

Project Proposal: AI-Powered Space Mission Planning & Navigation System

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1. Introduction

Space exploration faces challenges like autonomous navigation in unpredictable environments, orbital debris avoidance, and the need for real-time decision-making in resource-constrained settings. This project proposes an **AI-driven system** integrating machine learning (ML), deep learning (DL), and robotics to address these challenges. The system will autonomously navigate rovers/satellites, predict orbital paths, forecast space weather, and assist astronauts via a voice-enabled bot, while supporting future planetary colonization efforts.

2. Objectives

- Develop an **autonomous navigation framework** for rovers/satellites using reinforcement learning (RL) and sensor fusion.
- Predict orbital trajectories and space weather events using time-series forecasting and LSTMs.
- Build a **voice assistant** to execute astronaut commands (e.g., system diagnostics, equipment control).
- Enable exoplanet discovery via light-curve analysis and CNNs.
- Simulate and optimize planetary colonization strategies (habitat design, resource management).

3. Conclusion

This project bridges AI and aerospace engineering to advance autonomous space exploration. By prioritizing simulation-driven development and modular design, it lays the groundwork for scalable, ethical systems to support interplanetary colonization.

4. References

- NASA JPL Horizons, Kepler Data Archive.
- PyTorch Documentation, ROS Wiki.
- COSPAR Planetary Protection Policy.