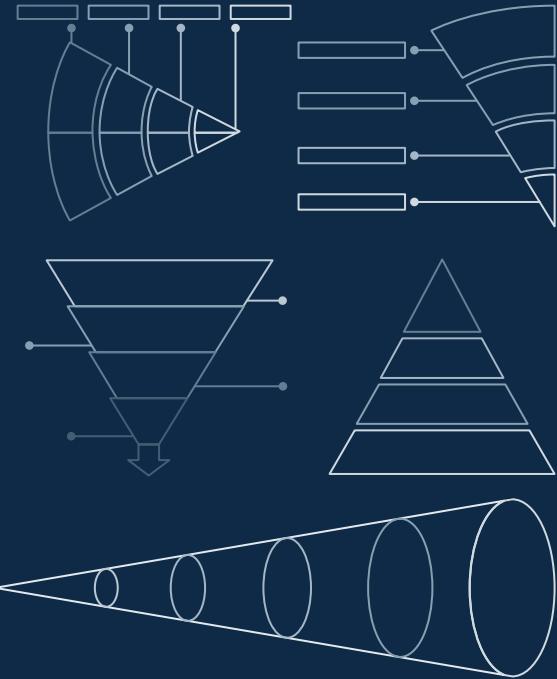
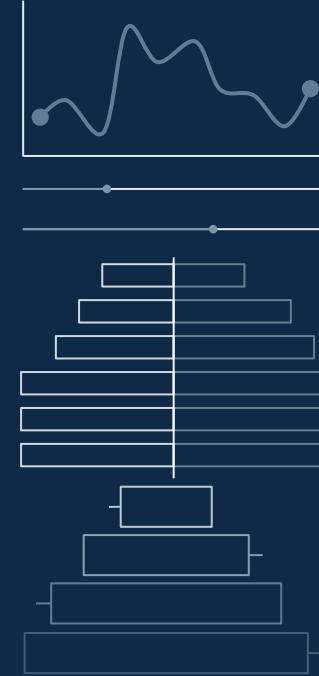
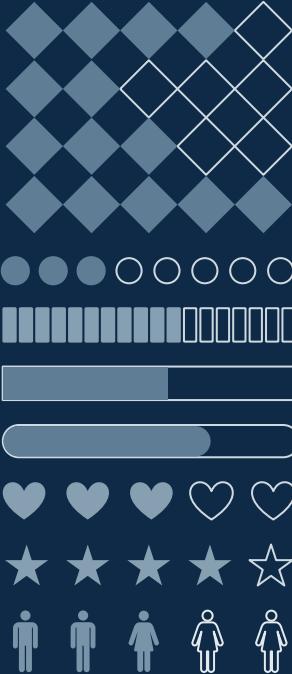
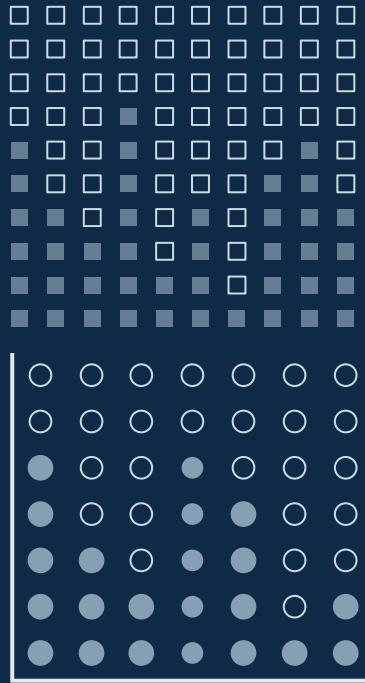












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# Educational Icons



# Medical Icons



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