Course Project Options

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Topic 1: Multi-package Delivery   This is a variant of vehicle routing problem in which packing decisions need to be made in addition to routing multiple vehicles. In recent years, online grocery shopping becomes popular and many companies (e.g., Amazon) deliver things to customers' home locations instead of the traditional way of having customers visiting a store to shop.

You are given a set of customers with their home addresses. Each customer orders a list of products with different sizes. There are multiple vehicles being routed from one or multiple depots to deliver products to customers in daily base. At the beginning of the day, you will obtain the list of products and their delivery addresses. Consider that a customer could order several things with very different sizes and you can pack them in different vehicles to save packing space. Therefore, you need to decide which products to be packed in each vehicle and how to route vehicles to deliver products to their customers. The vehicles need to come back to the depots at the end of each day. You can assume vehicles with the same sizes or with different sizes. For simplicity, you can assume that we only need to match one dimension of vehicle sizes and product sizes when modeling the "bin packing" part.

I suggest you start from the one-depot routing first, and after it, the problem can be complicated in the following ways:

⬦ There could be multiple depots rather than a single one. Each depot has inventories of all products ordered by all the customers, but you need to decide how many vehicles are located in each depot before packing and routing. We assume that all vehicles will be packed once in their depot and will then be routed.

⬦ There could be multiple depots and each may contain different inventory levels of different products. The vehicles can be routed first to visit a few depots and load all the products needed and then be routed to deliver them to customers. You will need to decide in a daily base: (1) how many we stock each type of products in each depot; (2) how to route vehicles to multiple depots to be packed; (3) how to route vehicles to customer locations to deliver.