



PROFECTA

Smart Logistics using Apache Spark Environment

First Review – BATCH 8

Guide : Dr. N Gopika Rani

Team:

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Problem Statement

PROBLEM DOMAIN : Vehicle Routing Problem

OBJECTIVES:

- Optimise the logistics route for famous brands like Amazon, FedEx, BlueDart etc. and suggest k best routes.
- After understanding the factors affecting logistics, build a system taking them into consideration.
- Try and leverage the benefits of distributed data processing using Spark Environment.



Literature Survey

SNO	Paper Title	Authors	Algorithms used	Advantages	Disadvantage
1	Route Optimization in logistics distribution based on Particle Swarm Optimization (2019)	Appiah Martinson Yeboah, Xiong Qiang	Particle Swarm Optimization(PSO)	PSO has stronger function extreme value optimization ability so it provides the value which is close to actual optimal function value. When population size is increased, results were faster and better.	Certain parameters were not considered like loading and unloading time, real-time constraints.
2	Automotive Route Optimization for a Logistics Service Provider : Pre-study for Route Planning and Optimization Software Investment (2017)	ALDIN AVDIC & ZHENGYANG XIANG	RPS (Algorithm), Centralised and Decentralised vehicle routing	Factors considered are elaborate and detailed.	Some supply chain issues like investment decision, the availability of inventory spaces are not optimised.

SNO	Paper Title	Authors	Algorithms used	Advantages	Disadvantage
3	Optimization of Transportation Routing Problem for Fresh Food by Improved Ant Colony Algorithm Based on Tabu Search (2019)	Jing Chen 1,2,3, Pengfei Gui 3, Tao Ding 3, Sanggyun Na 3, and Yingtang Zhou 1	Improved Ant Colony Algorithm (IACA), Tabu search (TS)	VRP problem solving uses the minimum total distribution cost. It helps cold chain logistics to deliver fresh goods which is a unique point.	Due to experimental limitations, extensive and comprehensive comparative experiments will need to be applied to the LCFD-VRP model to get better overall optimization results.
4	International Truck Routing Optimization Using Deep Reinforcement Learning (2020)	Taufik Nur Adi, Yelita Anggiane Iskandar and Hyerim Bae	DQN (Deep Q Network - combination of RL and a convolutional neural network), SA, Tabu search	DQN can quickly adapt to the environment. Compared to SA and TS, DQN is faster.	DQN does not show better results across all datasets. Another issue is the development of a stable DQN that requires less training data and training time.



Inference

Possible Algorithms:

1. Metaheuristic algorithms like Ant Colony Algorithm, Particle Swarm Optimization, Genetic Algorithms.
2. Route planning System algorithms - DRP
3. Algorithms to solve problems: VRP (Vehicle Routing Problem), SVRP (Schostatic VRP), GVRP, MDVRP

Proposed Work:

- Clusters can be built one for each geographic zone and algorithms to optimise routes can be run independently.
- Various algorithms can be ensembled to find the best possible solution.
- The Real world agents for various factors like delivery urgency, depot traffic, fuel efficiency, capacity of vehicle are considered.



Hardware & Software Requirements

Hardware Requirements:

- 14 GB RAM
- Compute resources for running the algorithm
- Cloud services for data storage

Software Requirements:

- Graph visualization and analysis tools like Gephi, NetworkX, GraphX
- Databricks for SPARK



Dataset details

Logistics Dataset:

- Supply Chain Shipment Pricing Data (10000 instances)
- E Commerce Dataset (10000 instances)

Graph Dataset: (Nodes, Edges, Edge weight, Long-Lat)

- US Road Networks (CA, PA, TX)
- Europe (24 major cities)

Timeline





References

- Route Optimization System - A Guide to plan out the Best Logistics Route
- Route Learning: A machine learning-based approach to infer constrained customers in delivery routes - Andre Snoeck, Daniel Merchan, Matthias Winkenbach.
- Route Planning Model of multi-agent system for a supply chain management- Mortaza Zolfpour-Arokhlo, Ali Selamat, Siti Zaiton Mohd Hashim.
- Big Data in Logistics - Matea Lekić¹, Kristijan Rogić¹, Adrienn Boldizsár², Máté Zöldy², Ádám Török^{2*}; Published in 2019.
- A Vehicle Routing Optimization Problem for Cold Chain Logistics Considering Customer Satisfaction and Carbon Emissions - Gaoyuan Qin, Fengming Tao * and Lixia L; Published in 2019



Thank You

*"Logistics is simple, but not
easy."
~ Joe Lynch*



Approval From Guide



18Z320 - HARSHINI S



Thu, Sep 9, 5:30 PM (3 days ago)



Respected ma'am, We are herewith attaching the presentation for first review for your perusal. Kindly review the sam...



Dr Gopika Rani N - PSGCT

Sat, Sep 11, 11:05 AM (22 hours ago)



to me ▼

Yes Approved. Proceed with review

Regards,

Gopika

