NASA SPACE APPS CHALLENGE 2024

ORRERY WEB APP

Team ORBIDIUM

PROBLEM

01

Engagement Challenges

Global space education struggles to engage youth and foster interest in space careers. Current programs lack the coordination and reach necessary to inspire the next generation.

02

Need for Innovation and Skills Development

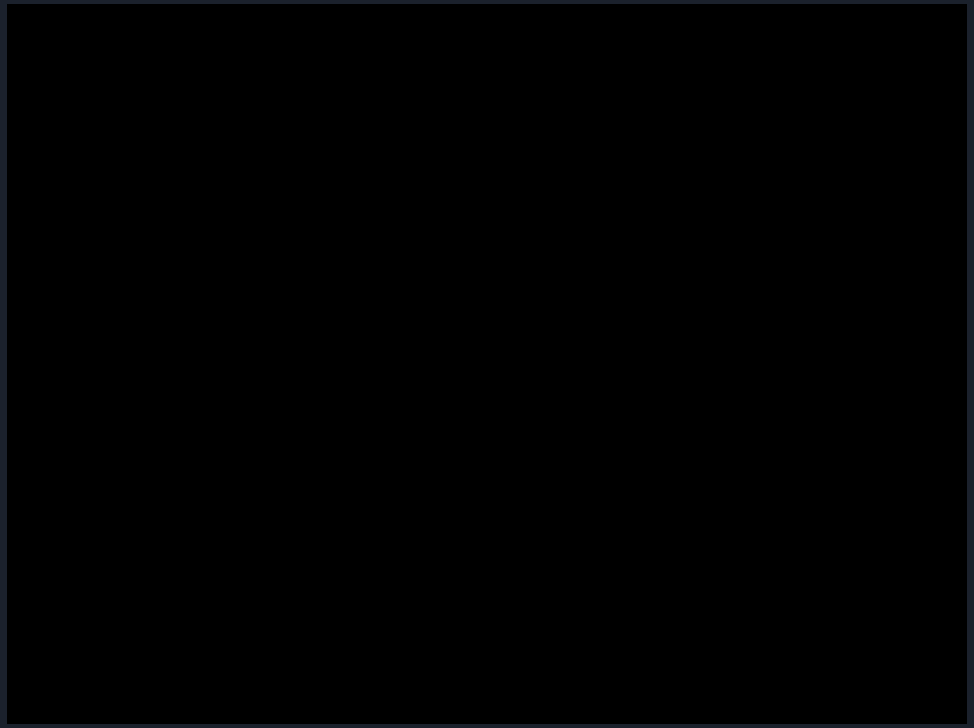
There is a growing need for educational programs that span all levels, integrating space technology, data collection, and innovation to build essential skills for future space exploration.

03

Impact on Future Space Exploration

Without improved outreach and targeted programs, the potential to inspire and develop future space scientists and engineers is underutilized, limiting advancements in space exploration.

Background



Persona 01

Sarah Patel
ASTRONOMER

Role: Astronomer conducting research and tracking celestial bodies.

Goals: Utilize real-time data for tracking celestial events. Conduct in-depth research on asteroids, comets, and space debris.

Challenges: Accessing up-to-date, interactive tools for accurate tracking. Balancing research demands with limited resources and time.

Needs: Advanced tracking tools with real-time data and simulations. Customizable features for detailed analysis and research projects.

Information Intake: Relies on scientific literature, data from space agencies, and interactive simulation tools to stay updated.

Interests: *Specializes in NEOs, NECs, PHAs, and custom*

Persona 02

Alex Carson
EDUCATOR

Role: Educator at a school/planetarium teaching astronomy.

Goals: Engage students/visitors with interactive learning. Simplify complex space concepts in exciting ways.

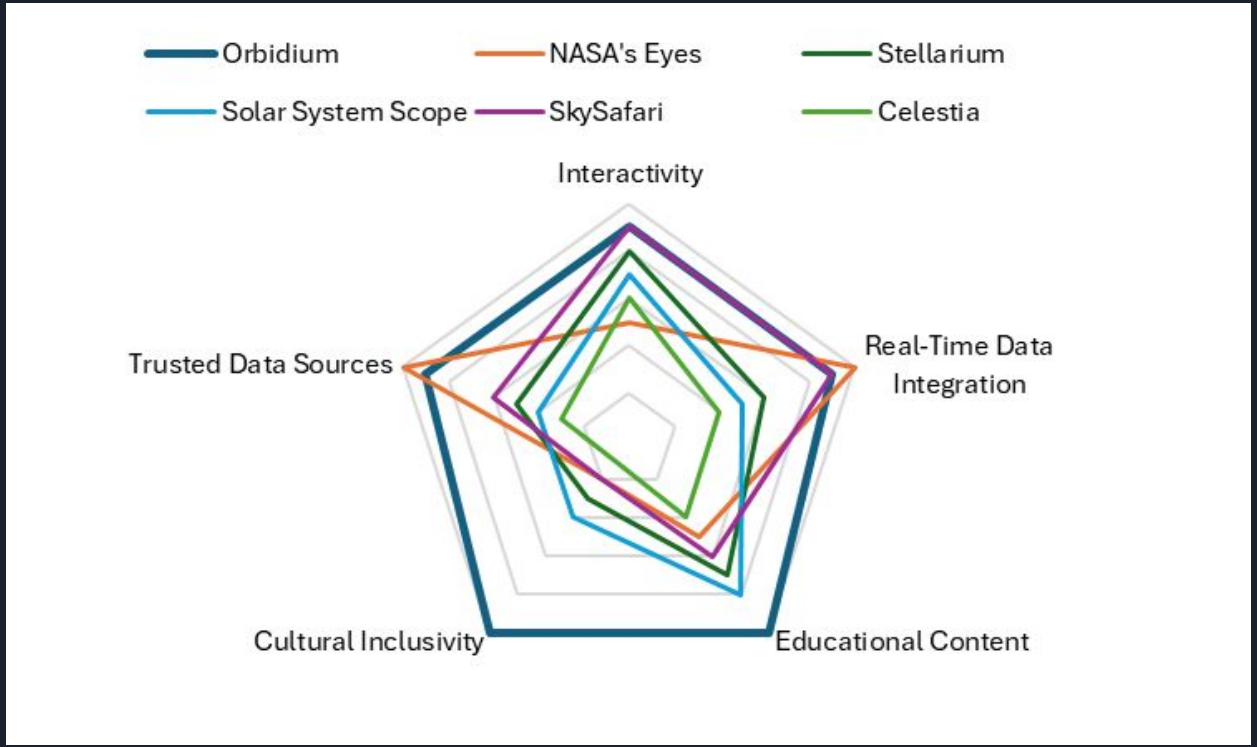
Challenges: Keeping students engaged with dynamic tools. Integrating real-time data into lessons/exhibits.

Needs: Intuitive, real-time tools for interactive education. Alignment with STEM curricula and hands-on learning.

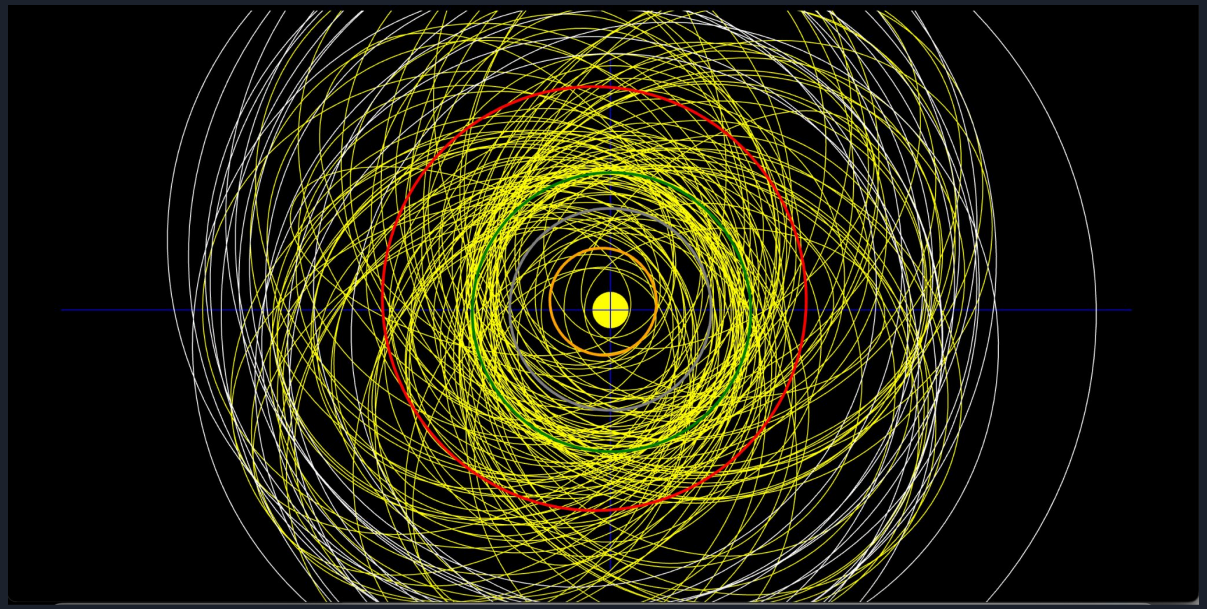
Information Intake: Gathers information through research, workshops, online resources, and collaborating with colleagues.

Interests: Focuses on orbits, PHAs, exoplanets, and the interaction between celestial bodies.

Competitive Analysis



Solution (Demo)



Tools and Data Used:

- Using MPC database file converted into SQLite DB
- Plain JS for 2D rendering on HTML Canvas
- Used Claude AI to help with elliptical orbits rendering
- Django Web App for frontend and backend
- All 1.4M asteroids available in database - but only those rendered for the users:
  - Inner planets (1:1 scale)
  - Major mainbelt ones
  - PHA > 1 km

Key Features

Constraints:

- Limit by Object Kind/Group
- Limit By Orbit Class

Features:

- Labels and Basic Information.
- Speed Control.
- Coloured trajectories.
- 1st person vs 3rd person POV.
- Dynamic canvas sizing.

Future Aspirations

Constraints:

- Custom Object/Orbit Constraints
- Output Selection Controls - e.g., e, a, i, peri, M, n, etc

Features:

- AI based object recommendation
- UI controls to limit the number and size of NEOs, NECs, or PHAs to display in the orrery.
- Timeline control to display positions of celestial bodies for specified data.
- First-person control for the point of view of flying among the celestial bodies.
- Exterior and interior views of a spaceship flying amongst the celestial bodies in the orrery.
- File upload function and control for other orbital parameter data sets.
- Search and land on specified objects.

Business Model

Tier 1: Freemium (Basic Plan)
Access:
Free access to static celestial data (orbits, positions of celestial objects, etc.)
Basic real-time tracking of artificial satellites (limited to popular satellites).

Features:
Hover over celestial objects to generate basic stats (object properties, simplified trajectories).
Educational access for young students, hobbyists, and casual users.
Basic simulation tools for basic orbit manipulation (e.g., visualizing a simple orbital change).
Community Access: Basic forum or chat access for general users and students.
Event Planning: Simple tools for basic celestial observation event planning (restricted to a small set of events).

Tier 2: Premium (Advanced Plan)
Access:
Full real-time tracking of celestial objects and artificial satellites with more detailed data.
Access to mission planning simulations for hobbyists, educators, and students.
More comprehensive educational content with advanced orbit simulations.

Features:
Hover over celestial objects and artificial satellites to generate more advanced stats (detailed object properties, trajectories, real-time velocity, etc.).
Advanced orbit manipulation: Users can adjust and simulate complex orbital changes for educational purposes.
Full mission planning simulations for both educators and advanced hobbyists, allowing detailed analysis.
Community Access: Access to advanced forums (e.g., educator and student-specific groups, user-driven discussions).
Event Planning: Tools for planning and sharing celestial observation events, including multi-user collaborative features.

Tier 3: Corporate/Enterprise (Licensing for Organizations)
Access:
Comprehensive real-time tracking of celestial and artificial objects with advanced insights.
Access to exclusive datasets, including restricted or advanced mission planning data (e.g., proprietary satellite tracking).
Priority access to new features and data updates.

Features:
Advanced Orbit Manipulation: Users can modify or simulate complex orbital changes (for research, professional use, or educational purposes).
Detailed mission planning and simulation tools for researchers, educators, and professional astronomers.
Corporate Community Access: Exclusive forums for professional astronomers, educators, and organizational teams, including invite-only discussion panels and webinars.
Custom Event Planning: Tailored tools for global observation events, including organizational-level collaboration tools and event management systems.
Licensing & API Access: Licensing options for schools, universities, or research organizations. Includes API access for integrating celestial tracking and mission simulation into proprietary systems.
White-labeling: Custom branding options for organizations (e.g., schools or companies) to tailor the webapp interface and integrate into internal systems.
Dedicated Support: Access to dedicated customer support and onboarding assistance, including exclusive training materials and webinars.

Target audience

Educators: Teachers and instructors in **schools**, **universities**, and **research institutions** looking for engaging, interactive tools to teach astronomy and space science.

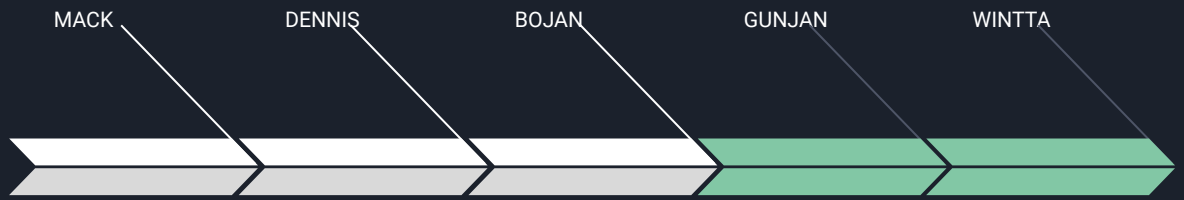
Planetariums and Science Centers: Facilities that provide **interactive educational exhibits** to the public, seeking cutting-edge tools to enhance visitor engagement and learning experiences.

Museums and Entertainment Venues: **Museums**, **game bars**, and other entertainment venues offering immersive, space-themed experiences to their visitors.

Space Enthusiasts: **Amateur astronomers**, **sci-fi writers**, and hobbyists who want to explore celestial phenomena with real-time tracking and interactive simulations.

ORBIDIUM

The high impact orrery for mobile and web



Flutter and Unity	Backend	Frontend	Data & Research	Business & Design
BSC Computer Science Software Developer	BSc Computer Science MSc Astronautics Software Engineer	BSc Computer Science MSc System on Chip Software Engineer	B.Tech Electronics Engineering Data Analyst	PhD Aerospace Engineering Graduate Researcher