Objective
We aim to solve a large-scale SAV (Shared Autonomous Vehicle) DARP (Dial-A-Ride Problem), where the system has to process a large number of passenger requests (around 100,000 for a time horizon of 10h per day). One of the main objectives is to speed up the dispatching and scheduling process while maintaining a good decision quality. For this, we introduce different techniques:

► The use of a fleet filter in order to quickly identify a small subset of SAVs that are worth exploring given a passenger request.

► The use of an insertion position filter in order to quickly identify a subset of insertion positions within the route of a candidate SAV that are worth examining.

The fleet screening module

► The fleet filter: We introduce an index matrix $M$, serving as a fleet filter. The road network and time horizon are partitioned into zones and periods. Each cell $M_{Z,H}$ contains a set of SAVs that could potentially reach the zone $Z$ during the period $H$.

► The fleet screening process: Given a new passenger query, we explore simultaneously from the origin and the destination sides all the cells with zones and periods related to the query, take all the concerned SAVs, sort them by score and keep the first few to form the candidate set.

The insertion position screening module

► The insertion position filter: For each SAV, a structure $N_{Z,H}$ is used to serve as an insertion position filter. Each cell $N_{Z,H}$ contains a set of points, departing from which the SAV could pass the zone $Z$ during the period $H$.

► The insertion position screening process: Given a candidate SAV, the insertion positions for the query’s origin and the destination are selected from the related cells of $N_{Z,H}$. In addition, a position is called a candidate only if it could arrive at the target zone during the time window imposed by the query.