

Autonomous Greenhouse Control

An RL approach to controlling and monitoring greenhouses by Team Parshuram. (Kaushal, Arpit, Vyoma, Pathik)



AGC & Monitoring

Autonomous Greenhouse Control & Monitoring is a reinforcement learning powered solution to manage greenhouses, increase their efficiency and monitor their environment.



01

INTRODUCTION

What is AGC? Why AGC? How AGC?

03

CREATING A SOLUTION AND BUILDING A PRODUCTION READY PIPELINE

02

RESEARCH AND DEVELOPMENT WORK

04

PRODUCT DEMO

01

...

INTRODUCTION

A small action for a robot, a
huge leap for plants? 🌱



What is AGC?

Autonomous Greenhouse Control is a research area where we find different ways to control greenhouses autonomously

How AGC?

Using predetermined algorithms, machine learning approaches & reinforcement learning.

Why AGC?

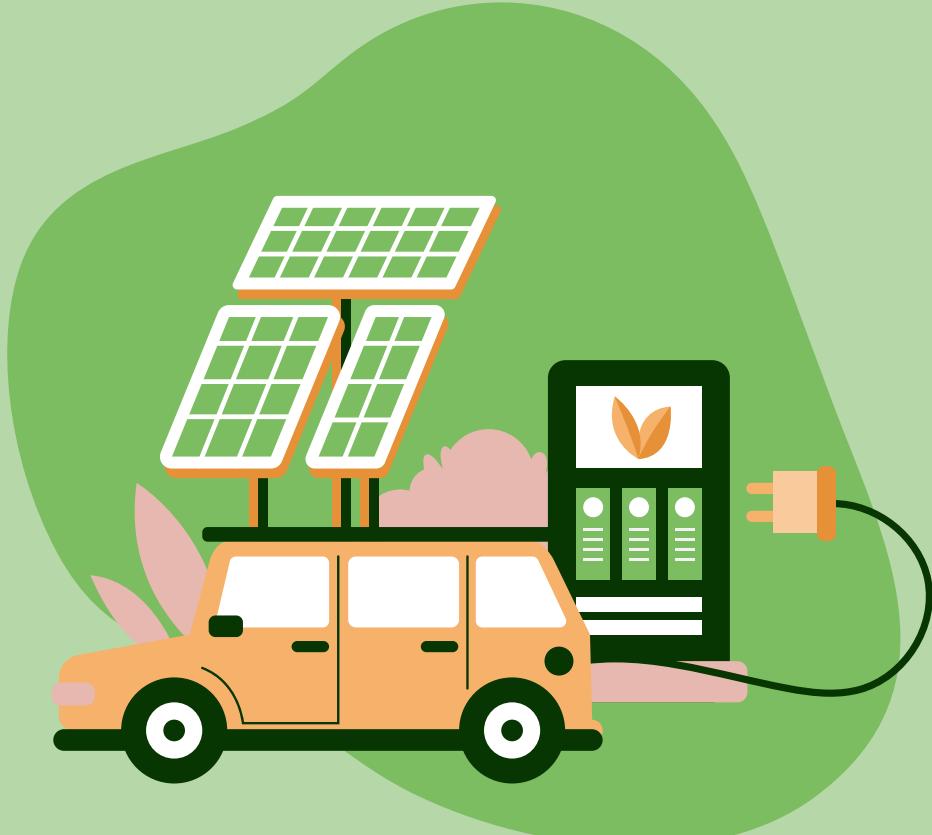
- Reduces load of growers
- Increase produce quality and quantity



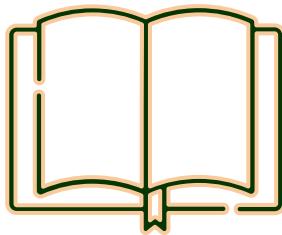
02

RESEARCH AND DEVELOPMENT WORK

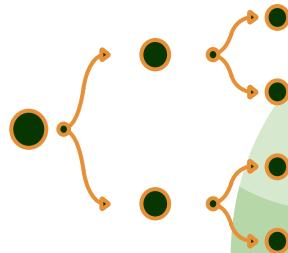
Can robots grow plants?
Robot Farmers? 



Our Research And Development



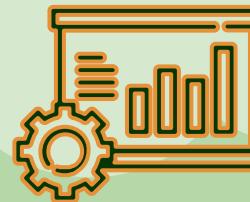
Studying AGC 2 Datasets



Creating Environment and
Training DQN Agent



Formulating problem as an RL problem

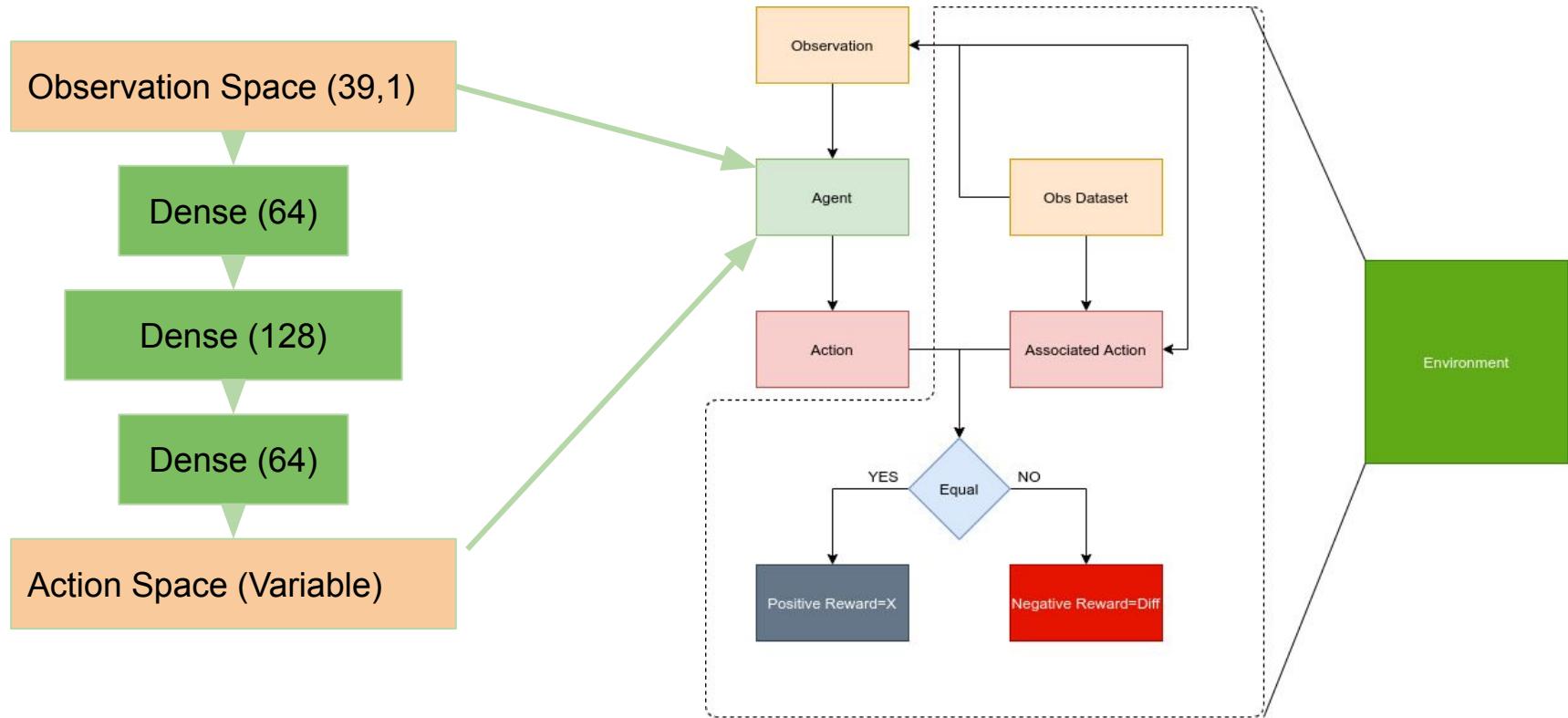


Monitoring Metrics and
Rewards and Selecting Best
Models

Dataset

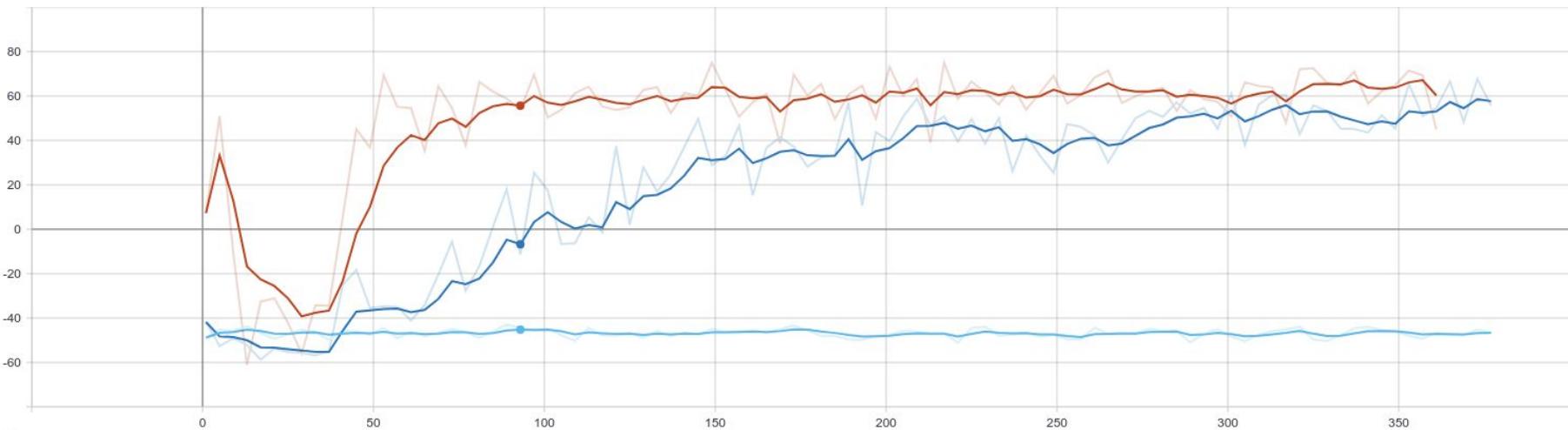
obs[0].head(10)	%time	AssimLight	BlackScr	CO2air	Cum_irr	EC_drain_PC	EnScr	HumDef	PipeGrow	PipeLow	...	Acid	%Juice	Bite	Weight	DMC_fruit	Stem_elong	Stem_thick	Cum_trusses	stem_dens
.000000	0.0	35.0	474.0	0.2		1.9	96.0	7.1	71.000000	58.400002	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.003906	0.0	85.0	470.0	0.3		1.9	96.0	7.0	55.900002	57.500000	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.007812	0.0	96.0	482.0	0.3		1.9	96.0	7.1	53.099998	62.299999	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.011719	0.0	96.0	472.0	0.3		1.9	96.0	6.8	70.000000	60.099998	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.015625	0.0	96.0	469.0	0.3		1.9	96.0	6.7	69.300003	57.000000	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.015625	0.0	96.0	479.0	0.3		1.9	96.0	7.4	57.000000	54.200001	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.019531	0.0	96.0	487.0	0.3		1.9	96.0	6.5	48.299999	51.900002	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.023438	0.0	96.0	485.0	0.3		1.9	96.0	6.9	59.500000	49.900002	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.027344	0.0	96.0	483.0	0.3		1.9	96.0	7.3	69.400002	47.900002	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6
.031250	0.0	96.0	476.0	0.3		1.9	96.0	6.6	63.400002	46.599998	...	13.3	68.0	193.0	9.5	8.77	15.0	8.0	1.0	2.6

Our Approach



Metrics

reward_avg
tag: reward_avg



Name	Smoothed	Value	Step	Time	Relative
reward_max	-45.23	-44.54	93	Wed Apr 14, 11:10:08	7s
AGCRL-Team0_AssimLogs	-6.775	-11.4	93	Wed Apr 14, 09:30:11	8m 47s
reward_min	55.64	53.93	93	Wed Apr 14, 10:25:56	9m 49s

03

• • •
CREATING A SOLUTION AND
BUILDING A PRODUCTION
READY PIPELINE

I need to pay robots who farm,
hence I should monitor their
performance 🤔



OUR SOLUTIONS

Integration of Dynamic Metric Monitoring System with Tableau using PostgreSQL on AWS RDS

Tableau Integration



Created an API (using FastAPI) that interacts with created Environment and Agent. Deployed on AWS EC2

Backend API to interact with Simulation and Agent



Built an Environment and Agent Metric Monitoring System using Dash Python, Plotly deployed on EC2

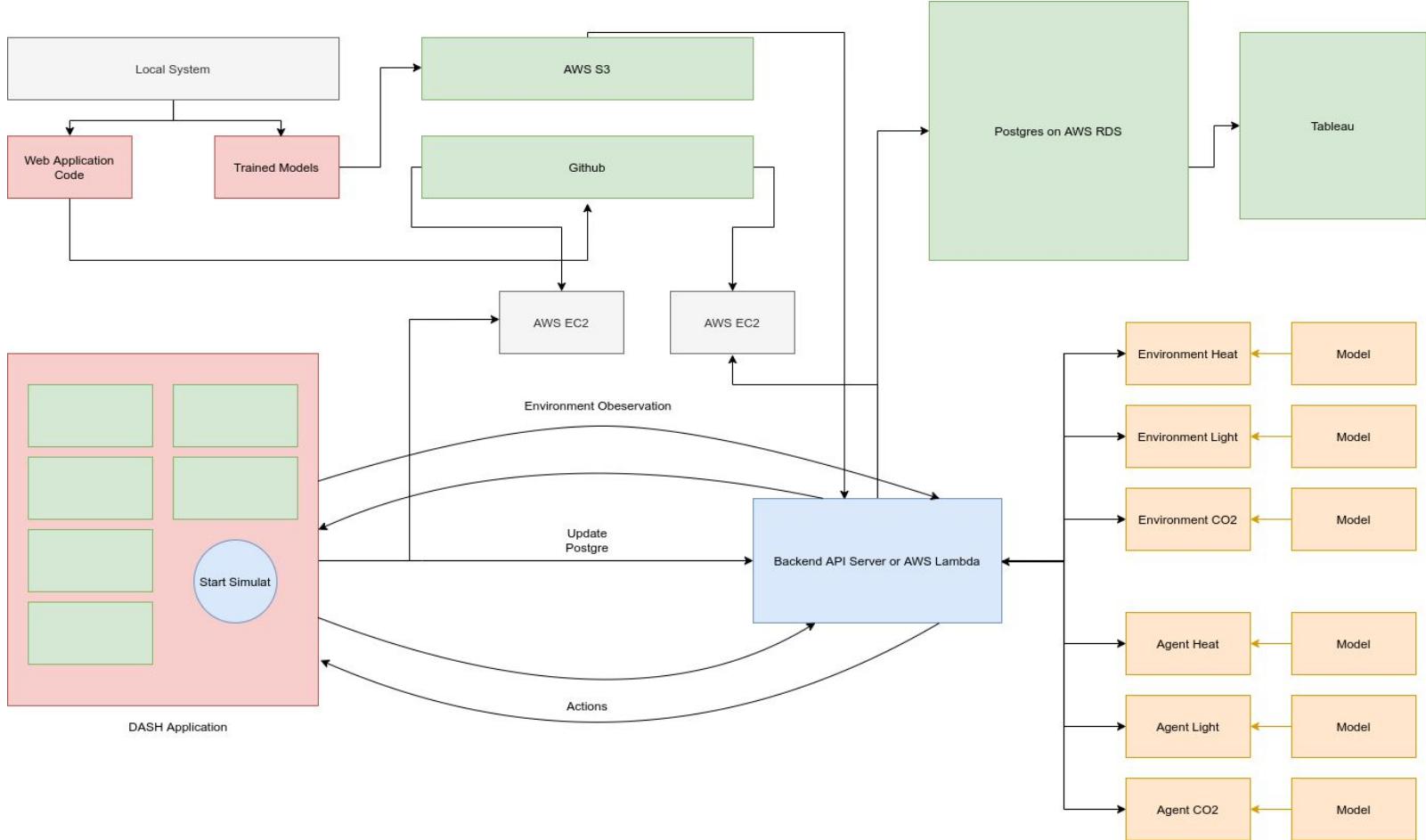
Environment and Agent Monitoring System



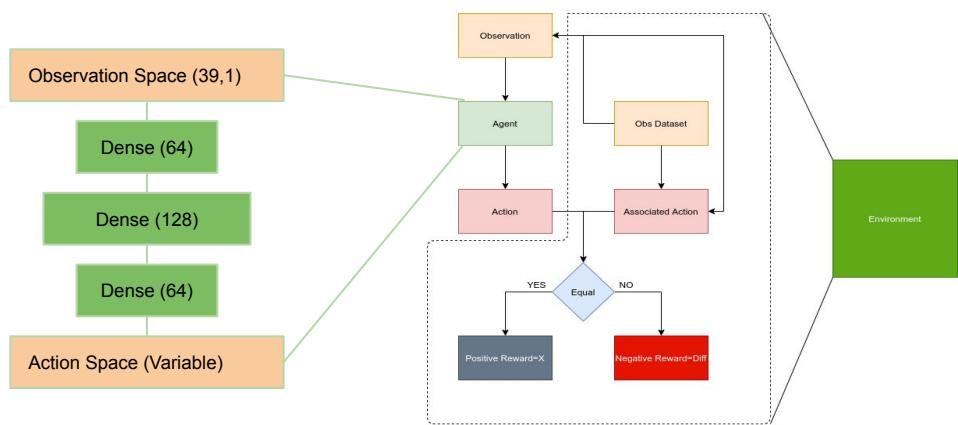
It's the farthest planet from the Sun and the fourth-largest in our Solar System

Greenhouse Simulation Environment & Agent

PIPELINE



Greenhouse Simulation and Agent



Backend API

Root

GET / Read Root

Light Simulation

POST /light/predict Predict

POST /light/environment Assim Env

GET /light/reset Reset Assim Env

GET /light/reset_team Reset Assim Env Team

POST /light/teamnindex Set Teamnindex

GET /light/randomstep Randomstep

GET /light/updatetableau Updatetableau

Water Simulation

POST /water/predict Predict

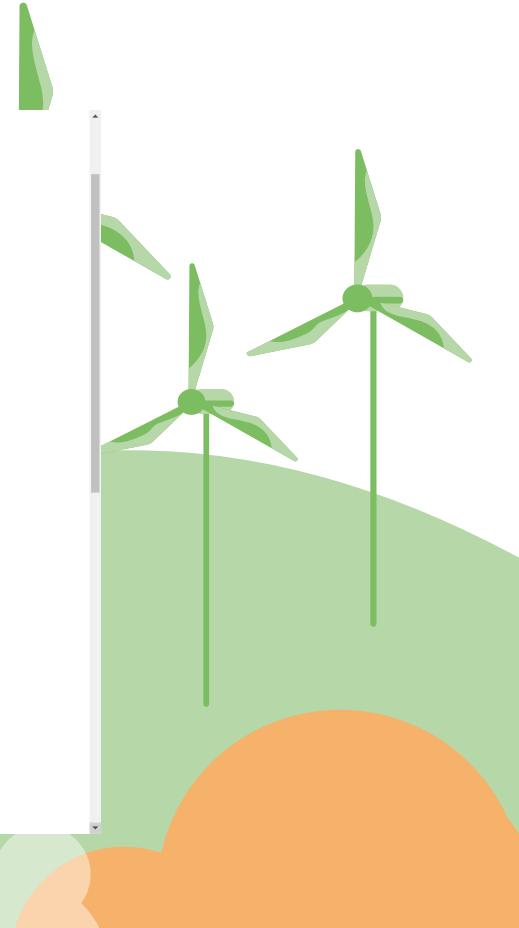
POST /water/environment Water Env

GET /water/reset Reset Water Env

GET /water/reset_team Reset Water Env Team

POST /water/teamnindex Set Teamnindex

GET /water/randomstep Randomstep



Environment and Agent Monitoring System

START SIMULATION STOP SIMULATION RESET SIMULATION RESET TEAM Light 0 2 UPDATE TABLEAU

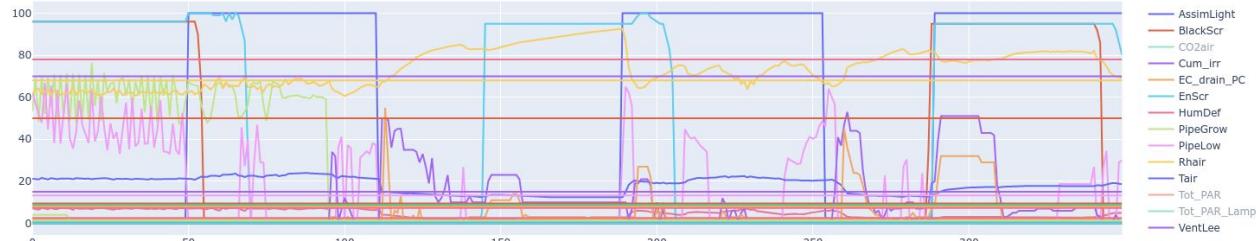
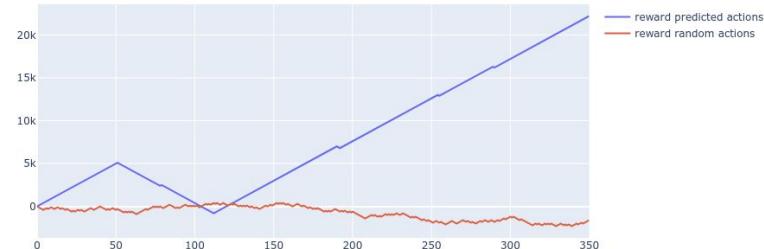
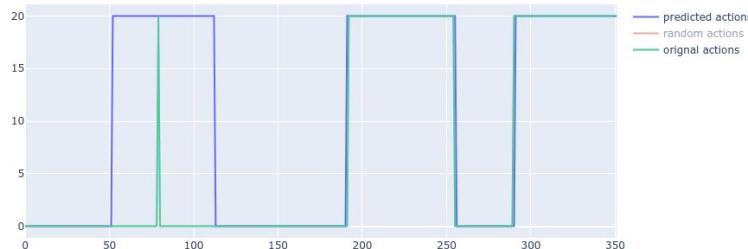
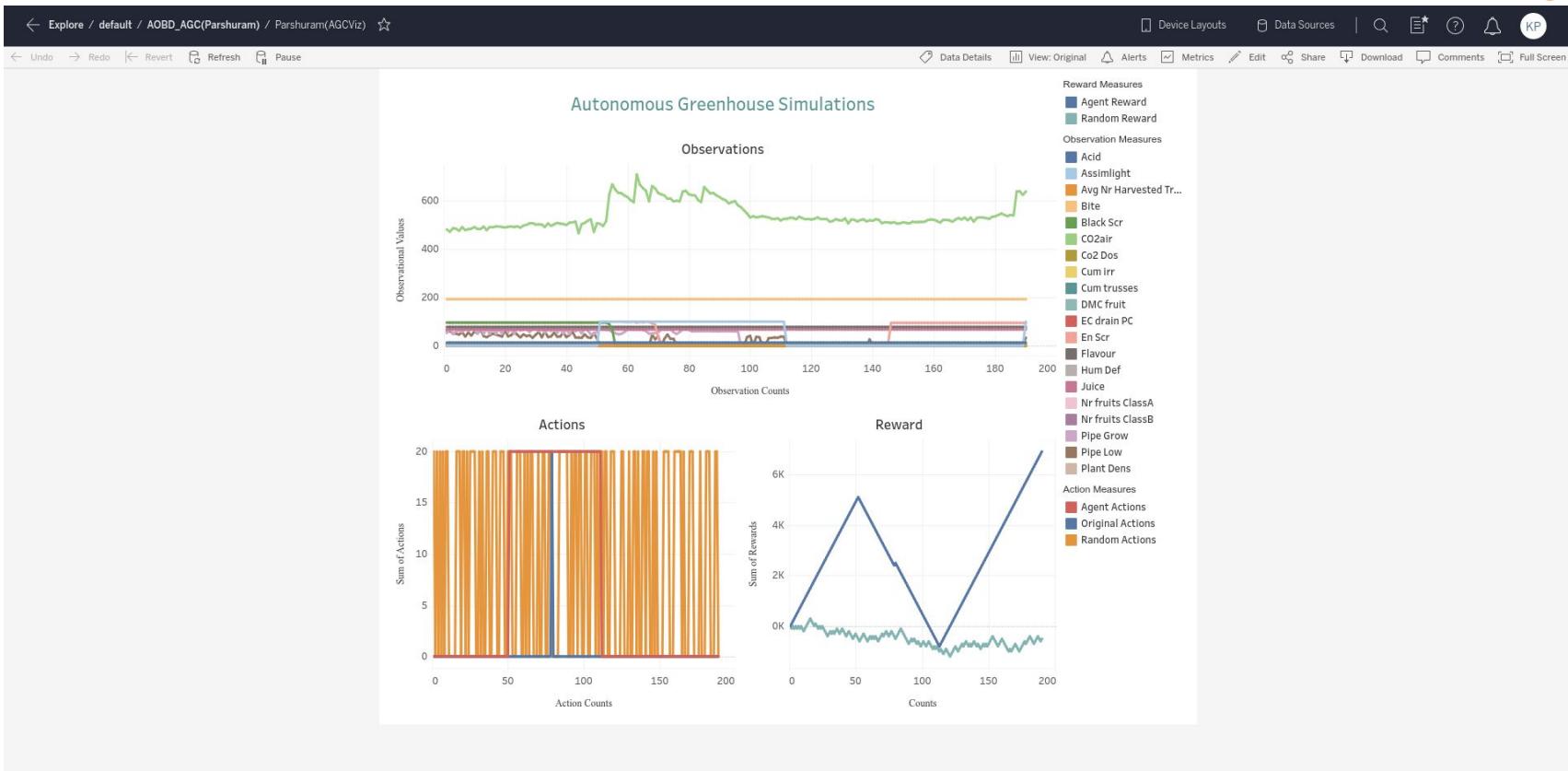


Tableau Integration



04

• • •

Product Demo

Now presenting: Something

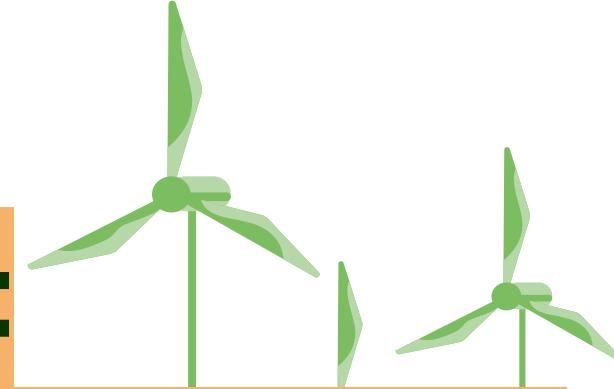
Cool

COOL





OUR HOME:



<http://www.autogreenhouse.ml/>



THIS IS OUR TEAM Parshuram

Kaushal Patil

Arpit Vaghela

Pathik Patel

Vyoma Patel



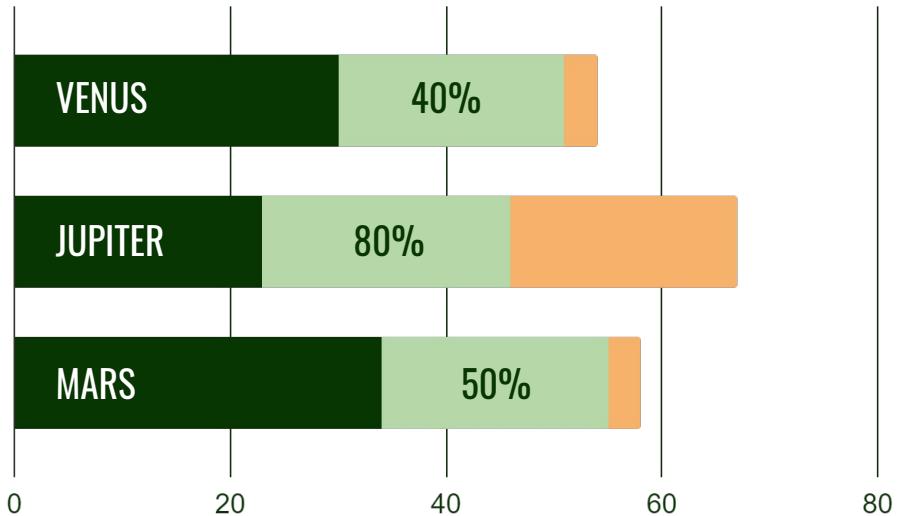
Thanks!



Do you have any questions?



MAIN COMPETITORS



CUSTOMIZE IT!

If you want to modify this graph, click on it, follow the link, change the data and replace it



OUR PROCESS



MERCURY

...
Mercury is the closest planet to the Sun.



MARS

...
Mars is actually a cold place full of iron oxide



NEPTUNE

...
Neptune is the fourth-largest planet



SATURN

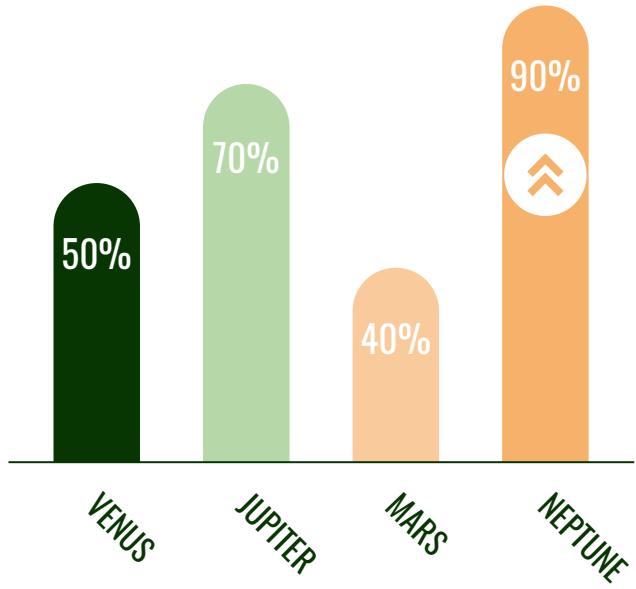
...
Saturn is the ringed planet in Solar System

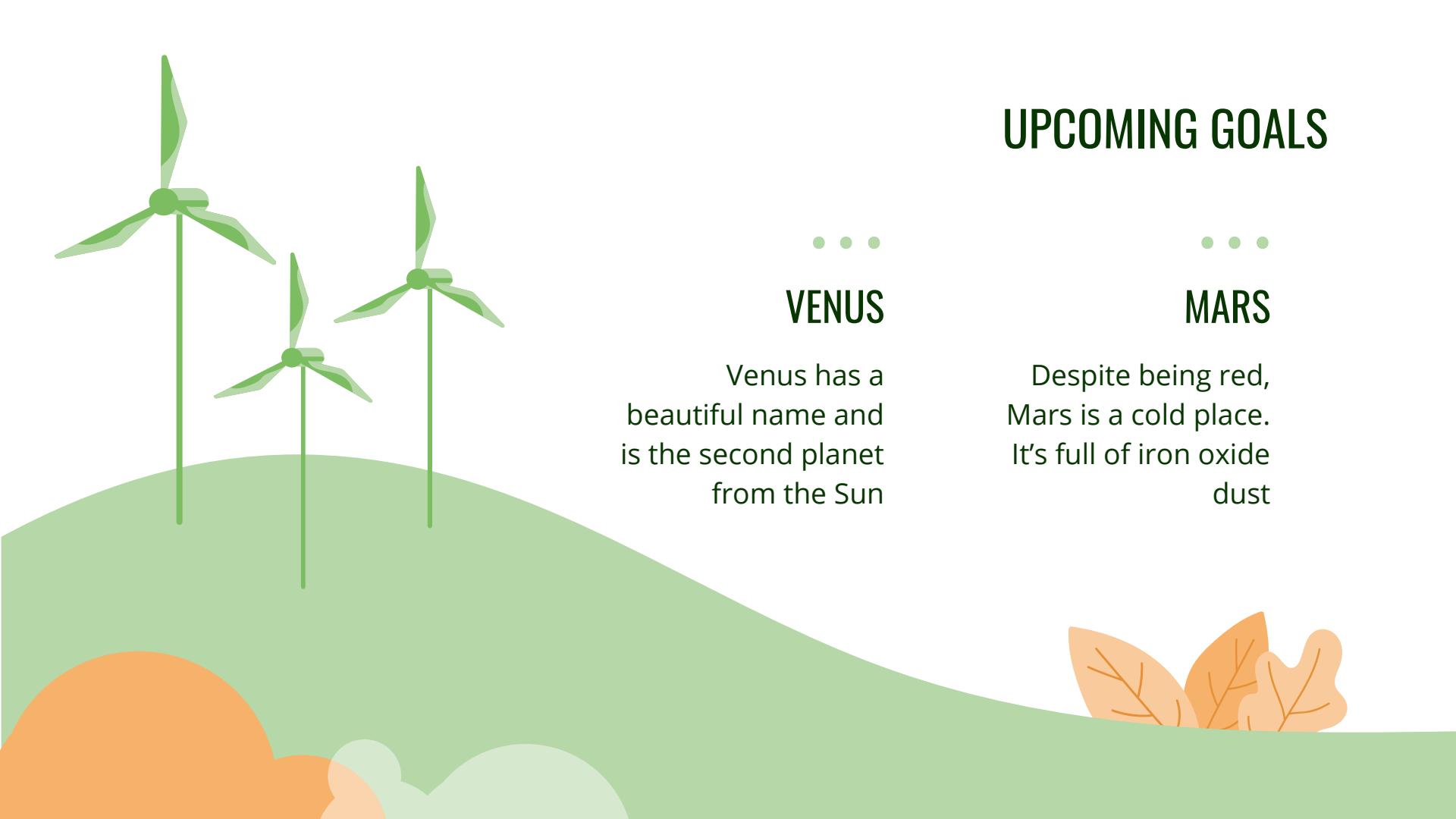


VENUS

...
Venus is the second planet from the Sun

MARKET RESEARCH





UPCOMING GOALS

• • •

VENUS

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

• • •

MARS

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

UPCOMING GOALS



MERCURY

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



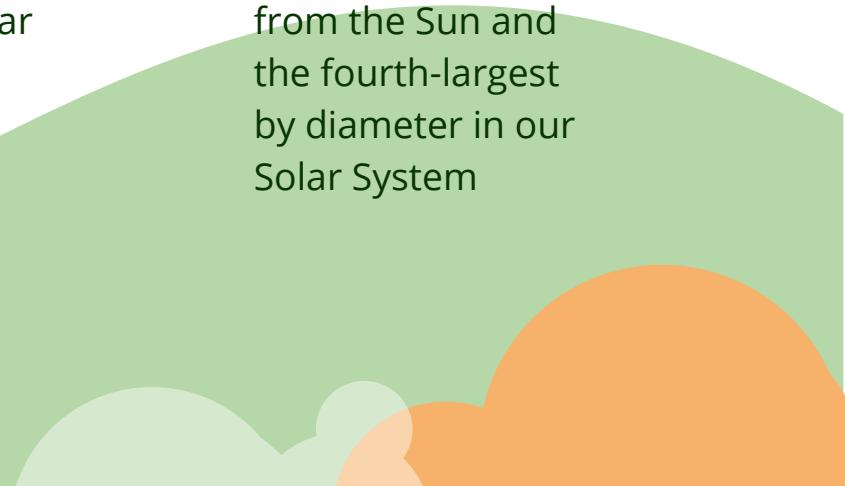
JUPITER

Jupiter is a gas giant, the biggest planet in our Solar System and the fourth-brightest object in the sky



NEPTUNE

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



...

A PICTURE
ALWAYS REINFORCES
THE CONCEPT



ANALYSIS



• • •

SATURN

It's a gas giant,
composed mostly of
hydrogen and helium

• • •

VENUS

Venus is the second
planet from the Sun.
It's very hot



• • •

MERCURY

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

• • •

NEPTUNE

Neptune is the
farthest planet from
the Sun

ANALYSIS



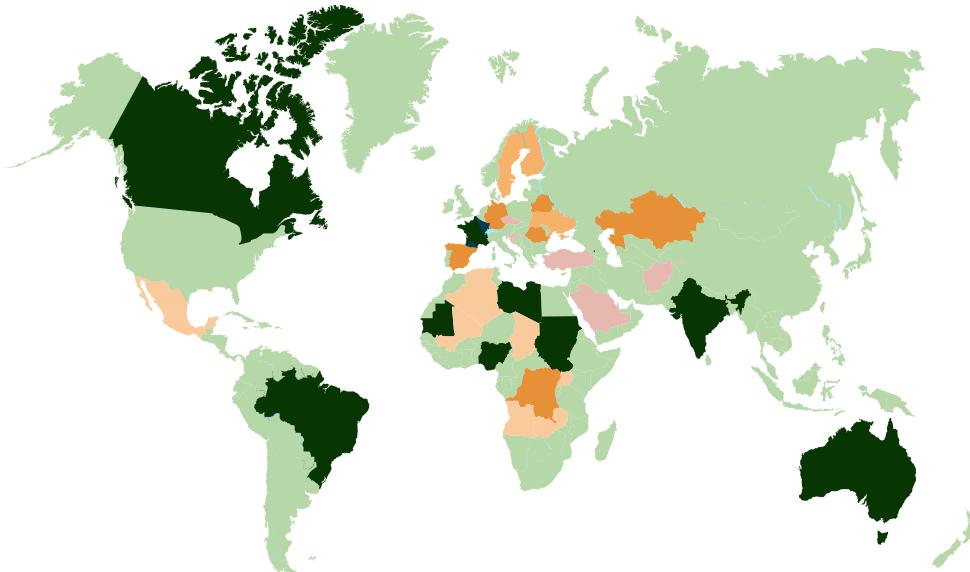
MARS

Despite being red, Mars is a cold place



VENUS

This planet is terribly hot in Solar System



MERCURY

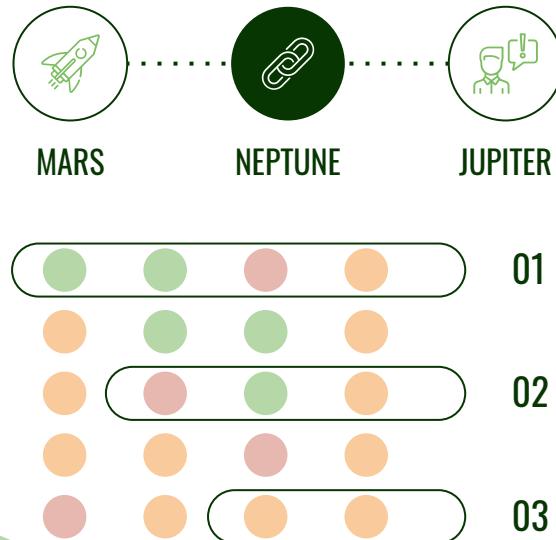
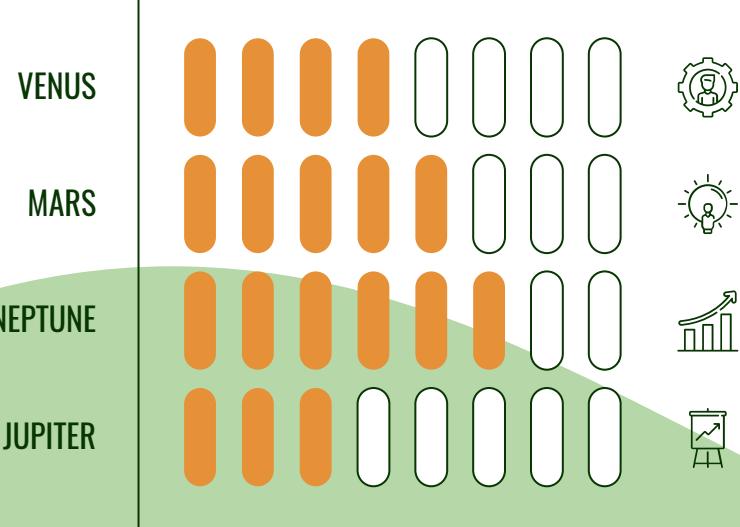
Mercury is the closest planet to the Sun



NEPTUNE

Neptune is the farthest planet from the Sun

TARGET





OUR PARTNERS

VENUS	MARS	JUPITER
Venus has a beautiful name and is the second planet from the Sun	Despite being red, Mars is actually a cold place. It's full of iron oxide dust	Jupiter is a gas giant planet and the biggest planet in our Solar System
PARTNER	PARTNER	PARTNER



TESTIMONIALS



MARS

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



JUPITER

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



VENUS

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



SATURN

"Saturn is a gas giant, composed mostly of hydrogen and helium"



MERCURY

"This planet is named after the Roman messenger god"



NEPTUNE

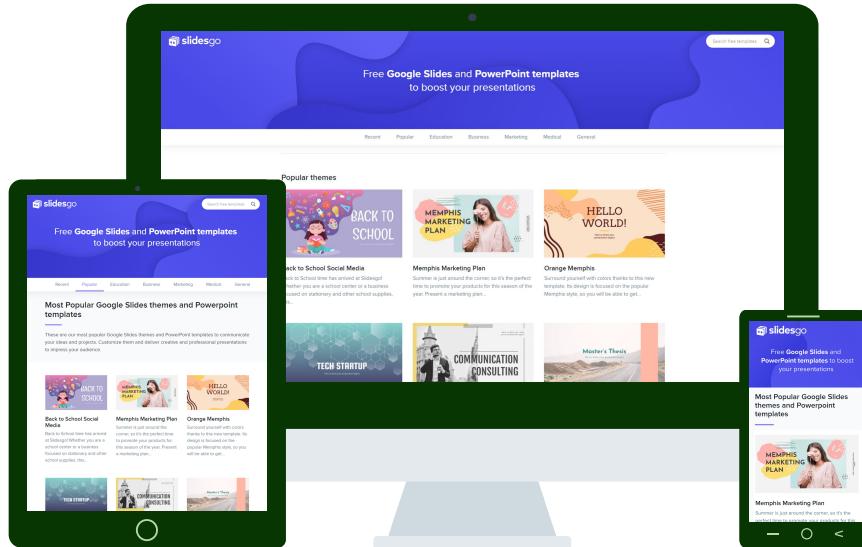
"Neptune is the fourth-largest planet in our Solar System"



MOCKUPS

...

You can replace the image on the screen with your own work. Just delete this one, add yours and send it to the back



AWARDS



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

AWARD

...



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

AWARD

...



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

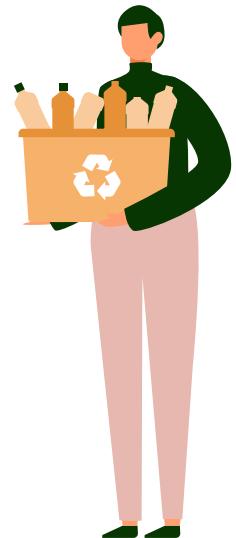
AWARD

...

ALTERNATIVE RESOURCES



ALTERNATIVE RESOURCES



RESOURCES

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- Public contributions concept 2
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- Landing page template ecology concept
- Earth globes collection flat design
- Renewable energy symbol
- Round infographic ecology concept
- Landing page template ecology car
- Landing page template ecology landscape

- People saving the planet ecology concept
- Nature background ecology concept
- Puzzle and people concept
- Landing page garbage bins
- Landing page time to recycle

PHOTOS:



- Windmills in field
- Hands holding earth globe

CONTENTS OF THIS TEMPLATE



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Pana



Amico



Bro



Rafiki

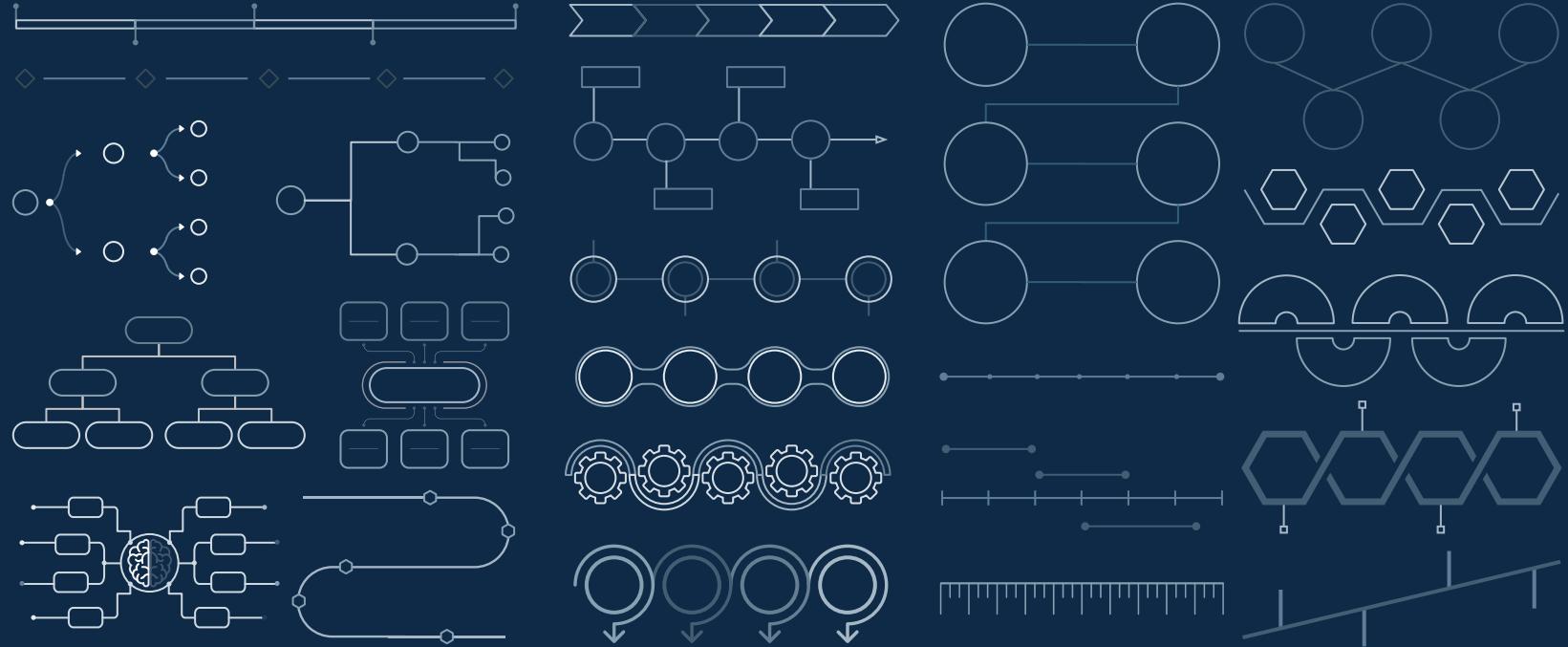
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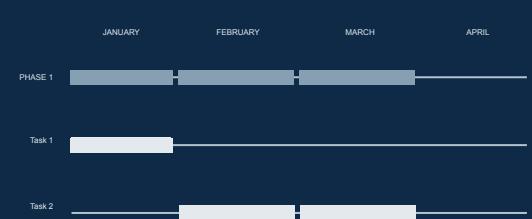
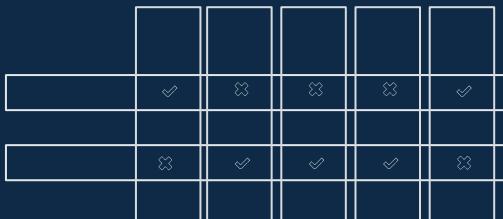
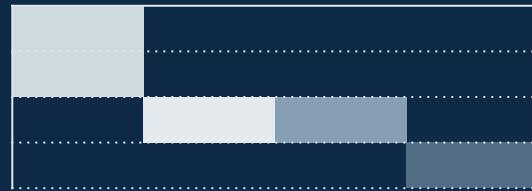
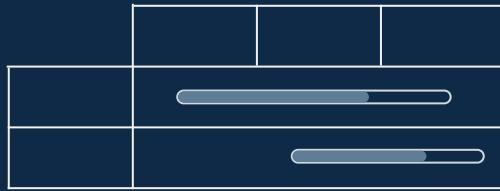
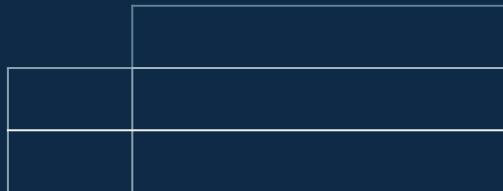
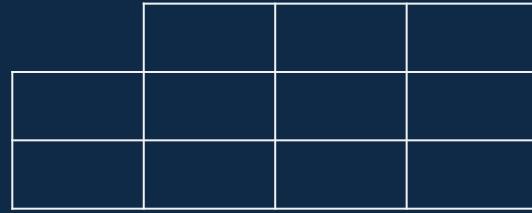
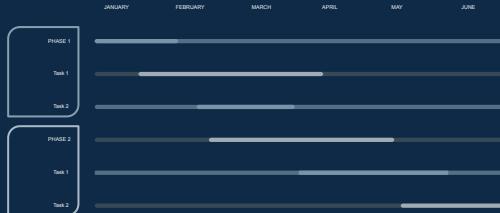
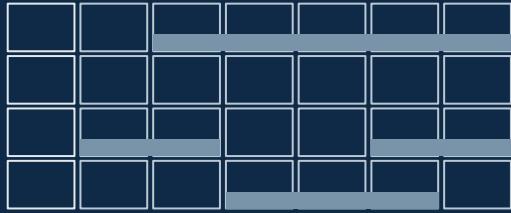
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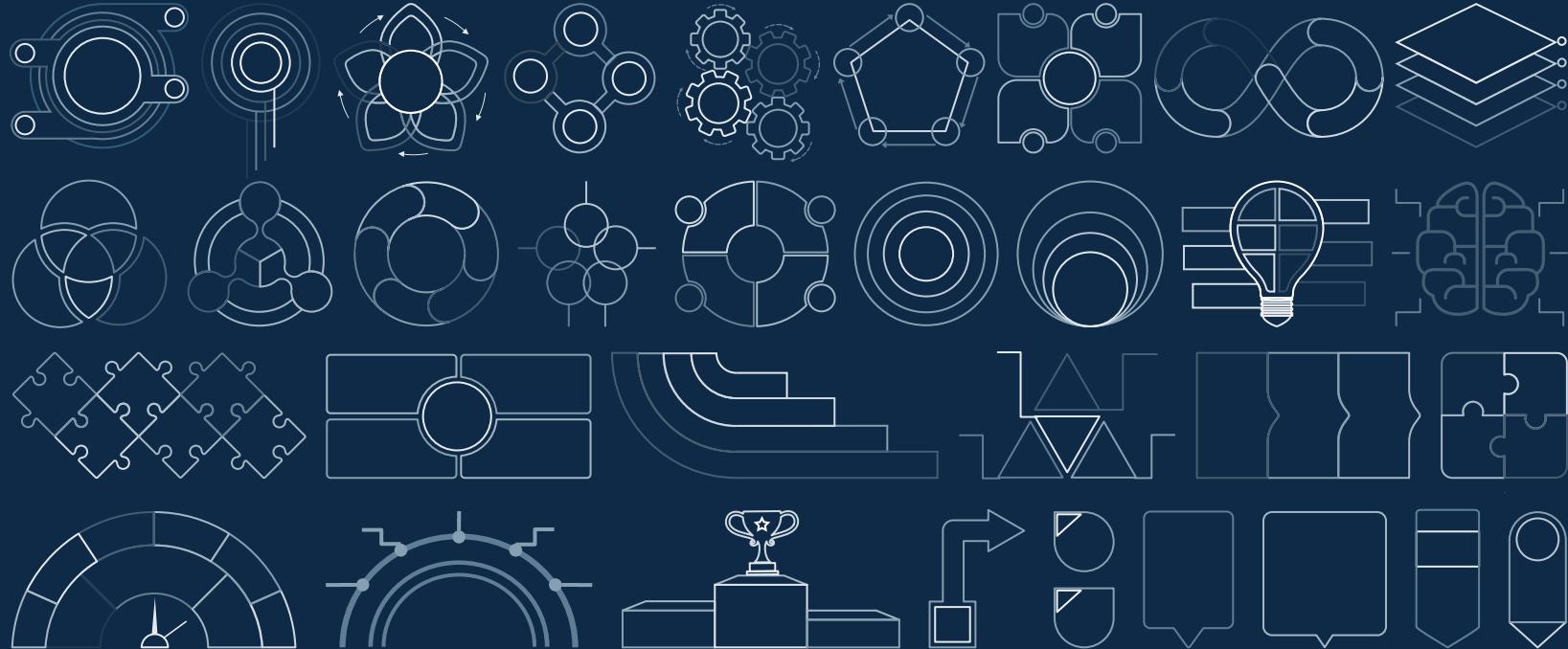
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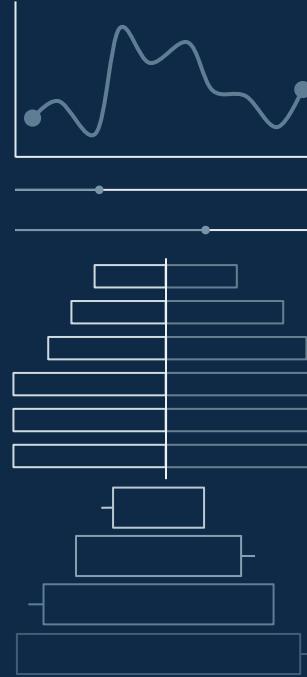
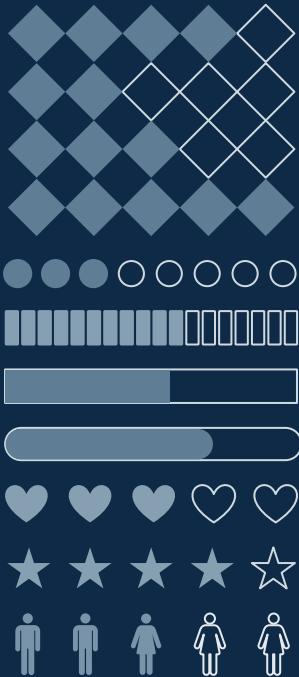
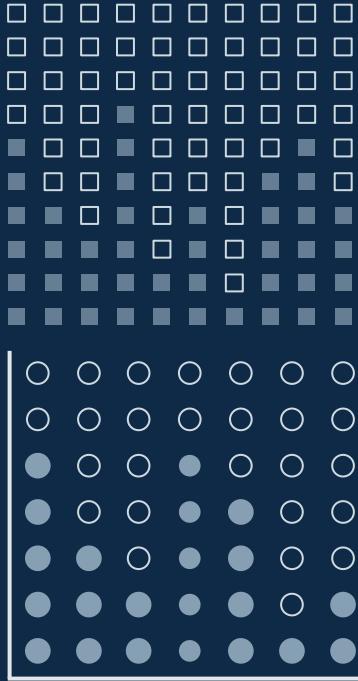












...and our sets of editable icons

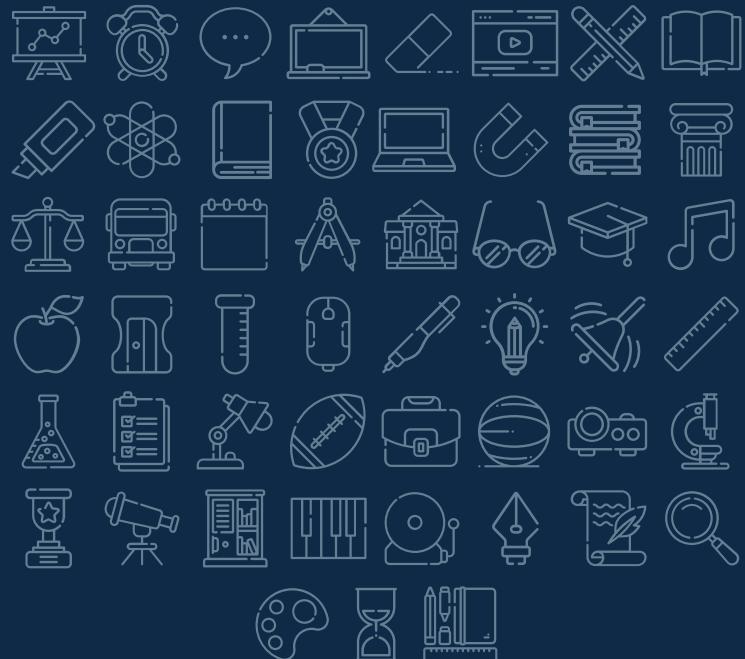
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Nature Icons



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