AI-Based Ration Shop Availability & Mapping System

Using RHEL + OpenShift + Grafana  
  
College Project Report

# Abstract

This project proposes an AI-based system to predict ration shop availability and shortages. It uses RHEL technologies like OpenShift, Podman, Grafana, Kafka, and PostgreSQL. The system helps both the public and government by providing alerts and dashboards, ensuring timely interventions in ration distribution.

# Introduction

The Public Distribution System (PDS) is critical in India for providing food grains and essential commodities at subsidized rates. However, due to poor stock management and lack of monitoring, ration shortages frequently occur. This project leverages Artificial Intelligence and RHEL tools to predict ration shop stock availability and prevent shortages.

# Literature Review

Existing systems rely on manual reporting or basic online portals. These solutions lack predictive capabilities and real-time updates. There is a clear gap in integrating AI prediction models with modern visualization and deployment platforms like OpenShift.

# Proposed System

The proposed system collects ration shop stock data through CSV uploads or web forms. The data flows into Apache Kafka for streaming and is stored in PostgreSQL. A Linear Regression model predicts when stock shortages will occur. Results are visualized using Grafana dashboards. The system is deployed using Podman containers and OpenShift for scalability.

# System Architecture

Flow of the system:  
1. Data Input (CSV Upload)  
2. Kafka Streaming  
3. PostgreSQL Database  
4. AI Prediction Model  
5. Grafana Visualization  
6. Web Application (Flask/Django)  
7. Deployment on OpenShift with Podman

# Technology Stack

• Backend: Flask/Django (Python)  
• ML/AI: Scikit-learn (Linear Regression)  
• Database: PostgreSQL  
• Streaming: Apache Kafka  
• Visualization: Grafana  
• Deployment: OpenShift + Podman  
• Platform: RHEL

# Implementation

1. Data is uploaded in CSV format.  
2. Kafka simulates real-time stock updates.  
3. The AI model (Linear Regression) predicts days until stock runs out.  
4. PostgreSQL stores historical data.  
5. Grafana dashboards display stock trends and alerts.  
6. Flask/Django backend serves the data to users.  
7. Entire application deployed on OpenShift using Podman.

# Results

The system successfully predicts ration shortages using historical data. Graphs show actual vs predicted stock levels, and Grafana dashboards provide real-time visualization. Alerts notify when a shop is likely to face shortages.

# Advantages

• Socially impactful solution for ration management.  
• Lightweight implementation using simulated data.  
• Industry-relevant RHEL toolchain.  
• Scalable and extendable architecture.

# Future Scope

• Integration with IoT sensors for real-time data.  
• Mobile app for ration card holders.  
• Integration with government e-Ration systems.  
• Use of advanced AI models like ARIMA or LSTM for time-series forecasting.

# Conclusion

This project demonstrates how AI and RHEL tools can be combined to address real-world problems like ration shortages. By predicting stock depletion and visualizing data in Grafana dashboards, the system benefits both the government and public. It is simple to implement, easy to demo, and highly impactful as a college project.