

**SCHEDULE OPTIMIZATION OF FREIGHT VEHICLE  
FLEET USING DATA ANALYTICS**

Nammuni Arachchige Chami Madhushika Keerthisinghe  
(168035F)

Degree of Master of Science in Computer Science

Department of Computer Science and Engineering

University of Moratuwa

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Name of the supervisor: Dr. HMN Dilum Bandara

Signature of the supervisor:

Date:

Name of the supervisor: Eng. Nishal A Samarasekera

Signature of the supervisor:

Date:

## **Abstract**

### **Schedule Optimization of Freight Vehicle Fleet Using Data Analytics**

Schedule optimization is a key decision process of fleet management. However, truck and driver scheduling in multi-plant goods distribution is a complex problem due to geographically distributed customer sites and plants, heterogeneity in trucks, driver behavior, varying traffic conditions, and constraints such as working and resting hours for drivers. Moreover, we need to satisfy conflicting objectives such as maximizing order coverage and minimizing of the overall costs. At present context, the scheduling process is typically handled by a fleet manager who is responsible for assigning both the trucks and drivers to meet the confirmed jobs/orders of a given day. Such scheduling usually happens on the evening of the day prior to the order delivery date. As an NP-complete problem, assigning most suitable pair of vehicle and driver while satisfying both company and customer becomes difficult in a situation where there is an increment of total number of orders. We propose an automated, heuristic-based truck and driver scheduling solution which comprises of a rule checker and a scheduler. Rule checker imposes constraints and conditions such as driver and truck availability, delivery time constraints, and operating and resting hours. A scheduler that applies simulated annealing is proposed to cover as many orders as possible while minimizing the overall cost. The utility of the proposed solution is tested using a workload derived from a real-world bulk-cement distribution company. The results show good coverage of orders where the coverage increased by more than 10% compared to manual scheduling while minimizing the total cost by 35%. Furthermore, the solution has flexibility to tolerate exceptions due to breakdowns, traffic congestion, and extreme weather conditions without a considerable impact on most of the already assigned pairs of vehicle and driver to orders.

**Keywords:** Heavy Goods Distribution, Multi-plant, Simulated Annealing, Truck and Driver Scheduling

## **Dedication**

I am dedicating this thesis to:

My loving parents, Mr. & Mrs. Keerthisinghe who are my pillars of success

My beloved brother, Mr. Chinthaka M. Keerthisinghe who is my admirer

My dearest husband, Mr. Dinesh Madusanke who stands by me with light of hope and support

All the teachers and friend who encourage and support me.

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## List of Abbreviations

ANN	Artificial neural network
ANS	Artificial Neural Systems
BCD	Bulk Cement Delivery
DF	Deficit Function
DSS	Decision Support System
GA	Genetic Algorithm
IBK	Naive Bayes classifier
ILP	Integer Linear Programming
J48	Decision tree
LP	Linear Programming
ML	Machine Learning
NB	K nearest neighbor
PART	Rule based algorithm
RMC	Ready Mix Concrete
RO	Relief Opportunity
SA	Simulated Annealing
SMO	Support vector machine