Offer #2025-09079

Internship - Integrated transit system with Electric RIDE-sharing and Mobility Pickup Stations in smart grid (H/F)

Level of qualifications required : Bachelor's degree or equivalent

Fonction : Internship Engineering

Assignment

Recently, the integration between machine learning and operations research has been a novel trend to tackle

problems with stochasticity. For example, Baty et al. [2024] tackle the dynamic vehicle routing problem

(VRP) with real-time customer requests. The task involved a rapid delivery service using capacitated vehicles

to serve customer requests originating from a depot. Each request had to be served within a specified time

window. Requests arrived dynamically, and vehicles were dispatched in waves to serve them. At each wave's

decision time t, the system state X_t consists of the set of requests that have not yet been served. The

decision Y_t involves selecting the subset of requests to be served by the vehicles dispatched at time t, as well

as the corresponding routing plan. The objective is to find a policy h that minimizes the expected total

routing cost. The authors proposed hybrid machine learning pipelines to tackle the problem, which includes

two layers: a graph neuro network (GNN) to predict the "prize" of serving each request in the graph and

a combinatorial optimization layer to solve a price-collection capacitated vehicle routing problem at each

decision epoch t to produce the routing solution with the predicted prizes. Another important stream is

to integrate Large Language models (LLMs) into optimization, where the optimization task is described

in natural language. In each optimization step, the LLM generates new solutions from the prompt that

contains previously generated solutions with their values, then the new solutions are evaluated and added

to the prompt for the next optimization step. This idea has been demonstrated efficient in solving traveling

salesman problems (TSP) (Yang et al. [2023]).

Main activities

The objective of the internship is to implement combinatorial optimization augmented machine learning

(COAML) method and LLM to solve dynamic electric autonomous dial-a-ride problem (E-ADARP). The

static version of the E-ADARP with determined requests has been fully analyzed in Bongiovanni et al. [2019],

Su et al. [2023, 2024]. The first step is to leverage the existing resource of Baty et al. [2024], Yang et al.

[2023] to solve the dynamic DARP - a simplified version of dynamic E-ADARP by deactivating charging

options. It would be a good example to start, as the dynamic DARP is extended from VRP and TSP. The

obtained results will be benchmarked with literature.

Skills

Technical skills and level required : C++, python, optimization

Languages :english, french

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

Current internship bonus: €4.35/hour

General Information

- **Theme/Domain :** Optimization, machine learning and statistical methods Scientific computing (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** Centre Inria de l'Université de Lille
- **Starting date :** 2025-09-01
- **Duration of contract :** 6 months
- **Deadline to apply :** 2025-08-02

Contacts

- **Inria Team :** INOCS
- **Recruiter :**
  Brotcorne Luce / Luce.Brotcorne@inria.fr

About Inria

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Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

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