Collaborative Retail Shelf Restock Manager

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BVRIT Hyderabad College of Engineering for Women | October 2025

Revolutionising Retail Restocking

AI-Driven Multi-Agent System

Automated retail restocking using intelligent robotic coordination

Smart Task Allocation

Priority-based scheduling with real-time cloud coordination

Proven Results

Improved efficiency and balanced workload distribution

The Challenge

Dynamic retail environments demand efficient multi-robot coordination to maintain optimal stock levels and customer satisfaction.

Uneven Workloads

Robots experience excessive idle time whilst others remain overloaded

Static Scheduling

Inflexible systems cannot adapt to changing store conditions

Poor Adaptability

Traditional methods fail to respond to real-time priority changes

Project Objectives

01

Data Collection

Retrieve restock data from Agent 1 via Google Cloud Storage

02

Task Prioritisation

Analyse urgency and proximity factors for optimal scheduling

03

Implement Scheduling

Deploy priority-based system with greedy robot selection

04

Visualise Execution

Create 2D grid representation of task allocation

05

Evaluate Performance

Measure metrics and share feedback to cloud platform

Methodology & Algorithms

Priority Queue Scheduling

Urgent tasks processed first based on criticality

Greedy Robot Selection

Assign nearest available robot to minimise travel

Dynamic Load Balancing

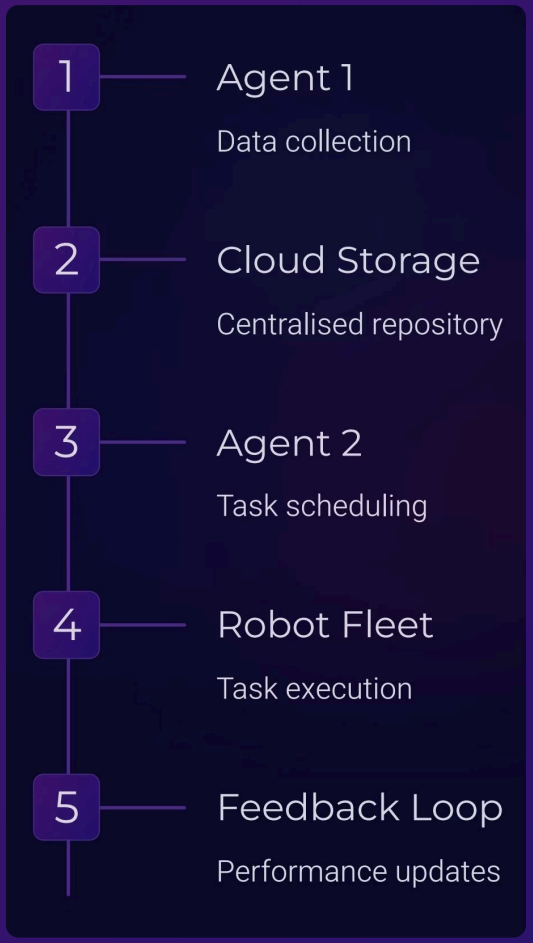
Real-time workload redistribution across fleet

AI-Heuristic Optimisation

Adaptive responses to congestion and demand

System Architecture

- **Core Technologies:** Python scheduling algorithms (heapq), Matplotlib visualisation, real-time performance metrics tracking



Performance Results

35%

Faster Completion

Reduced total task completion time versus static scheduling

25%

Better Utilisation

Improved robot utilisation efficiency across fleet

100%

Task Success

All priority items restocked within target timeframes

Sample assignments demonstrate intelligent routing: Eggs003 → R2 (closest at [3, 8]), Milk001 → R1 (minimal travel distance)

Visual Task Execution

Key Achievements

- Clear 2D path visualisation
- Balanced task distribution
- Reduced travel distances
- Real-time adaptability

System Benefits

- Transparent operations
- Predictable outcomes
- Scalable architecture
- Data-driven decisions

Future Scope

Smarter Scheduling

Incorporate battery levels, load capacity, path congestion

IoT Integration

Connect with smart shelves for predictive restocking

Reinforcement Learning

Adaptive intelligence through continuous system improvement

Enterprise Scale

Multi-store collaboration and fleet management

Thank You

Efficiency Through Intelligent Automation

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Algorithm Design & Simulation

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Cloud Integration

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Testing & Documentation

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Data Handling & Visualisation

Questions & Discussion