Project Title: AI-Powered Communication Optimization Between Earth and Deep Space Probes

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Conceptual Design Track
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The Issue

Prolonged delays, bandwidth constraints, and signal interruptions hinder probe–Earth communication.

Conventional rule-based systems exhibit poor adaptability.

Critical data (such as emergencies) may experience delays.

AI Solution – System Overview

The Significance of This for NASA NASA depends on prompt data for both safety and scientific purposes. Probes transmit a wide range of information, from alerts to groundbreaking discoveries. Artificial Intelligence has the potential to prioritize and optimize the timing and content of these transmissions.

AI System Design (Insert Diagram)

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AI Solution – Overview of the System

Categorizes data (such as alerts and scientific logs). Prioritizes critical information. Forecasts signal strength and available bandwidth. Organizes intelligent transmission schedules.

AI System Design (Insert Diagram)
system flowchart image
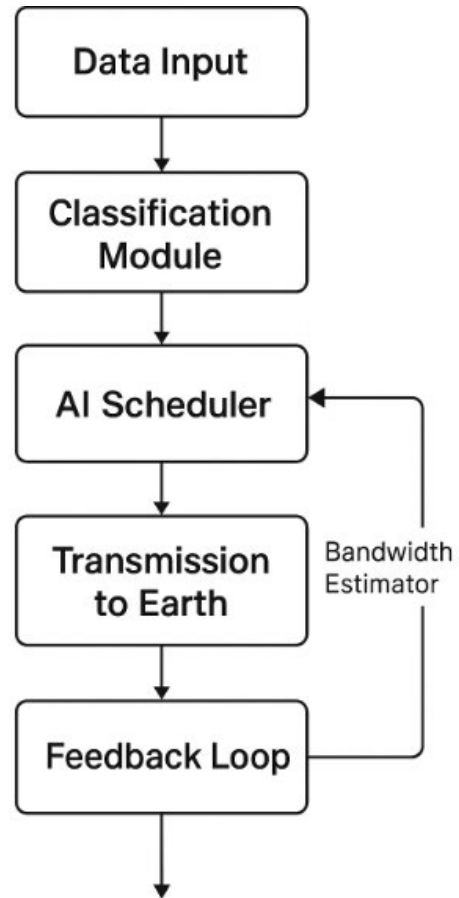
Key Features

Learns from past decisions (feedback loop)

Makes real-time choices during limited bandwidth

Can delay or compress non-essential data

Testing Plan Summary

5 simulated test scenarios:

Emergency during signal loss

Science data vs routine logs

Evaluated using metrics: efficiency, success rate, resilience

Conceptual testing only

Challenges and Ethical Considerations

- AI should not postpone essential data Human intervention must be feasible It must be safeguarded against disruptions

Conclusion

- AI has the potential to enhance NASA's management of deep space communication The design is adaptable, pertinent to missions, and prepared for future needs It could provide advantages for Artemis, Mars, and missions to the outer solar system.

https://github.com/joelleyarro03/nasa-ai-conceptual-willianeyarro/upload/main