Variable Neighbourhood Search for the Knapsack Problem

Congratulations!
You are the winner.

Imagine that you have won a gameshow where you get five minutes in your favourite store to take all the items that you can carry for free. The items you pick must fit into one cart. Which items would you place in your cart?

The problem stated above, and many other real-world problems, can be modelled as the Knapsack problem. The Knapsack problem is part of what is known as an optimisation problem. Optimisation is the process of finding the optimal solution to a problem. In this case, the goal is to maximise the total value of the objects inside the knapsack while keeping the weight of the knapsack below its capacity.

Problem Statement

The Knapsack problem entails having a knapsack with a maximum weight capacity, and a set of objects with a weight and a value. The goal is to find the combination of objects that should be put inside the knapsack to maximise the value, without exceeding the weight capacity.

The Knapsack problem appears in many decision-making problems, such as resource allocation and cargo loading.

Summary

The project group have created different adaptations of the Kernighan-Lin algorithm. The algorithm is normally used to solve the Travelling Salesman and Graph Partitioning problem and is for the first time used to solve the Knapsack problem. These solutions were then tested against more commonly used algorithms, to see if the new algorithms can produce more optimised results.

About the group

The group is comprised of three students of Bachelor of Science in Computer Engineer – Cybersecurity from the University of South- Eastern Norway.

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