18-month postdoctoral position - Shuttle on demand Partners: IFSTTAR, SNCF Location: IFSTTAR, Villeneuve-d'Ascq Expected start: At the earliest Salary: Between 32 000 and 35 000 Euro year gross salary

### Context

The research is part of the SNCF work towards the development of new mobility services complementary to conventional rail transport. It takes as a starting point the Autonomous Shuttle project between Nantes and Carquefou (France). It also addresses certain aspects of more generic configurations.

## Goal

Design and testing of an optimization algorithm for the real-time planning of a dedicated on-demand passenger transport service.

## **Problem definition**

The problem is to plan the shuttle service operating on a dedicated line for passenger transport. In rush hour, the shuttle service is planned in a periodic manner. This rush hour service defines the sizing of the fleet.

In off-peak hours, the service is on demand: the user connects to the system (through terminals or a smartphone application, for example) and requests a service specifying: the departure and arrival stops, the desired departure time and the number of passengers. This request can be made in real time or in advance. Based on a request to be satisfied, a forecast of available requests, the validated service plan and the current position of the shuttles, the algorithm decides which shuttle satisfies the demand of each user and in which order. If suitable, the shuttles can be organized in convoys. The main constraints to be taken into account are: the maximum travel time; the maximum waiting time; the charge level of shuttle batteries (if electric); the location and recharge time of shuttles (if electric); the constraints of the shift of the drivers or operators (if non autonomous shuttles).

The infrastructure is dedicated and has a simple structure. Several turning points may be available, as well as several garage areas. In the case of electric shuttles, the location of the charging stations is given. Different criteria are critical for evaluating the system performance. In particular, the waiting time of the user, the travel time, and the shuttle utilization. The algorithm considers either one of these criteria or a weighed sum of two or three.

In addition to real-time service planning, the algorithm can be used offline to perform scenario analysis, for example to evaluate the performance of an autonomous shuttle system versus driver-operated shuttles.

# **Contact person:**

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# Application procedure, by February 14th:

Via email:

- detailed CV (education, work experience, internships, research projects carried out, publications)

- copy of the most relevant publications

- motivation letter explaining how the candidate's CV fits the position requirements and indicating the possible links of the publications chosen with the job description

- one or more recommendation letters