# Developing a Large-scale Taxi Dispatching System for Urban Networks

A way of improving taxi operations is to deploy a **taxi dispatch system** that considers the interrelated effects of taxis on other traffic modes.

This paper presents a **taxi dispatch model** that takes into account the impact of taxis on normal traffic flows while optimizing for an effective dispatch policy. The presented model builds on the concept of the **macroscopic fundamental diagram** (MFD) to represent the dynamic evolution of the traffic conditions. A model predictive control approach is devised to control the taxi dispatch system on a two-region city case study.

Result: the case of no network-scale taxi dispatching leads to **severe accumulation of taxi passengers and vacant taxis** in different regions whereas the dispatch system **improves the taxi service performance and reduces traffic congestion** by regulating the network towards the undersaturated condition.

Taxi dispatching is an imperative part of taxi management systems that uses real-time taxi-fleet information to provide them them guidance to achieve higher passenger pickup rates. An efficient taxi dispatch system must take into account the interrelated effects of taxis on other traffic modes while optimizing a network objective criterion. On one hand, excessive and unwarranted taxi dispatching can further hinder mixed traffic flow in cities where taxis make up a substantial ratio of the traffic. On the other hand, dispatched taxis are themselves affected by normal traffic conditions; i.e., taxis might be en-route for an unreasonably long time under congested traffic conditions.

This study proposes a traffic flow model and a taxi dispatching system that incorporates the interrelated dynamics of taxis and other transport modes (e.g. personal vehicles) in congestion propagation in order to minimize total network travel time.

This paper integrates a dynamic taxi service model within an urban network using the concept of the macroscopic network fundamental diagram (MFD). The MFD captures the collective traffic flow dynamics of an urban region and relates the urban region outflow (production) to the accumulation (density) of vehicles while a homogenous traffic state is prevalent.

This paper aims at developing an efficient multi-modal (cars and taxis) traffic control strategy, i.e. taxi dispatching, to improve urban mobility and mitigate congestion in cities.

Takes in consideration density of vacant taxis in a region and density of waiting clients in a region.