Overview

This project is an adaptive AI-based reverse logistics module developed as a Command-Line Interface (CLI) tool. It automates product return management by leveraging algorithms and intelligent decision-making processes.The system enables classification of returned items, optimal warehouse selection based on geographic data, prediction of resaleprices.The main goal is to simplify and streamline reverse logistics operations,making them efficient and cost-effective.

Features

1. Product Return Classification

A decision tree algorithm is used to analyze the condition of returned products and their reasons for return. Based on this data, the system provides recommendations such as:

- Refurbish
- Recycle
- Restock
- Resell at Discount

2. Optimal Warehouse Selection

Dijkstra's algorithm is implemented to find the best warehouse for return processing. The algorithm evaluates warehouses based on geographical proximity (latitude and longitude) and cost considerations, effectively modeling the system as a weighted graph.

3. Resale Price Prediction

The system uses K-means clustering to estimate the resale value of returned products. Given the original price and the product's condition score (ranging from 0.0 to 1.0), the algorithm predicts a fair resale price based on historical data clusters.

4. Data Management

The tool loads and manages data from CSV files, handling:

- Customers(with details like ID,name,contact info,latitude, and longitude)
- Products
- Warehouses

This structured data is used across all modules to support accurate computation and decision-making.

File Structure

```
├── main.c
├── cli.c / cli.h                # Command-line interface and menu control
├── products.c / products.h      # Product management
├── customers.c / customers.h    # Customer management
├── warehouses.c / warehouses.h  # Warehouse management
├── algorithms.c / algorithms.h  # Dijkstra's algorithm implementation
├── return_classification.c / return_classification.h  # Decision tree for returns
├── resale_prediction.c / resale_prediction.h          # K-means for resale prediction
├── Makefile
├── products.csv
├── customers.csv
├── warehouses.csv
```

Team Contributions

Mehta Taksh Ashish(B24ME1047)

- Integrated all modules cohesively.
- Designed and implemented the CLI interface.
- Created header files to modularize functionality.
- Ensured proper inclusion of header files across modules.
- Developed the Makefile for efficient compilation and build management.

Jayani Keyur Parikh(B24BB1014)

- Implemented Dijkstra’s algorithm for optimal warehouse selection.
- Modeled warehouses and customer locations as graph nodes with distance-based edge weights.
- Integrated the algorithm to work with real coordinates from the customer dataset.

Vedansh Manish Buchasia(B24CM1066)

- Developed the decision tree for return classification.
- Implemented logic to process conditions and reasons for return.
- Integrated the module into the CLI for interactive classification.

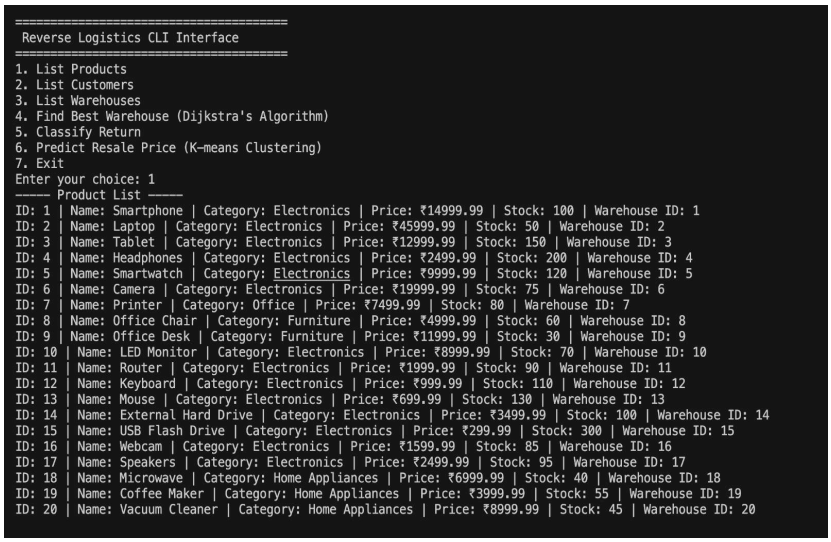
Shah Suhani Vishal(B24CH1037)

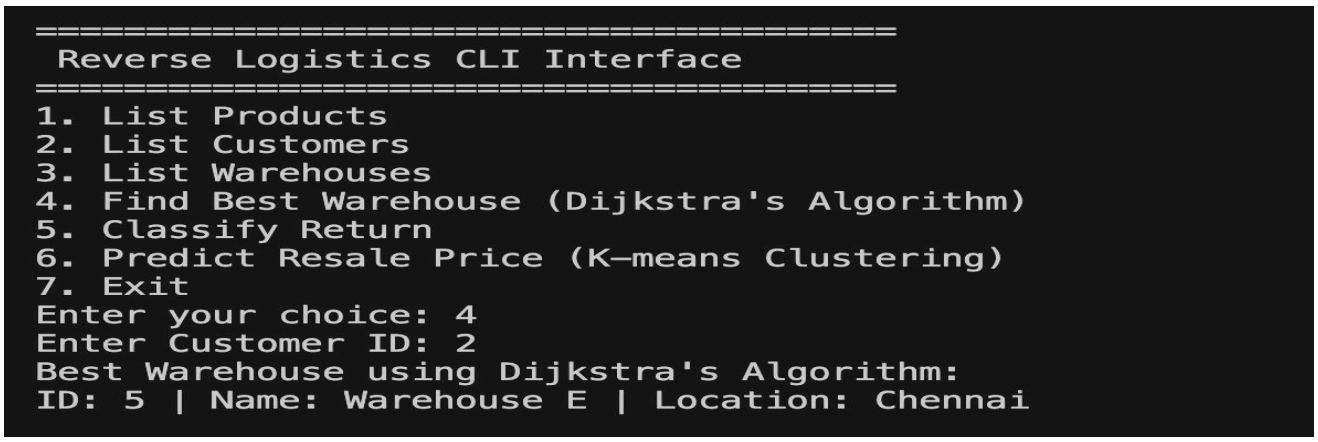
- Implemented K-means clustering to predict resale prices.
- Used clustering on synthetic historical data for pricing.
- Integrated interactive resale prediction feature into the CLI.

Conclusion

This CLI-based reverse logistics system brings intelligence and efficiency to product return handling. The team's modular approach, supported by algorithmic decision-making, makes the tool adaptable to various logistics scenarios and easy to extend or deploy in real-world environments.

Photos:-





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 Reverse Logistics CLI Interface
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1. List Products
2. List Customers
3. List Warehouses
4. Find Best Warehouse (Dijkstra's Algorithm)
5. Classify Return
6. Predict Resale Price (K-means Clustering)
7. Exit
Enter your choice: 5
Enter return reason (e.g., Defective, Minor Issue, Customer Remorse): Defective
Enter product condition (e.g., Damaged, Broken): Damaged
Recommended Action: Refurbish
```

```
 ====================================
  Reverse Logistics CLI Interface
 ====================================
 1. List Products
 2. List Customers
 3. List Warehouses
 4. Find Best Warehouse (Dijkstra's Algorithm)
 5. Classify Return
 6. Predict Resale Price (K-means Clustering)
 7. Exit
 Enter your choice: 5
 Enter return reason (e.g., Defective, Minor Issue, Customer Remorse): Minor Issue
 Recommended Action: Resell at Discount
```

```
 =====================================
  Reverse Logistics CLI Interface
 =====================================
 1. List Products
 2. List Customers
 3. List Warehouses
 4. Find Best Warehouse (Dijkstra's Algorithm)
 5. Classify Return
 6. Predict Resale Price (K-means Clustering)
 7. Exit
 Enter your choice: 6
 Enter the product's original price: 2200
 Enter the product's condition score (0.0 to 1.0): 0.3
 Predicted Resale Price using K-means Clustering: ₹1210.00
```