Optimizing Delivery Routes in Supply Chain Management Using Machine Learning

Problem statement:

The increasing complexity of supply chain operations, especially in e-commerce, necessitates efficient delivery routes to minimize costs and improve customer satisfaction. With the surge in online shopping, companies face challenges in optimizing their logistics. By applying machine learning, we can identify patterns and improve route efficiency.

Objective:

The literature on supply chain optimization highlights various methods for improving logistics efficiency. Traditional approaches, such as linear programming and heuristic methods, have been widely studied. However, recent advancements in machine learning have opened new avenues for optimizing delivery routes. Studies have shown that supervised learning algorithms, such as decision trees and random forests, can predict the most efficient routes by analyzing historical delivery data and we will use these machine learning algorithms and technology to optimize delivery routes in the supply chain and try to reduce cost and time of delivery which directly reduce lead time.

Research Variables:

- **Dependent Variable:** Delivery time
- **Independent Variables:**
    - Distance
    - Number of stops
    - Traffic conditions
    - Weather conditions
    - Delivery vehicle type

Data Sources:

- **Primary Data Source:** Kaggle dataset named "E-commerce Shipping Data," which includes information on various factors affecting delivery routes.

Research Model:

The research will employ a supervised machine learning model, specifically using a random forest algorithm. This model will analyze historical shipping data to predict the most efficient delivery routes based on the identified variables. The model will be trained on a portion of the dataset and tested on the remaining data to evaluate its accuracy.

Remaining Work:

- Data preprocessing and cleaning
- Training and tuning the machine learning model
- Model validation and testing
- Analysis of results and interpretation

Timeline of Your Work:

1. **Week 1-2:** Data collection and preprocessing
2. **Week 3-4:** Feature engineering and model selection
3. **Week 5-6:** Model training and tuning
4. **Week 7:** Model validation and testing
5. **Week 8:** Analysis of results
6. **Week 9:** Final report writing
7. **Week 10:** Review and submission

References (APA 7 Format):

- Christopher, M. (2016). *Logistics & supply chain management*. Pearson UK.
- Tsao, Y. C., Lu, J. C., & Yu, V. F. (2018). A supply chain network design considering transportation cost discounts. *Transportation Research Part E: Logistics and Transportation Review*, 111, 18-39.
- Winkenbach, M., & Malhame, M. (2021). Optimizing last-mile delivery networks with machine learning. *MIT Sloan Management Review*, 62(3), 1-5.