
CREATE AN ORRERY WEB APP THAT DISPLAYS NEAR-EARTH OBJECTS
TEAM: PINGULAND-IBERO PUE

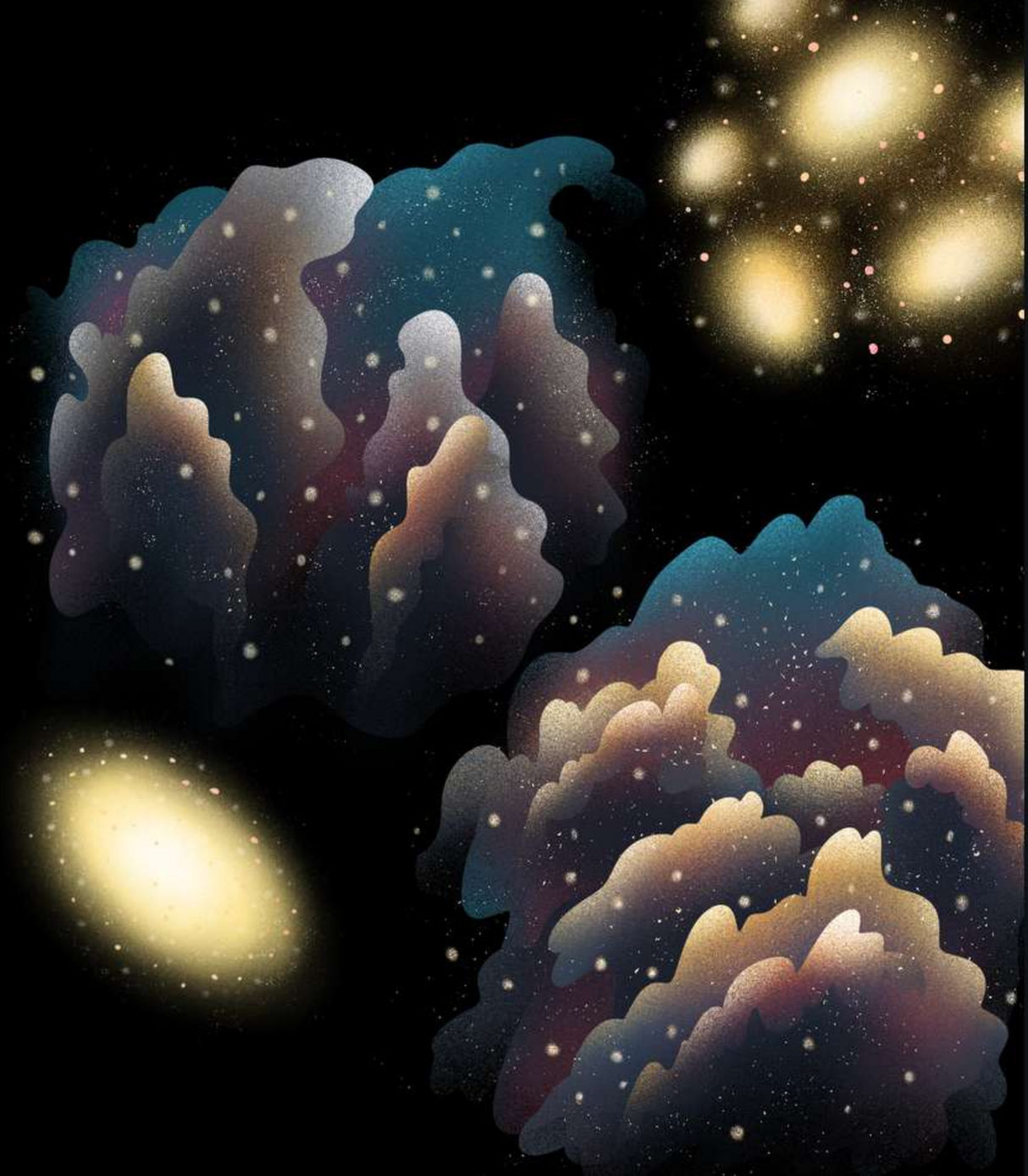
OBJECTIVES

01 Create an engaging, educational web application (website) that visualizes our solar system

02 Allow users to explore and interact with celestial bodies

03 Learn about web app design and deployment and develop skills working with 3D graphics libraries.

04 Inspire future generations of space enthusiasts and scientists




THE
METHODOLOGY
The Heart of the Project

TECHNOLOGIES

Figma

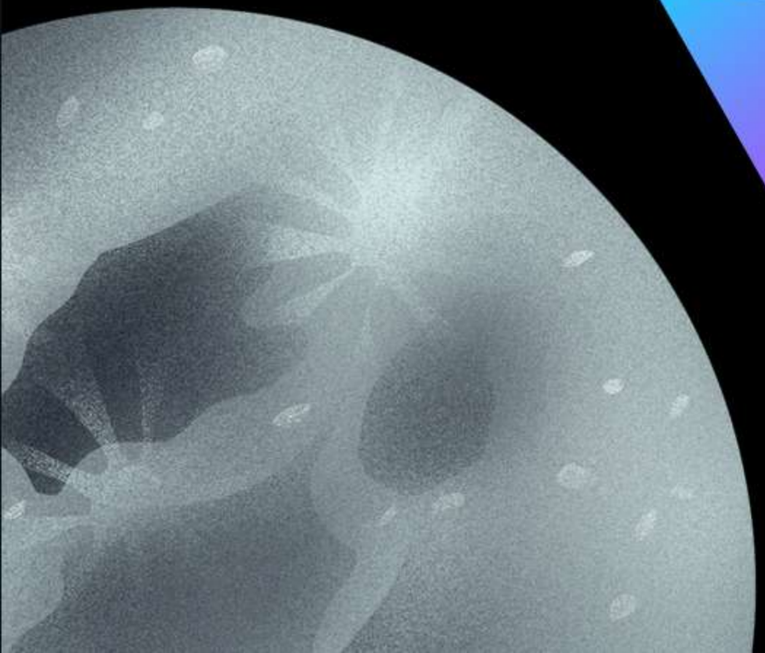
React JS

React

Tailwind

Vite

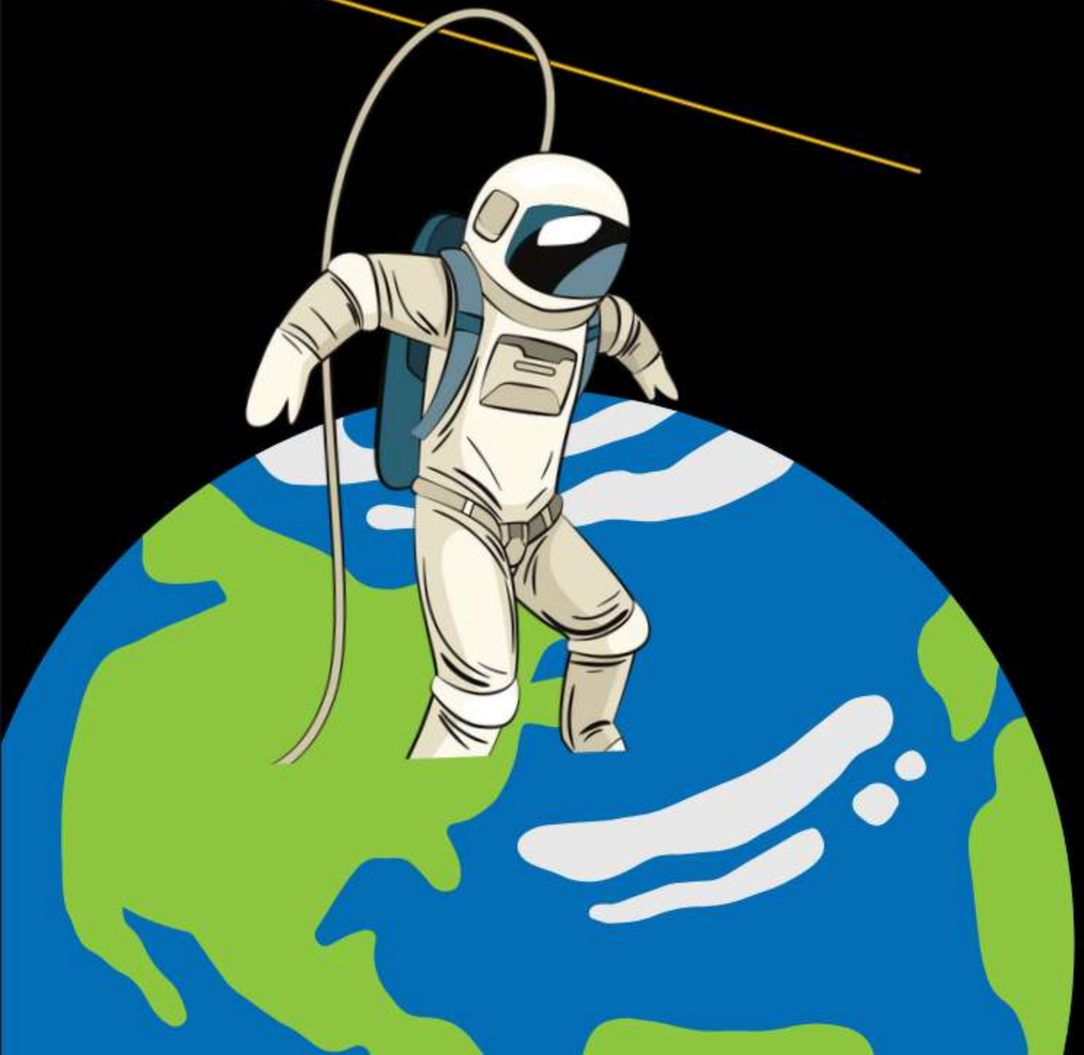
Three.js



Python

pandas


DEVELOPMENT
Our space trip



BENCHMARK

Here we go!

Used a benchmark for:

1. Identify best practices in existing orrery and space education websites
2. Gather inspiration for visual design and user interaction

Ideas

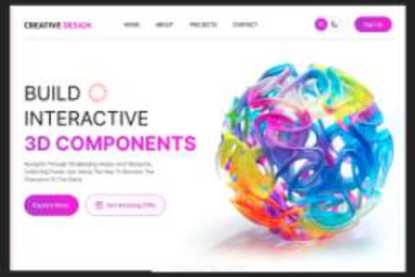

Metalness


Nos gusto la luna en el centro
LUNAR TREK


Botones con informacion basica
Visualizador 3D de los planetas

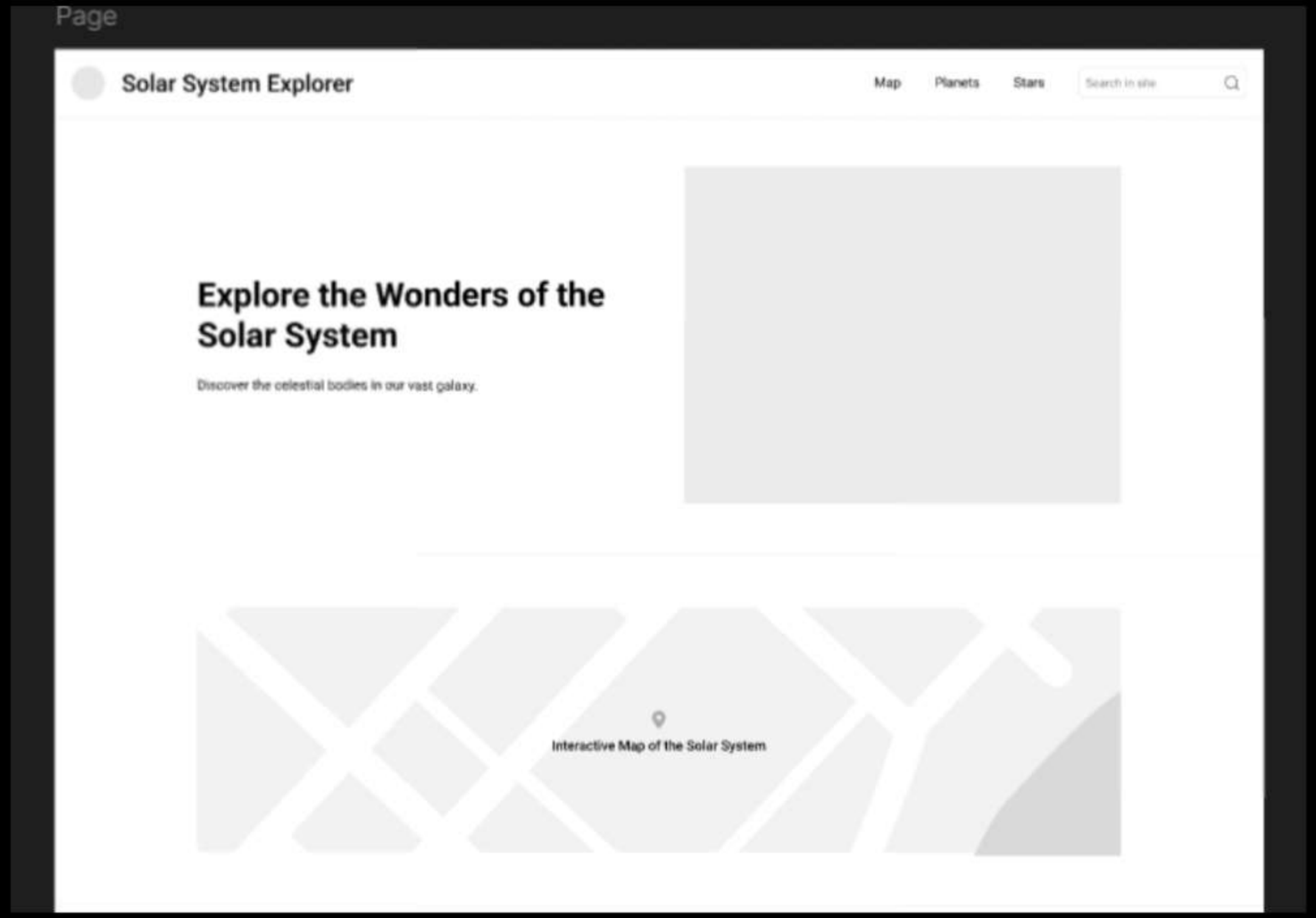

THE FASTEST WAY TO
CREATE TRUSTED DATA


ANIMATE


BUILD
INTERACTIVE
3D COMPONENTS


We speak your language

LOW FIDELITY WIREFRAME



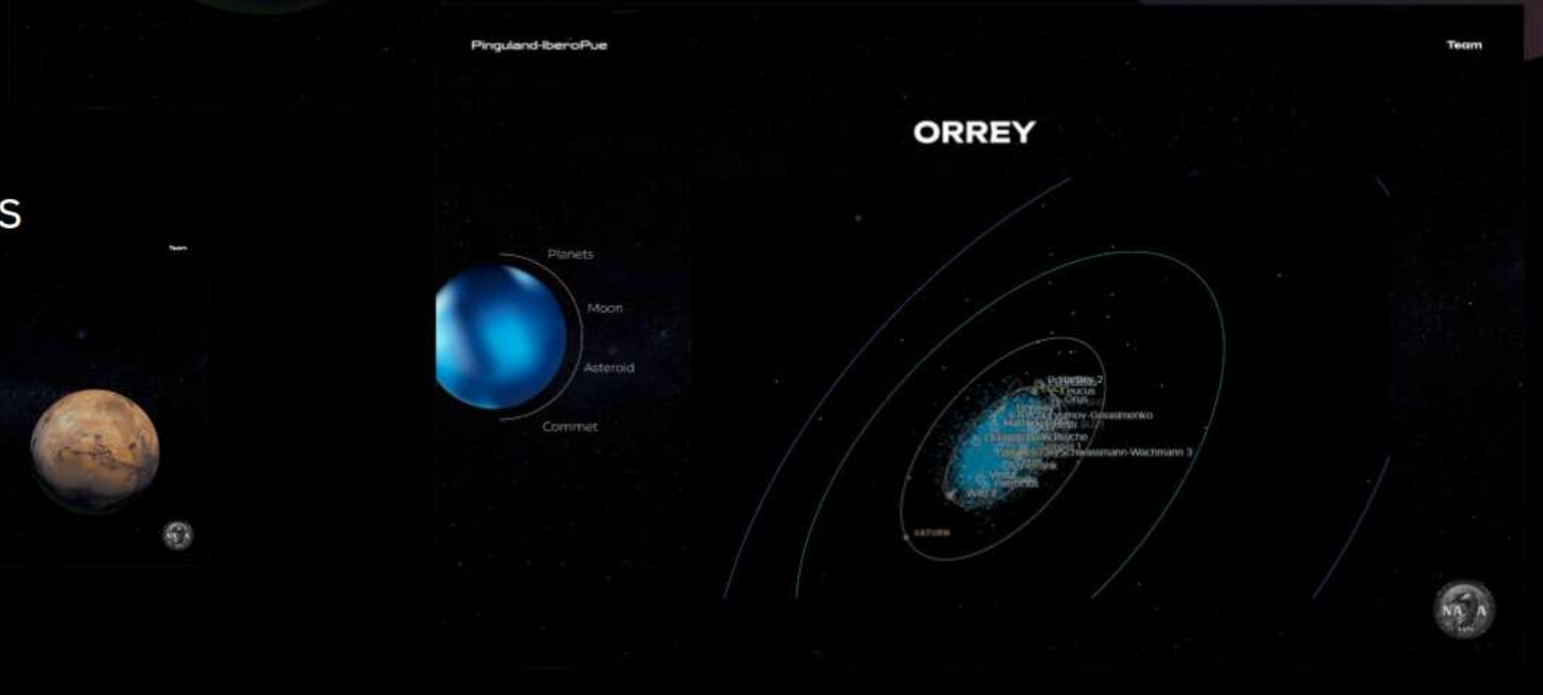
HIGH FIDELITY WIREFRAME

Landing Page

Planet info

Team

Tools



LANDING PAGE

Pinguland-IberoPue

Team · About

NASA-CHALLENGE
- public
  - models
    - mercury.glb
    - neptune.glb
    - react.glb
    - realistic_jupiter.glb
    - realistic_saturn_8k.glb
    - saturn.glb
    - uranus.glb
    - venus.glb
  - textures
  - favicon.ico
  - index.html
  - logo192.png
  - logo512.png
  - manifest.json
  - robots.txt
  - scene.glb
  - vite.svg
- src
  - components
    - Earth.jsx
    - HackerRoom.jsx
    - Hero.jsx
    - HeroCamera.jsx
    - Jupiter.jsx
    - Loading2D.jsx
    - Mars.jsx
    - Mercury.jsx
    - Navbar.jsx
    - Neptune.jsx
    - Planet.jsx
    - PlanetCarousel.jsx
    - RadialMenu.css

Use left and right arrow keys to change planets

Models obtained from Sketchfab

Free License Agreement

Blasting off!

PLANET INFORMATION

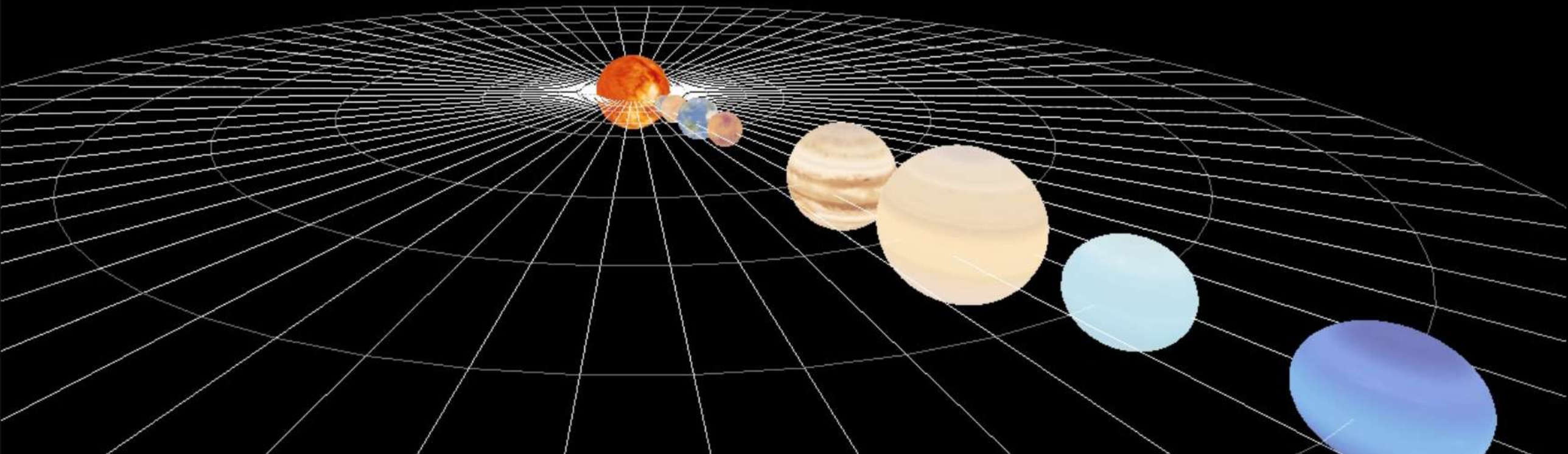
< Home

Mars

The Red Planet is the fourth planet from the Sun and the second-smallest planet in the Solar System, being larger than only Mercury.

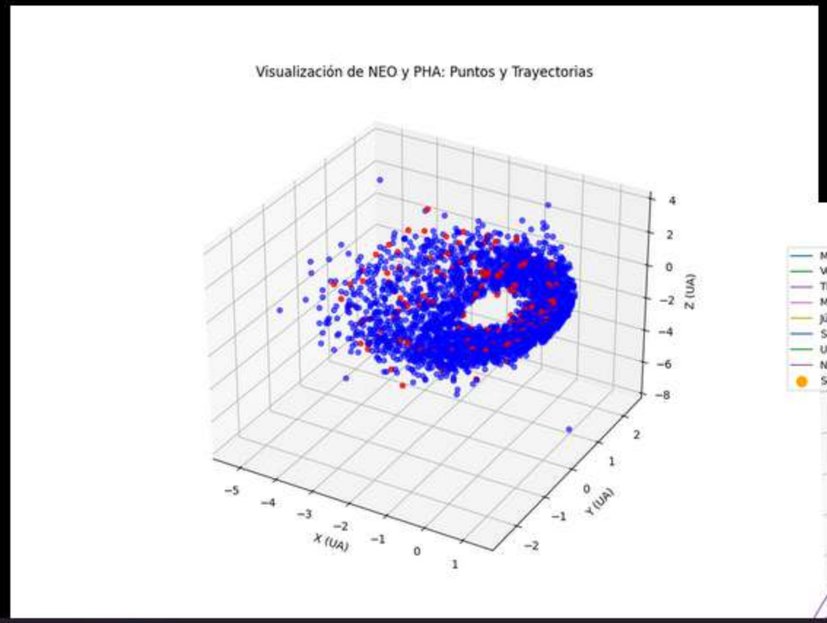
- **Diameter:** 6,779 km
- **Distance from Sun:** 227.9 million km
- **Moons:** 2

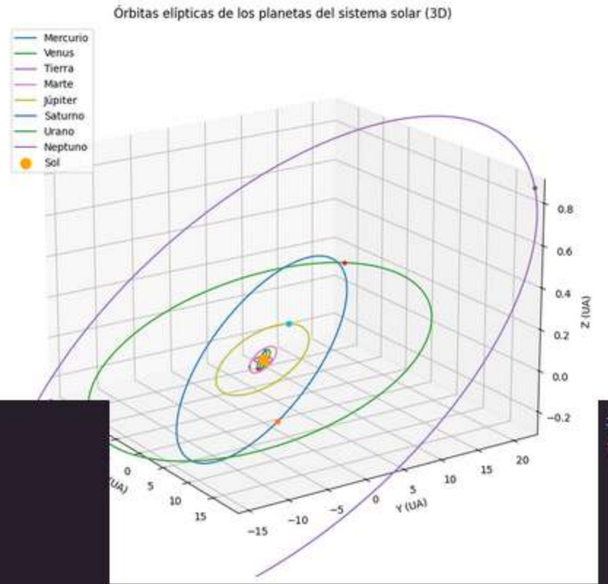
ORREY

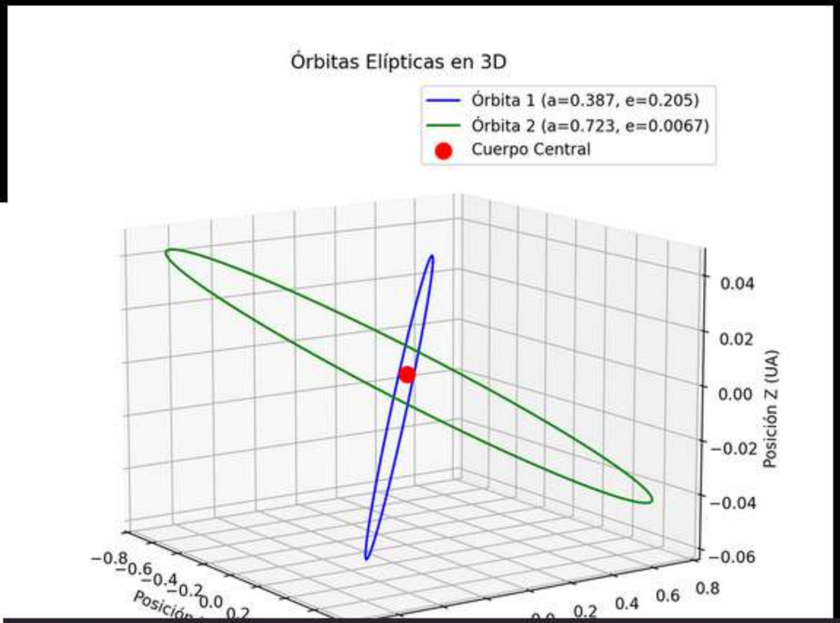


ORREY

Spage Agency Data





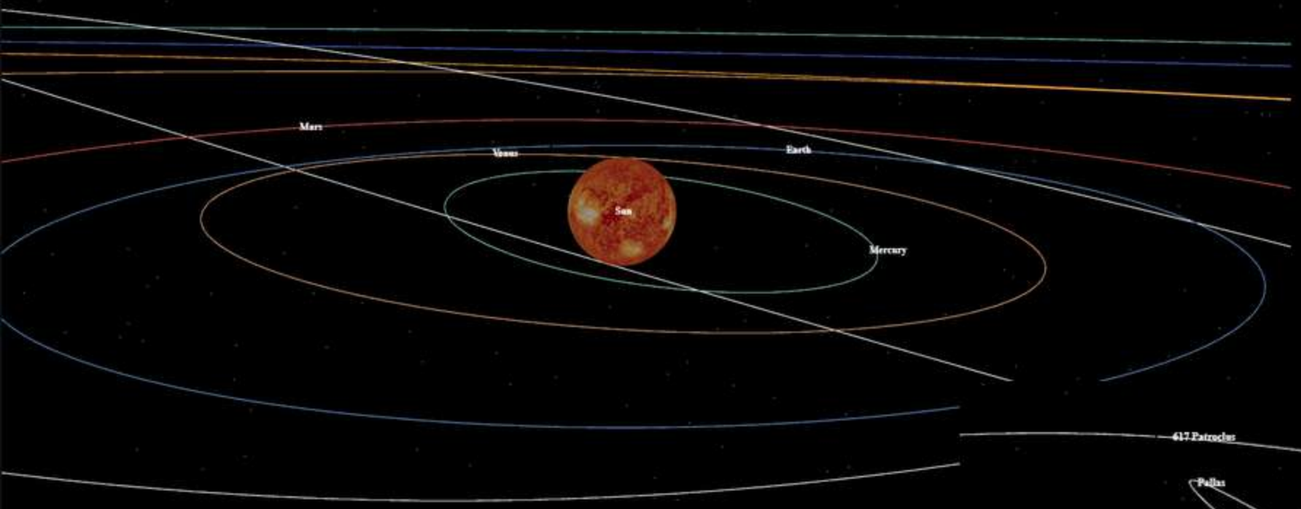


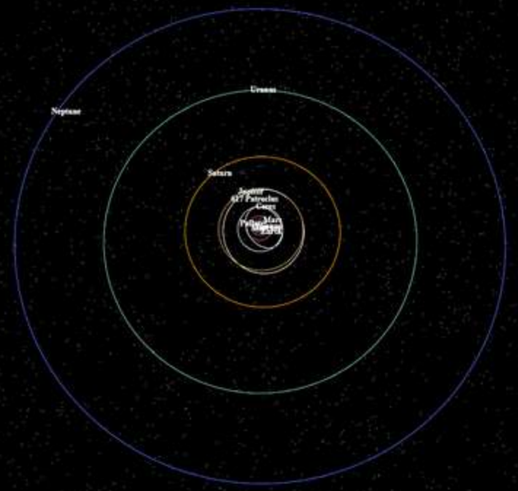

```python
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
from mpl_toolkits.mplot3d import Axes3D

show_neo = True         # Mostrar NEO (azules) si es True
show_pha = True         # Mostrar PHA (rojos) si es True
show_pha_traj = False   # Mostrar trayectorias de PHA (naranjas) si es True

# Cargar el archivo CSV
file_path = 'sbdb_query_results_xyz_random_sampled.csv'
df = pd.read_csv(file_path)

# Filtrar solo los objetos que son NEO (marcados con 'Y')
df_filtered = df[df['neo'] == 'Y']

# Extraer los elementos orbitales
a_values = df_filtered['a'].values  # Semi-eje mayor
e_values = df_filtered['e'].values  # Excentricidad
i_values = np.radians(df_filtered['i'].values)  # Inclinación en radianes
pha_flags = df_filtered['pha'].values  # Identificar si es PHA

# Crear la figura y los ejes 3D para la visualización
fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection='3d')
```

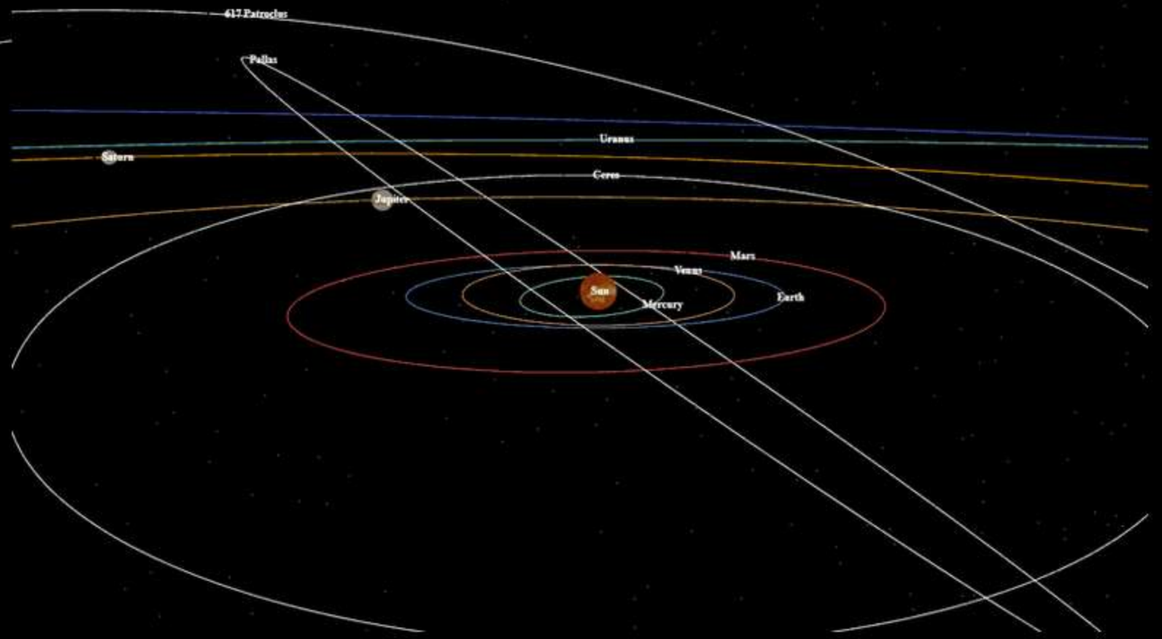
via pandas

```python
# Dibujar las trayectorias y puntos de los PHA y NEO
for a, e, i, pha in zip(a_values, e_values, i_values, pha_flags):

    if pha == 'Y' and show_pha:  # Es un PHA y mostrar PHA está activado
        # Mostrar trayectorias si está activado
        if show_pha_traj:
            # Generar una serie de ángulos (theta) para representar la órbita
            theta = np.linspace(0, 2 * np.pi, 500)

            # Calcular la distancia radial en cada punto
            r = a * (1 - e**2) / (1 + e * np.cos(theta))

            # Convertir coordenadas polares a cartesianas para la trayectoria
            x = r * np.cos(theta)
            y = r * np.sin(theta)
            z = np.tan(i) * y  # Aplicar inclinación

            # Graficar la trayectoria en naranja
            ax.plot(x, y, z, color='orange', alpha=0.6)

        # Generar un punto aleatorio en la órbita del PHA
```

ORREY


Mars
Venus
Earth
Sun
Mercury


Neptune
Uranus
Saturn
Jupiter
617 Patroclus
Ceres
Pallas
Mars
Venus
Earth
Sun
Mercury


617 Patroclus
Pallas
Uranus
Saturn
Ceres
Jupiter
Mars
Venus
Sun
Earth
Mercury


CONCLUSION
The Ever-Evolving Knowledge

CONCLUSION

By combining NASA's extensive data with cutting-edge 3D visualization, we're creating a powerful tool to enhance public understanding of space and making complexities of space more accessible, we hope to ignite passion in future generations of scientists and space enthusiasts.


THANK
YOU
XALAPA

REFERENCES

Three.js Documentation - For managing 3D models and rendering celestial bodies in the web app.
React Documentation - Framework used for building the frontend.
Tailwind CSS Documentation - For implementing a modern and responsive design.
JPL Small-Body Database Documentation - Source of orbital data for NEOs and PHAs.
Keplerian Elements Overview - Explanation of orbital elements and their use in modeling planetary orbits.
NASA Mission Visualization Resources - For additional guidance on creating 3D visualizations of celestial objects.

USE OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) played a significant role in the development of this project, primarily in two areas:
Data Understanding and Analysis: AI tools helped us better understand orbital dynamics and how Keplerian parameters influence the paths of celestial bodies. This insight was crucial for accurately modeling orbits in the 3D space.
Web Development and Debugging: AI was used to generate code snippets for complex 3D interactions and to solve visualization issues, such as rendering optimizations and user interaction behaviors. It facilitated rapid iteration during the app's development, ensuring a smooth user experience.

SPACE AGENCY DATA

Our project integrates data from multiple NASA resources, providing scientifically accurate representations of celestial bodies:
JPL Small-Body Database: For retrieving detailed orbital elements of Near-Earth Objects (NEOs) and Potentially Hazardous Asteroids (PHAs). Data is accessed using the JPL Small-Body Database Query Tool.
Keplerian Orbital Elements: Using data from NASA's planetary data repository to accurately plot orbits and simulate planetary movements in the orrery.
Inspiration from NASA's Eyes on Asteroids: We took visual and functional inspiration from NASA's Ey