



**NASA**  
Space Apps  
Challenge 2025  
Jabalpur Local Event



# BioOrbit

*Unlocking Space Biology with AI*

► Challenge: Build a Space Biology Knowledge Engine

Team - Stellar Sparks





## The Challenge:

Decades of NASA space biology research  
(plants, animals, human health)



Publications are scattered across archives,  
hard to access

Researchers, students, and the public struggle  
to find relevant info quickly

Preparing for Moon & Mars missions needs fast,  
AI-powered access to insights



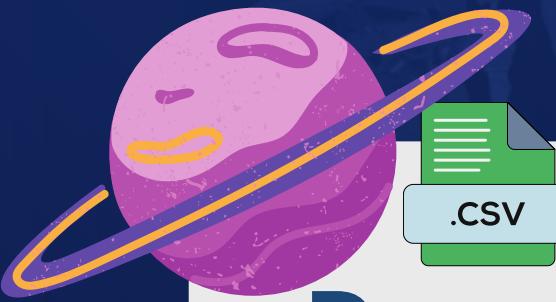
# Why It Matters?



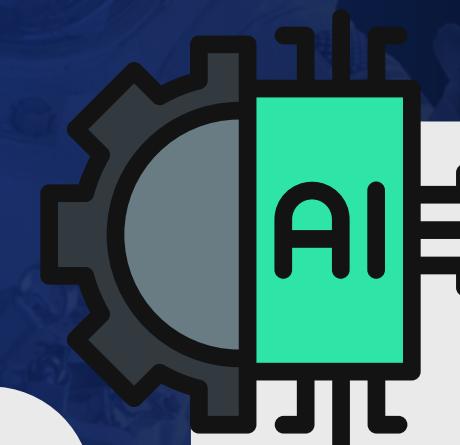
Astronaut health is a key challenge for deep space exploration.



Space environment risks:  
Microgravity ,  
Radiation ,  
Stress &  
isolation.



Decades of NASA bioscience data = scattered & hard to use.

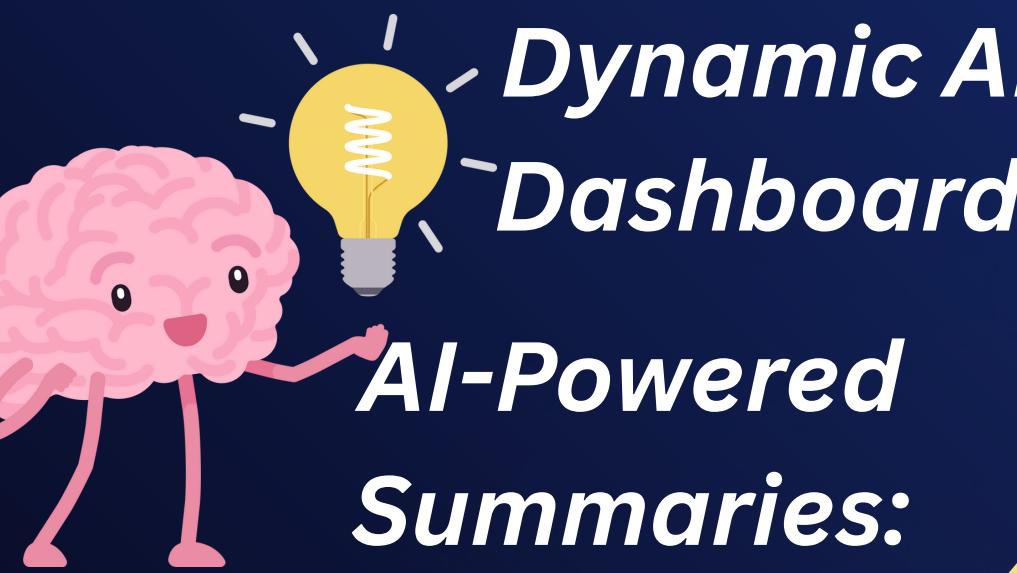


An AI-powered engine makes insights fast, clear, and actionable.



# Our Objectives:



  
*Dynamic AI Dashboard:*

A single interactive platform to explore NASA's space biology data.

  
*AI-Powered Summaries:*

Automatically convert long bioscience papers into concise, easy-to-understand summaries.

  
*Knowledge Graphs:*

Visualize experiments, species, and outcomes to uncover hidden relationships.

  
*Smart Search & Visualization:*

Natural language queries like "What happens to plants in microgravity?" with results in graphs, charts, and summaries.



## Target Audience:

**NASA Scientists & Researchers:** Access prior experiment data for mission planning.



**Students & Academics:** Learn from simplified summaries and interactive dashboards.



**Space Medicine Experts:** Study biological changes in humans and animals for long missions.



**Private Space Companies:** Gain insights for astronaut health and sustainable space travel.



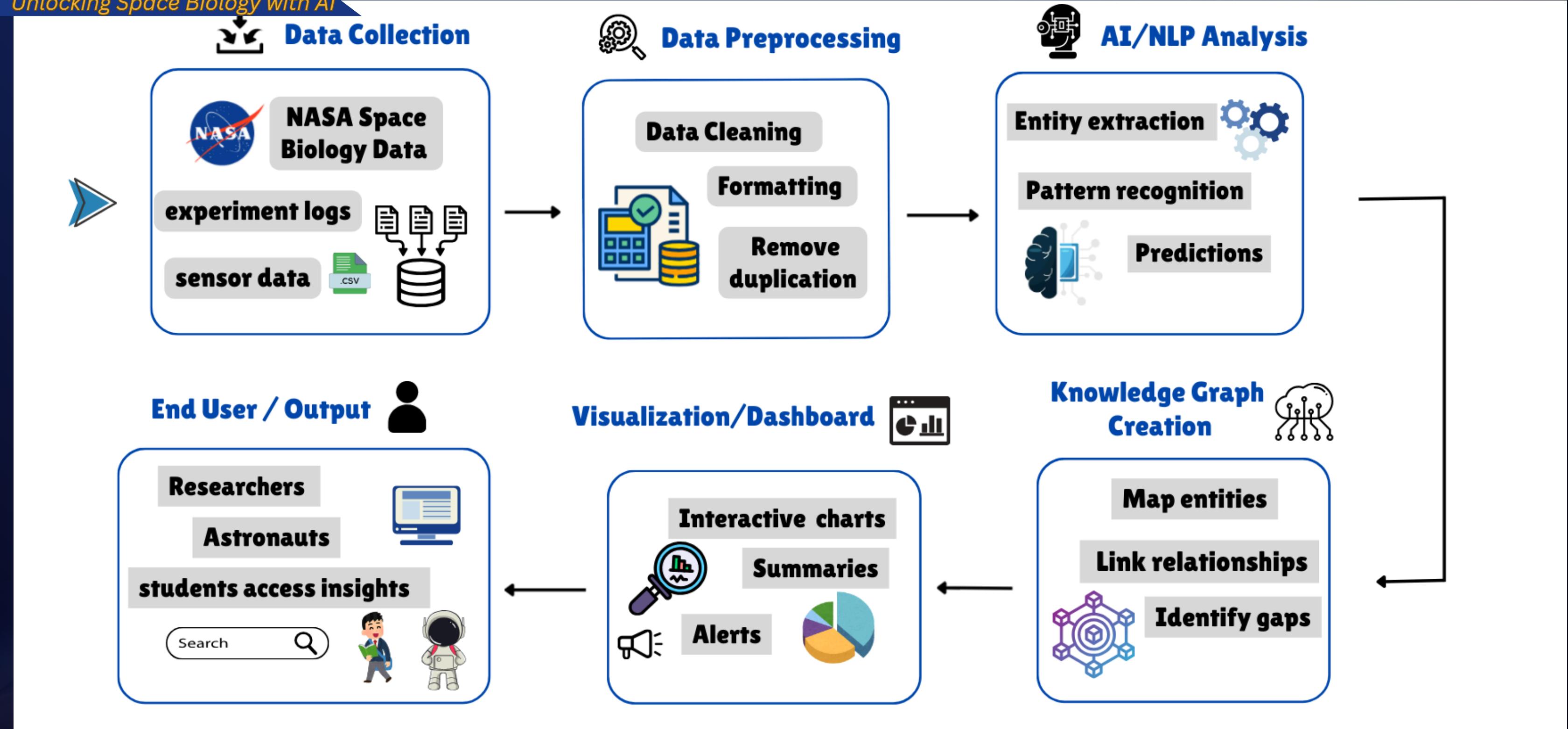


unstop

# BioOrbit

Unlocking Space Biology with AI

# System Architecture:





# Key Features of BioOrbit:

## Semantic Search:

Ask questions in plain English and get relevant experiment results.

## AI Summaries:

Each paper summarized into short bullet points + full technical summary for experts.

## Dual-Mode Access:

Research mode: technical details for scientists. Explore mode: simple summaries for students/public.

## KnowledgeGraph:

Explore how species, experiments, and missions are linked visually.

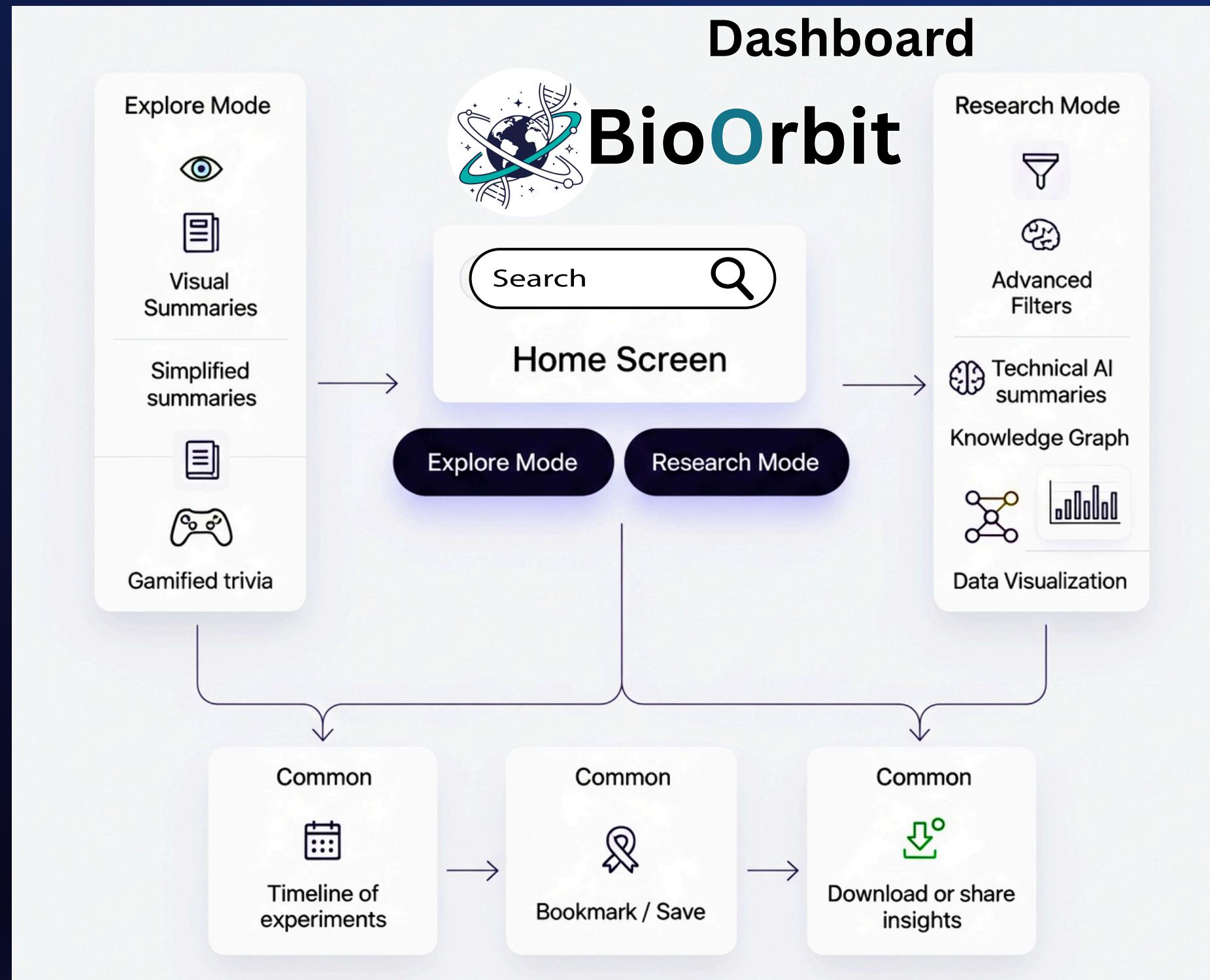


## Interactive Visuals:

Timelines, heatmaps, comparison charts, word clouds.



# UI / User Interaction :



## Explore Mode (For Students & Public)

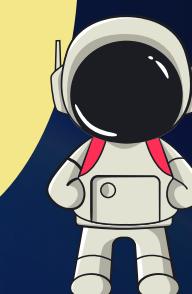
Simple summaries in plain English.

Visual dashboards (charts, timelines, word clouds).

Example: “How do plants grow in space?” → fun, visual answer.

## Research Mode (For Scientists & Experts)

- Advanced filters (species, mission, year, experiment type).
- Access to technical summaries & full publications.
- Example: Filter “Rodent experiments on ISS 2016–2020” → precise results.



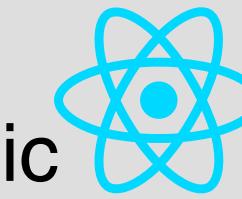


# Tech Stack:



## Frontend:

React.js (for dynamic UI). Plotly for interactive charts and visualizations.

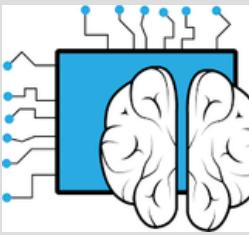


## Backend:

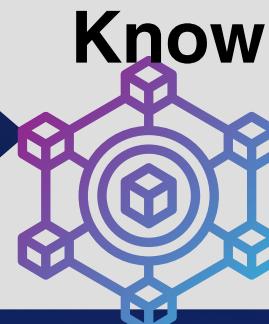
Flask/Django (to process AI models).  
for APIs and data processing.



## AI/NLP:



- GPT APIs, Hugging Face transformers,
- SpaCy (summarization, NER, Q&A).



**Knowledge Graph:** Neo4j or RDFLib for graph-based data storage and queries.

## Database:

Firebase / PostgreSQL.



Firebase

PostgreSQL

## Data Sources:

NASA Life Sciences Data Archive (LSDA), open bioscience datasets.





## Impacts :



- Researchers → faster access to critical insights for astronaut health.
- Students/public → simplified, visualized learning of space biology.
- NASA & space agencies → saves time in mission planning & biomedical research.
- Accelerates progress toward safe long-term Moon & Mars exploration.



## Impacts & Feasability:

### Feasability: ✅



➤ Prototype doable in hackathon (48 hrs) → dashboard with search, summaries, and graphs.

➤ Uses public NASA datasets + existing NLP/AI tools → no need to reinvent from scratch.

➤ Scalable design: can expand to more datasets, real-time mission data, or predictive AI models.

➤ Practical + impactful → balances ambition with realism.



## FUTURE SCOPE:

- Integration with NASA APIs

Live updates from bioscience databases.

- Multilingual Support

Summaries in multiple languages for global reach.

- VR/AR Visualizations

Immersive exploration of plant growth, cells & astronaut biology.

- AI Predictions

Forecast astronaut biological responses in Mars/long-term missions.



- Collaboration Mode

Researchers can annotate, share insights & co-build knowledge graphs.

- Gamified Education

Student-friendly interactive learning modules to inspire the next generation.



# CONCLUSION:

## Team Information:

### Team : Stellar Sparks

AI/ML & NLP Models  
(Summarization,  
Knowledge Graphs)  
System Architecture &  
Solution Design  
UI/UX & Visual  
Dashboards

Data Collection &  
Integration (NASA  
bioscience datasets)  
Backend & Database  
Management  
Research Validation &  
Documentation

Ayushi Rai  
(GGITS Jabalpur 4<sup>th</sup> year AIML)

Apoorva Nema

# THANK YOU!★



- We addressed the challenge of overwhelming, scattered space bioscience data.



- Our solution: a Knowledge Engine that transforms raw data into summaries, dashboards, and predictions.



- It ensures accessibility, collaboration, and impact for researchers, educators, and students worldwide.

