ADAM: A METHOD FOR STOCHASTIC OPTIMIZATION

MID PRESENTATION

Team no -

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01
Introduction and motivation

Introduction

Optimizers are very important in the training of neural networks. After the advent of backpropagation, a lot of scientists have worked on making better and more robust optimizers, to make the training of neural networks faster and better. Various famous optimizers have been developed so far. Some being -

- SGD
- Momentum
- Nesterov Accelerated GD
- ADAGRAD
- ADADELTA
- RMSprop
- ADAM

We will be talking about ADAM. It was proposed in 2015, and combines the advantages of RMSprop and Adagrad.

Previous work

Before jumping into ADAM, we will give a brief about other optimizers.

- Momentum - In this optimiser, a term called momentum would is added that accounts for previous steps in the current step. It is such that more recent steps are given an exponentially higher weight than less recent steps.

$$v = \gamma . v + \eta . \nabla_\theta J(\theta)$$
$$\theta = \theta - \alpha\, v$$

- Nesterov Accelerated Gradient - In this one, an acceleration term is added along with momentum. This was done because sometimes outliers in a data set would be completely ignored by the momentum optimiser, simply because the sum of all the steps before it would overpower it. This was solved by adding an acceleration term.

$$v = \gamma . v + \eta . \nabla_\theta J(\theta - \gamma . v)$$
$$\theta = \theta - \alpha\, v$$

Previous work

Before jumping into ADAM, we will give a brief about other optimizers.

- Adagrad - Previous optimisers had fixed learning rates for each parameter.This optimiser was made to allow for adaptive learning rates for each parameter. That is, with this optimiser, you are creating more degrees of freedom for your learner, as it can have different learning rates for different parameters.

$$\theta_{t+1,i} = \theta_{t,i} - \frac{\eta}{\sqrt{G_{t,ii}} + \epsilon} \nabla_{\theta_{t,i}} J(\theta_{t,i})$$

$$G_{t,ii} = G_{t-1,ii} + \nabla^2_{\theta_{t,i}} J(\theta_{t,i})$$

- AdaDelta - The problem with adaGrad is that, is that the G term is monotonically increasing, so eventually, the model learns slower every step it takes, and eventually just stops moving. Ada Delta solves this by added a weight to the G term, that reduces the influence of previous steps in G exponentially. This weight is gamma in the below equations.

$$\theta_{t+1,i} = \theta_{t,i} - \frac{\eta}{\sqrt{E\left[G_{t,ii}\right] + \epsilon}} \nabla_{\theta_{t,i}} J(\theta_{t,i})$$

$$G_{t,ii} = \gamma G_{t-1,ii} + (1-\gamma) \nabla^2_{\theta_{t,i}} J(\theta_{t,i})$$

ADAM

Adam adds onto AddaDelta by accounting for momentum, but using the expected value of past gradients.

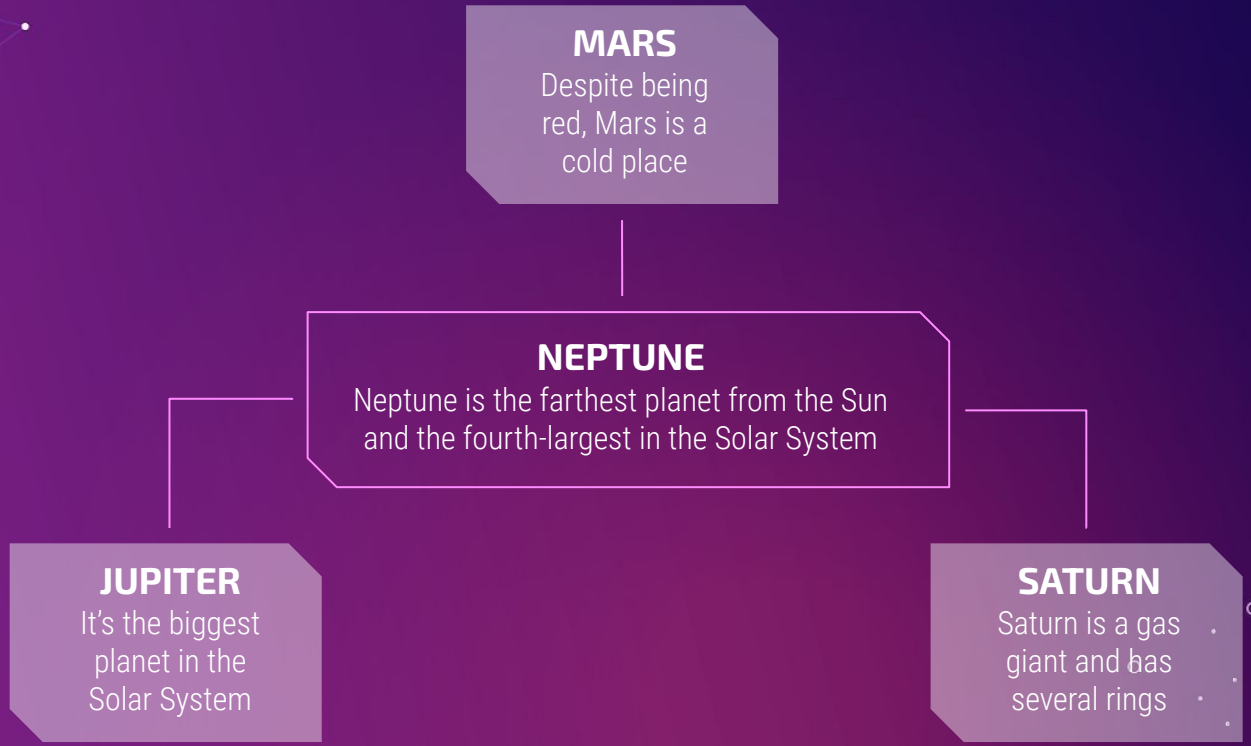
$$\theta_{t+1,i} = \theta_{t,i} - \frac{\eta}{\sqrt{E[G_{t,ii}] + \epsilon}} \times \mathrm{E}[g_{t,i}]$$

$$G_{t,ii} = \gamma G_{t-1,ii} + (1-\gamma)\nabla^2_{\theta_{t,i}} J(\theta_{t,i})$$

$$\mathrm{E}[g_{t,i}] = \beta E[g_{t-1,i}] + (1-\beta)\nabla_{\theta_{t,i}} J(\theta_{t,i})$$

In essence, Adam uses exponentially moving averages on the gradient and the square of the gradient, which is evaluated on mini-batches.

2nd ANNOUNCEMENT



02

IN DEPTH

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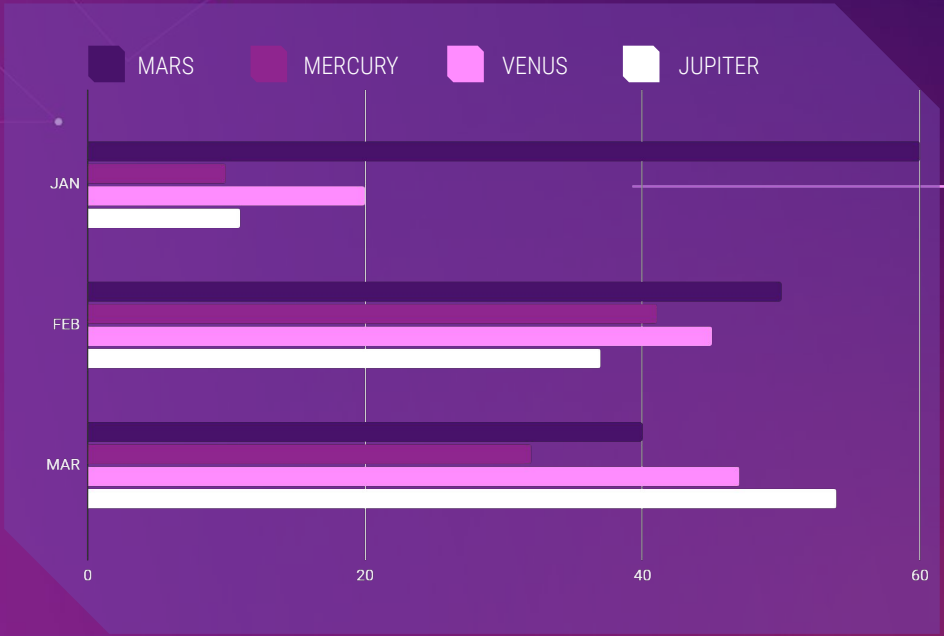
IN DEPTH

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

IN DEPTH



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VENUS

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot—even hotter than Mercury—and its atmosphere is extremely poisonous

OUR NUMBERS

500 new clients last semester

100 ongoing projects

40 new employees last semester

SECTOR NEWS

VENUS

Venus has a beautiful name and is the second planet from the Sun. It’s terribly hot, even hotter than the other planets

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

MARS

SATURN

Yes, this is the ringed one. It’s a gas giant, composed mostly of hydrogen and helium. It’s named after the Roman god

03

DELIVERABLES

You can enter here a subtitle if you need it

04

WORK DONE SO FAR

You can enter here a subtitle if you need it

05

TIMELINE

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NEWS

NEPTUNE

Neptune is the farthest planet from the Sun

MARS

Despite being red, Mars is actually a cold place

MERCURY

Mercury is the smallest one in the whole Solar System

JUPITER

Jupiter is the fourth-brightest in the Solar System

VENUS

Venus has a beautiful name and is terribly hot as well

SATURN

Yes, Saturn is the ringed planet. It's a gas giant

CUSTOMER REVIEWS

"Neptune is the farthest planet from the Sun and the fourth-largest planet in the Solar System!"

RICHARD ROE

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

HELENA PATTERSON

THIS IS A TABLE

	ISSUE 1	ISSUE 2	ISSUE 3	ISSUE 4
VENUS	12	32	23	45
MERCURY	67	23	45	65
MARS	67	49	78	34

WELCOME!

MARY RUIZ

Neptune is the farthest planet from the Sun and the fourth-largest

JOHN SMITH

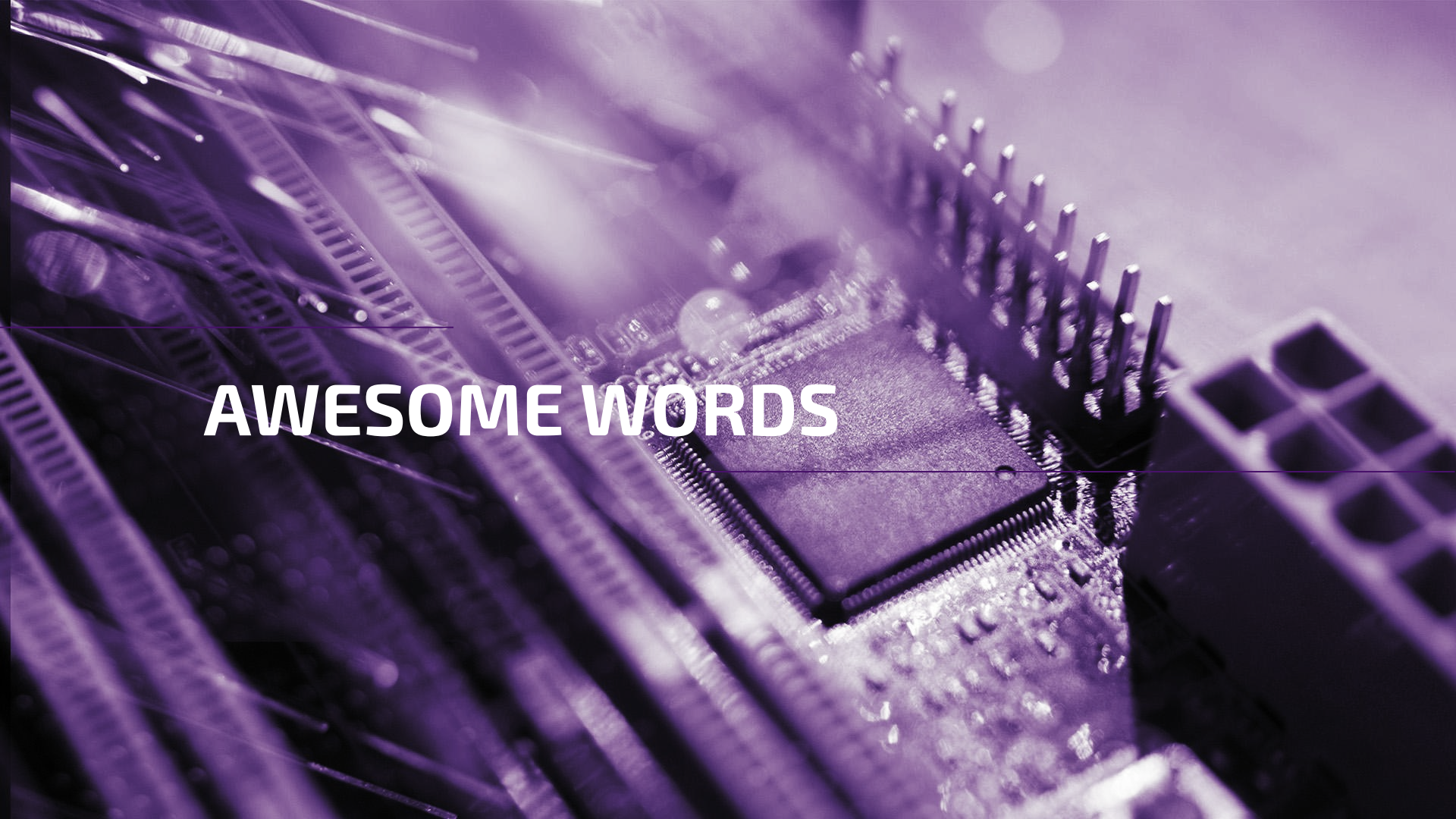
Despite being red, Mars is a cold place. It's full of iron oxide dust

JONATHAN DOE

Mercury is the closest planet to the Sun and the smallest one

MINA HAWKINS

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


AWESOME WORDS

REVIEW OF PAST EVENTS

JAN 14

It is the closest planet to the Sun and the smallest

FEB 02

Despite being red, Mars is actually a very cold place

MAR 10

Saturn is composed of hydrogen and also helium

APR 16

Jupiter is the biggest planet in the Solar System

MAY 30

Neptune is the farthest planet from the Sun

UPCOMING EVENTS

SEP 08

Mercury is the closest planet to the Sun

OCT 16

Despite being red, Mars is a cold place

NOV 29

Saturn is a gas giant and has several rings

DEC 10

Jupiter is the biggest planet in the Solar System

06

SNEAK PEEK

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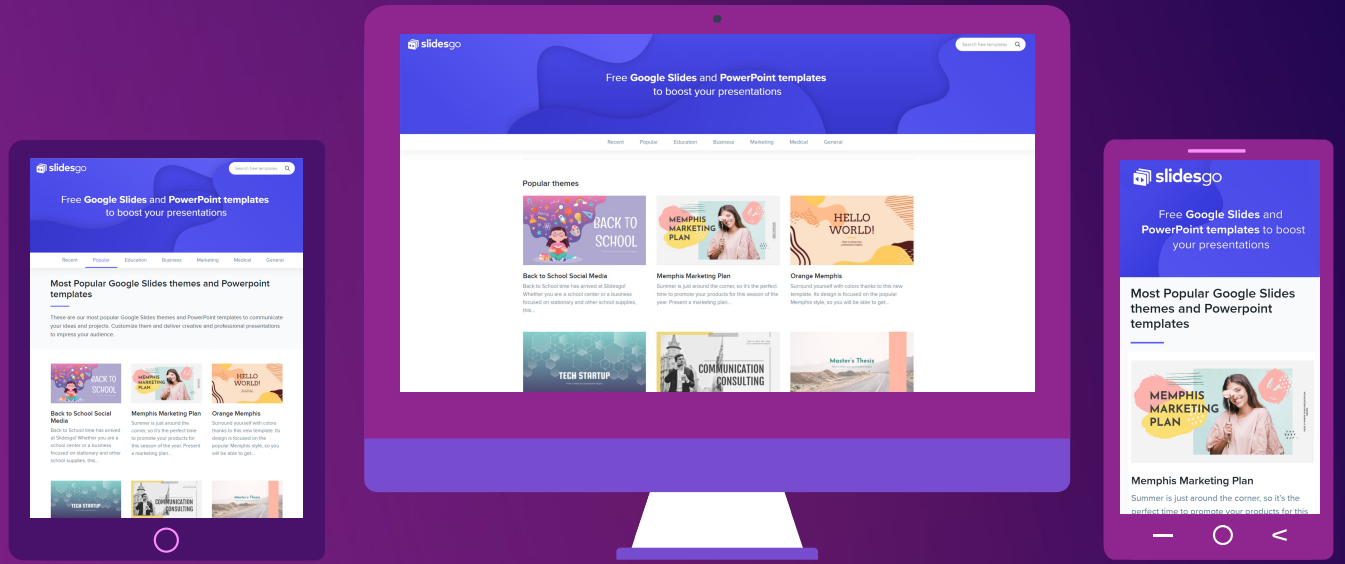
SNEAK PEEK



Neptune is the farthest planet from the Sun and the fourth-largest in the Solar System

THANKS

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- Portrait of smiling man holding digital tablet looking at camera
- Smiling bearded man holding disposable coffee cup while opening door
- Portrait of pretty woman holding laptop looking at camera
- Motherboard with optical fiber
- Futuristic technology screen interface
- Front view of businessman holding high tech tablet
- Businessman holding the newspaper and smiling
- Multiracial group of cheerful coworkers
- Happy young couple exchanging love messages
- Smiling business people team sitting around the table in the meeting

VECTORS

- Technology background with gradient colors
- Blue 5g concept background
- Abstract landing pages with technology devices

PREMIUM ICONS

- Big Data Icon pack

PREMIUM PHOTOS

- Short haired business woman laughing

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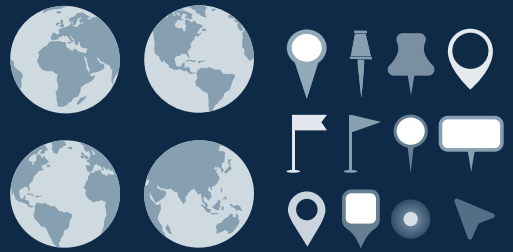

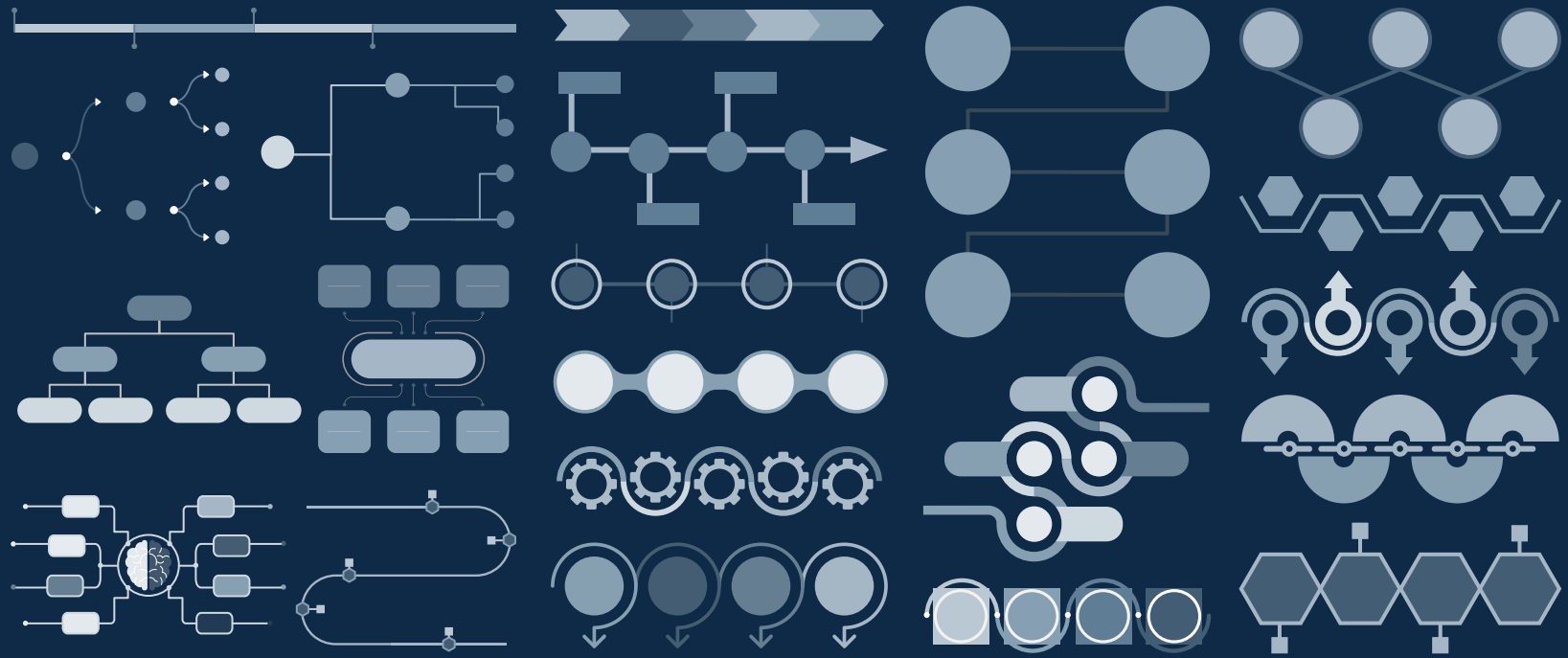

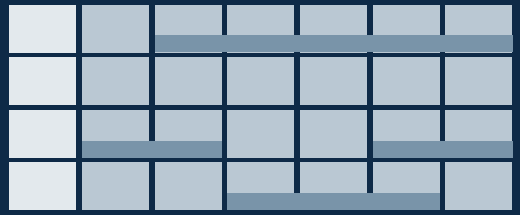

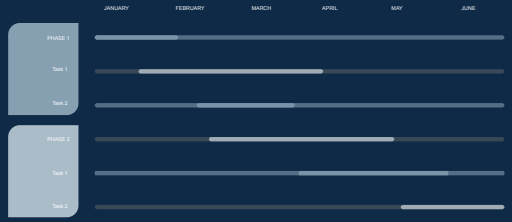
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FEBRUARY
MARCH
APRIL
MAY
JUNE
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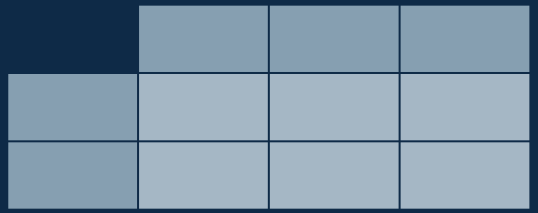
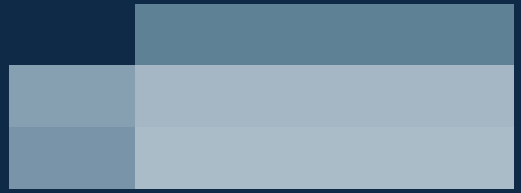
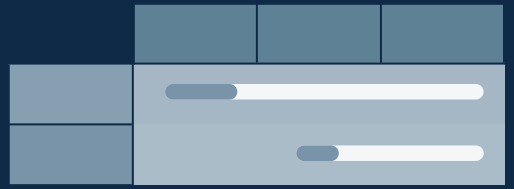
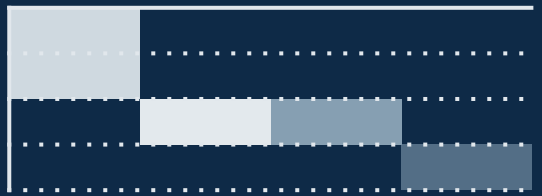
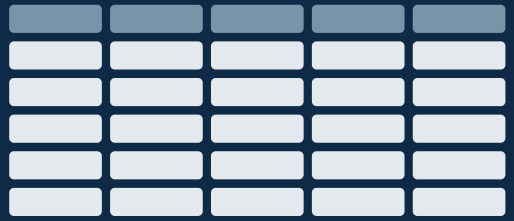
Task 1
Task 2
PHASE 2
Task 1
Task 2

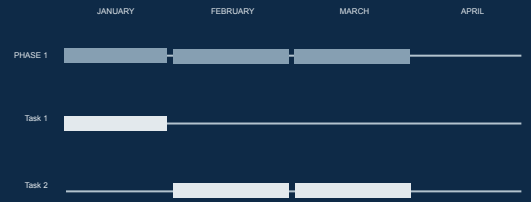








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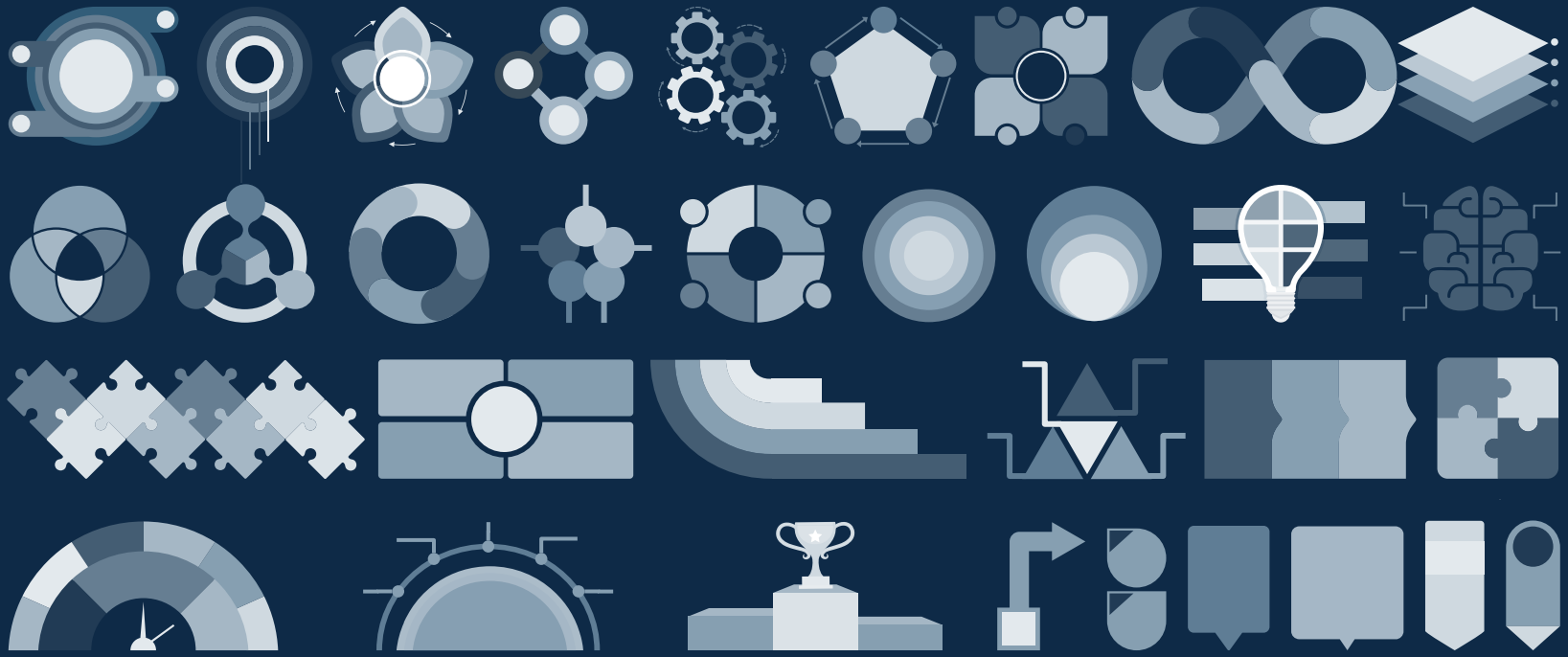

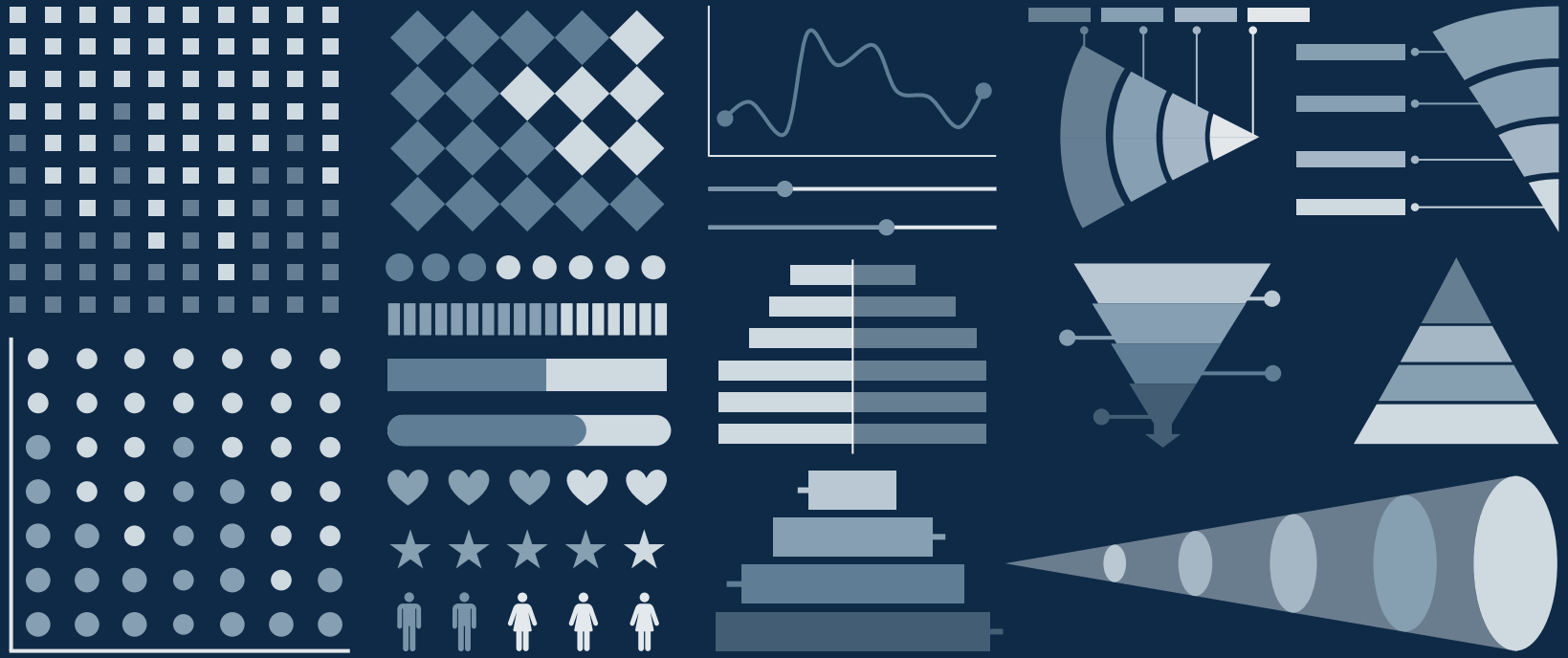

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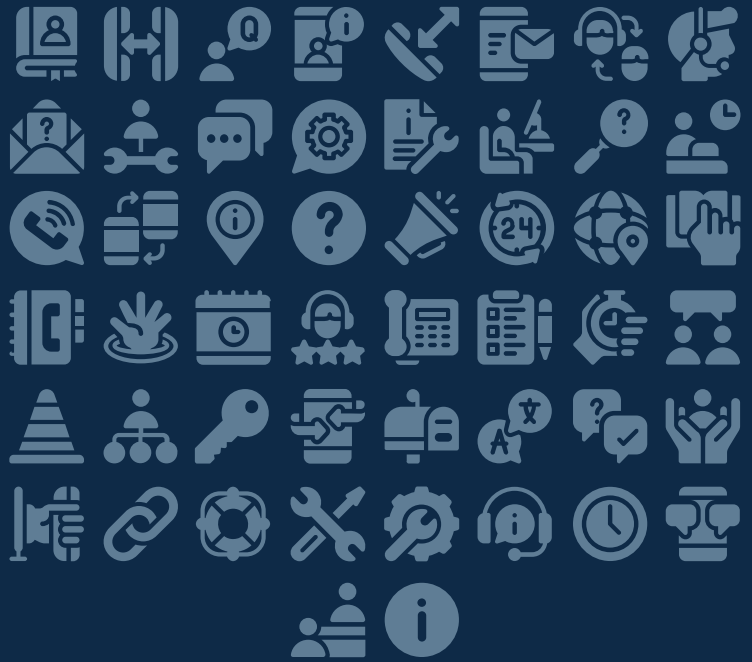

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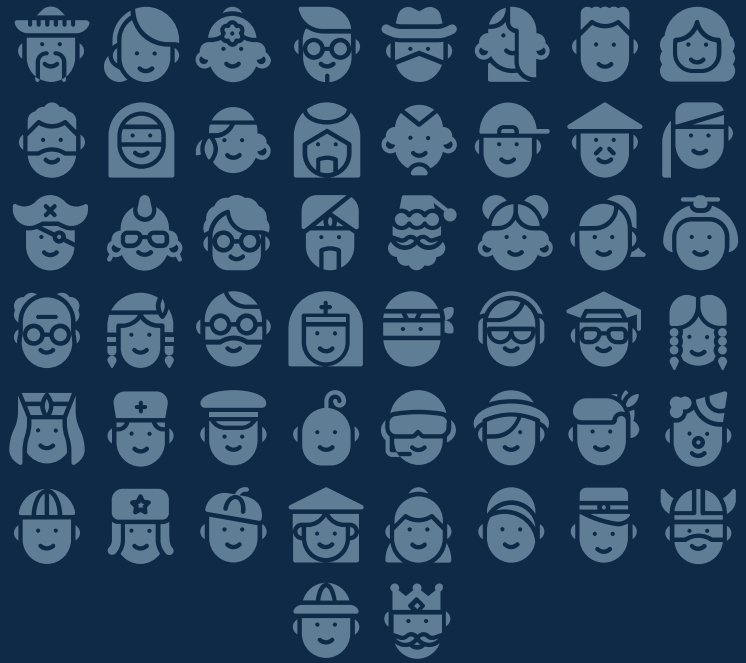

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