WOAS — Warehouse Optimization & Anomaly System

Summary

WOAS is an AI-driven prototype designed to enhance warehouse efficiency through intelligent inventory monitoring and anomaly detection.

It identifies abnormal inventory behaviors, such as sudden stock drops, excessive storage costs, or inconsistent restocking cycles, helping logistics teams detect inefficiencies, data errors, or potential losses before they escalate.

Key Components

1. Anomaly Detection Engine:
    - Built using Isolation Forest — an unsupervised Machine Learning model trained on live warehouse metrics (stock level, reorder threshold, storage cost, and restock interval).
    - Flags statistically abnormal warehouses or product categories for human review.
2. Optimization Layer:
    - Analyzes flagged records and suggests redistributions or restocking priorities.
    - Reduces over-stocking and prevents under-supply across warehouses.
3. Stream lit Dashboard:
    - Interactive visualization of inventory status and AI insights.
    - One-click anomaly detection, summary tables, and exportable reports.
4. Explainability & Extensibility:
    - Future-ready for SHAP-based explainability and predictive demand forecasting integration.

Business Impact (Projected)

- Inventory accuracy improvement: ~20–25% via early anomaly detection.
- Cost reduction: up to 15% from better stock allocation and reduced waste.
- Operational efficiency: 30% faster response to supply-chain issues.
- Risk mitigation: near-real-time alerts for potential stock mismanagement.

Deliverables

- app.py — Streamlit interface with integrated anomaly detection panel.
- anomaly_detection.py — AI engine using Isolation Forest.
- warehouse_optimizer module with optimization utilities.
- requirements.txt, readme.md, and innovation brief.

How to Run

1. Place all dataset CSVs into ./data/ or root directory.
2. Install dependencies: pip install -r requirements.txt
3. Launch the dashboard: stream lit run app.py

Contact

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