ORION-AI – ORBITAL RESOURCE INTELLIGENCE & OPERATIONS NETWORK

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OBJECTIVE

Develop an AI-powered system for real-time, autonomous resource management and operations support in LEO and lunar orbit missions.

PROBLEM STATEMENT

Manual Earth-based monitoring creates latency and operational bottlenecks. Missions like Artemis and Lunar Gateway require onboard autonomy for resource optimization.

ORION-AI CAPABILITIES:

- Reinforcement Learning: Smart energy allocation

- Predictive Analytics: Forecasts resource needs

- Computer Vision: Equipment health checks

- Knowledge Graphs: Cross-system semantic reasoning

KEY FEATURES

- Autonomous Power Allocation – Optimizes solar/battery use, prioritizes critical systems

- Predictive Forecasting – Plans resupply by predicting fuel, oxygen, water usage

- Maintenance Assistance – Detects wear/failure early, avoids mission downtime

- AI Command Assistant – Suggests actions under safety & ethical boundaries

USE CASE

- NASA Lunar Gateway – Predicts life support recalibration → Conserves power → Alerts crew 12 hrs early

SYSTEM ARCHITECTURE

- Edge AI onboard spacecraft
- Federated learning across missions
- Secure satellite-cloud syncing
- Compatible with Artemis/Gateway digital twins

EXPECTED BENEFITS

- 30% reduction in downtime
- Enhanced safety & crew autonomy
- Reduced Earth-comms bandwidth
- Scalable from ISS to Mars