AI Applications for Next-Generation Space Systems

Leveraging Multi-Agent Systems, RAG, and Edge AI for Falcon, Starship, and Mars Missions

Real-time Manufacturing Defect Detection

Deploy multimodal vision models directly on Starship production lines to catch defects in real-time, preventing faulty components from progressing through assembly.

Engineering Knowledge RAG System

Enable engineers to instantly query: "What caused pressure anomaly in Raptor #5?" Get immediate answers with citations from telemetry, reports, and historical data.

Mars Mission Autonomous Agents

Handle 20-minute Earth communication delay with onboard AI that diagnoses issues, runs troubleshooting protocols, and executes corrections autonomously.

Enhanced Autonomous Landing Systems

Next-gen vision AI for Starship catch tower operations, processing visual inputs for microsecond adjustments during the critical catch phase.

Simulation Orchestration & Analysis

AI-driven Monte Carlo simulation orchestration that automatically runs thousands of launch scenarios, identifies edge cases, and generates human-readable summaries of critical findings.

Multimodal Test Data Analysis

Process engine test telemetry, video feeds, and sensor data simultaneously to generate comprehensive test reports with automatic anomaly detection and root cause suggestions.

Technical Implementation Approach

Architecture
Multi-agent LangGraph systems with parallel processing

Edge Computing
Optimized models for spacecraft-grade hardware constraints

Data Pipeline
Real-time telemetry ingestion with pgvector for semantic search

Safety Framework
Advisory-first approach with human verification loops

Training Data
Historical telemetry, simulation data, engineering reports

Deployment
Gradual rollout from ground systems to flight-critical

Core AI Capabilities

- → Multi-agent orchestration for complex tasks
- → Computer vision for quality assurance
- → Edge computing for spacecraft autonomy
- → Semantic search across all engineering data
- → Natural language interfaces to technical systems
- → Multimodal processing of diverse data types

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"Same constraints, higher stakes, infinite possibilities"