NASA SPACE APPS CHALLENGE

BioOrbit

Unlocking Space Biology with AI

NASA Space Apps

Challenge 2025

Jabalpur Local Event

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

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.

🌐 Knowledge Graph: Explore how species, experiments, and missions are linked visually.

📈 Interactive Visuals: Timelines, heatmaps, comparison charts, word clouds.

👤 Dual-Mode Access:

General Mode: simple summaries for students/public.

Expert Mode: technical details for scientists.

UI / User Interaction

Tech Stack

- **AI/NLP:** GPT APIs, Hugging Face transformers, spaCy (summarization, NER, Q&A).
- **Knowledge Graph:** Neo4j or RDFLib for graph-based data storage and queries.
- **Backend:** Python (FastAPI/Flask) for APIs and data processing.
- **Frontend:** React.js with D3.js / Plotly for interactive charts and visualizations.
- **Database:** MongoDB/Postgres for structured storage.
- **Data Sources:** NASA Life Sciences Data Archive (LSDA), open bioscience datasets.

Impact of BIOORBIT

🚀 **Accelerated Research:** Saves time by giving summarized insights instead of scanning 100s of PDFs.

📚 **Education-Friendly:** Makes space biology understandable for students, increasing STEM engagement.

👩‍🚀 **Astronaut Health:** Helps researchers study long-term effects of microgravity & radiation, supporting Moon/Mars missions.

🤝 **Collaboration:** Provides an open-access tool that universities and companies worldwide can use.

FUTURE SCOPE

- **Integration with NASA APIs:** Directly pull live data updates from NASA's bioscience databases.
- **Multilingual Support:** Summaries and dashboards in multiple languages to reach global researchers & students.
- **Collaboration Mode:** Allow researchers to annotate papers, share insights, and co-build knowledge graphs.
- **VR/AR Visualizations**: Explore experiments, cells, or plant growth in space using immersive AR/VR dashboards.
- **AI Predictions:** Use machine learning to predict astronaut biological responses under simulated Mars/long-term missions.
- **Gamified Education:** Create student-friendly interactive learning modules from NASA data to inspire the next generation.

CONCLUSION:

- “BIOORBIT empowers researchers, students, and space agencies with AI-driven insights from decades of NASA bioscience data.”
- We provide a centralized, intelligent, and user-friendly platform.
- Supports Moon, Mars, and beyond by improving astronaut health & research accessibility.

THANK YOU✨🚀

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