# Offer #2024-07763

# Post-Doctoral Research Visit F/M Strategies for Optimal EV Charging Infrastructure and Power Allocation in EV Electromobility Networks

**Contract type :** Fixed-term contract

**Renewable contract :** Yes

**Level of qualifications required :** PhD or equivalent

**Fonction :** Post-Doctoral Research Visit

## About the research centre or Inria department

The Centre Inria de l'Université de Grenoble groups together almost 600 people in 22 research teams and 8 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (Université Grenoble Alpes, CNRS, CEA, INRAE, ...), but also with key economic players in the area.

The Centre Inria de l'Université Grenoble Alpes is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

## Context

**Working Context.** This research will be conducted by the DANCE research team (webpage): DANCE ("Dynamics
and Control of Networks") is a joint team of GIPSA-lab and Inria Grenoble–Rhône-Alpes. Our team has a strong expertise in modeling, estimation and control of large-scale networks with application to Electromobility. The research will be part of the PEPR Digitalisation et Décarbonation des Mobilités (MOBIDEC: https://pepr-mobidec.fr/), and the sub-project PC1: FORBAC "FORecasting impacts of mobility, BACkcasting optimal decisions".

## Assignment

**Scientific Context**. Our group has developed eMob-TwinV1 build upon the findings of the ERC-AdG Scale-FreeBack (emob-twin.inrialpes.fr), resulting in an e-mobility simulation tool driven by digital twin technology. eMob-Twin serves a wide range of purposes including forecasting, analysis, and unlocking EV flexibility, catering to the needs of companies, stakeholders, and electricity markets. Initially designed for the Grenoble metropolitan area, a new version currently under development, eMob-TwinV2, will have the capability to encompass any other metropolitan city in France, incorporating auto-calibration functionalities. Primarily focused on electric vehicle (EV) mobility and their state of charge, it also integrates multi-power charging stations. In the context of the PEPR-FORBAC initiative, we aim to tackle two primary challenges. Firstly, we seek to optimize the placement of charging stations (PC location) to ensure efficient coverage. Secondly, we aim to optimize power delivery density per unit area, utilizing the steady-state solution of the dynamic electromobility model while adhering to energy equilibria constraints (ensuring EV charging demand matches the charging station supply infrastructure). Results will be integrated as a toolbox in the eMob-Twin V2 software.

## Main activities

**Work program.** The work program includes several key areas of development, focusing on model extensions, large-scale optimization challenges, and software implementation:

- Expanding the existing model referenced in [1, 2] to incorporate additional nodes representing Charge Stations with actual capacity, driver-user price models, and their integration with the grid,
- Following ideas in [2], devising highly efficient optimization algorithms (including learning and IA strategies) for charge station placement and power delivery density per unit area within the expanded model framework. These solutions should be scalable to cover the entire graph model,
- Integrating the developed algorithms (both the model extension and optimization algorithms) into eMob-Twin V2, and conducting comparative analyses of optimization outcomes with those provided by policymakers and urban planners (SDRIVE).

The integration of software components will be undertaken with the assistance of our local team of Research Engineers.

**References**


1. Rodriguez-Vega, M., Canudas-de Wit, C., Nunzio, G.D., and Othman, B. (2023). A graph-based mobility model for electric vehicles in urban traffic networks: Application to the Grenoble metropolitan area. In 2023 European Control Conference (ECC), Bucarest, Ru.
2. Mourgues, R., and Canudas-De-Wit, C. , Rodriguez-Vega, M., (2023). Optimal location of evs public charging stations based on a macroscopic urban electromobility In 2023 62nd IEEE Conference on Decision and Control (CDC), 3122–3129.


## Skills

**Request Background**. Optimization, Applied mathematics, physical modeling, IA

## Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- 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

- 2788 euros/month gross salary

## General Information

- **Theme/Domain :** Optimization, machine learning and statistical methods
  Scientific computing (BAP E)
- **Town/city :** Montbonnot
- **Inria Center :** Centre Inria de l'Université Grenoble Alpes
- **Starting date :** 2024-09-01
- **Duration of contract :** 12 months
- **Deadline to apply :** 2024-07-31

## Contacts

- **Inria Team :** DANCE
- **Recruiter :**
  Canudas-de-wit Carlos / carlos.canudas-de-wit@inria.fr

## About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

## The keys to success


The integration of software components will be undertaken with the assistance of our local team of Research Engineers.


**Warning** : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

## 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.

**Recruitment Policy :**
As part of its diversity policy, all Inria positions are accessible to people with disabilities.