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Artificial Intel Applications

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**AI-Powered Predictive Maintenance for NASA Deep Space Missions**

**Project Description:**

This conceptual project proposes the design of an AI system capable of monitoring and predicting mechanical and electronic failures in deep space probes and spacecraft. The system uses sensor data, anomaly detection algorithms, and predictive analytics to ensure mission safety and reduce the risk of catastrophic failures during long-duration missions.

# **Objectives:**

* Design a conceptual AI system that collects real-time data from spacecraft subsystems.
* Apply predictive analytics to detect anomalies and forecast failures.
* Improve maintenance scheduling, reduce mission risk, and extend equipment lifespan.
* Provide early warnings and maintenance suggestions to ground control.

# **Technologies Explored:**

* Machine Learning (predictive models)
* Time-series analysis
* Reinforcement learning (optional future use)
* Anomaly detection algorithms
* Data pipelines and simulated telemetry

# **Relevance to NASA:**

Predictive maintenance in space missions is critical due to limited access to hardware. AI can improve mission efficiency, reduce operational costs, and avoid mission-ending hardware failures. This system aligns with NASA’s goals for autonomy and deep space sustainability.

# **Proposed Timeline:**

|  |  |
| --- | --- |
| Week | Milestone |
| 1 | Finalize problem definition & start documentation |
| 2 | Conduct research on existing NASA systems and AI models |
| 3 | Design architecture & system components |
| 4 | Develop testing plan and evaluation strategy |
| 5 | Final review & polish presentation |

# **Deliverables:**

* Project Proposal (this document)
* Detailed System Design (PDF)
* Testing and Evaluation Plan
* Final Presentation Slides
* GitHub repository with README