Abstract:

In high-volume delivery operations like small package shipping, territory-based routing approaches (also known as districting) can dramatically reduce the complexity of urban delivery operations. By appropriately designing and fixing the territories/districts served by each driver, very large scale vehicle routing problems (VRPs) can be disaggregated into smaller and independent traveling salesman problems (TSPs). This allows to streamline operations, and by reducing the complexity of the problem, various side-objectives can be more easily handled, e.g. balanced workload allocation, service consistency, robustness to uncertainty, environmental impact, etc.

However, territory-based approaches typically sacrifice operational flexibility. In addition, models and algorithms for this problem often do not explicitly consider the routing component, nor do they evaluate the quality of the territories over multiple scenarios or periods even though the plans are made on a tactical level.

In this talk, I will propose a mathematical model for the territory design problem that incorporates the corresponding routing decisions over a set of representative scenarios, and which provides a simple way to parameterize the degree of flexibility. I will also present preliminary computational results on instances solvable to optimality, and discuss some qualitative observations relating to the structure of territory plans for varying degrees of flexibility.