| | **JOB OFFER** | **Research Engineer (M/F) in Mobility Simulation**<br><br>**DR - CIRED** |
|---|---|---|

**École des Ponts ParisTech**

## 1. Presentation of CIRED and the Territorial Mobility Chair

CIRED is an applied economics laboratory that brings together ENPC, CNRS, AgroParisTech, CIRAD and EHESS. Its research focuses on the environmental (energy, climate, biodiversity) and social transition of anthropized systems such as cities and their mobility. CIRED develops a range of prospective models in different fields (energy/climate, urban systems, land use, biodiversity, etc.)

The "Territorial Mobility" Chair is a research partnership between ENPC and IDFM, the authority in charge of mobility in Ile-de-France. Between 2010 and 2019, the Chair focused on modeling user and vehicle traffic on a public transportation network. For the period from 2020 to 2025, the Chair is focusing on the economics of public transport and anticipating the future mobility system. Its areas of research are arranged in four largely overlapping themes:

A. Knowledge and foresight of the transport offer in the regional territory,
B. Statistical knowledge and foresight of the demand for mobility.
C. Economics of mobility: household budgets (in money, in time) and the issue of mobility permits,
D. Supply-demand-use-impact simulation, with applications at the regional scale.

## 2. Description of the position

The Territorial Mobility Chair is recruiting a Research Engineer (RE) in mobility modeling and simulation, in order to contribute to the four themes mentioned above. The mission is to design and develop computer simulators for the simulation models and estimation methods used by the Chair, and to contribute to the application of these simulators in case studies in Ile-de-France.

- Simulation of the mobility offering: the CapTA model for the simulation of public transport at the regional level will be used to consolidate the computer code and architecture. A complementary model will then be developed to simulate shared mobility services. See Leurent et al. (2014), Poulhès et al. (2017), Leurent (2013), Poulhès and Berrada (2019).

- Simulation of demand: disaggregated depending on spatial conditions (location of home and workplace, transport available) and individual socio-economic characteristics (including purchasing power) (see Trouvé, 2020). The household population will be modeled, mobilizing several databases (Population Census, Family Budget, Car Fleet, Household Mobility, OSM, GTFS, GBFS, digital traces from systems such as IDFM's SIDV-Navigo and KISIO's VisioPulse): see De Lauretis (2017). The statistical estimation of this "synthetic population" in terms of mobility will be the subject of specific research.

- Prospective simulation of supply and demand: the RE will develop the simulation framework for the prospective study of mobility in Ile-de-France for 2030 and for 2050, by combining the supply and demand simulators. They will focus on determining the "future states" of the system: taking into account exogenous influences (carbon budget, energy prices, composition of the vehicle fleet, prices of new vehicles according to energy types, socio-economics of incomes, etc.); simulating economic impacts (transport and energy consumption and production) and environmental impacts (carbon emissions, atmospheric pollutants).

These activities will be carried out under the supervision of the Chair's director, in collaboration with a researcher officer in mobility economics and young researchers (doctoral students, master's students on a final year assignment or project course). In particular, the RE will supervise the application of the synthetic population model by a PhD student, whose research will begin in the fall of 2021.

In a transversal manner, the RE will participate in the communication of the Chair and in its promotion among those concerned (IDFM, but also the transport operators and the local authorities, in particular the Ile-de-France

Region, as well as the State).

The RE will become part of CIRED's prospective modeling team. They may be required to participate in the laboratory's prospective modeling research projects on the environment-climate-energy link.

## 3. Profile required

The position is suitable for a computer development engineer, or doctor in computer science applied to complex systems (ideally in mobility systems, virtual urban environment, technical networks, information systems, etc.)
You have proven experience in program architecture design and software development. You master the use of open source software for geographic information management, graph processing, multi-agent simulation, data mining and advanced visualization.
You are mindful about IT efficiency and master complexity analysis.
You are precise and rigorous. You ensure that your work is documented to enable use and facilitate learning.
Proficiency in Python and C++ or Julia is required. Proficiency in numerical statistics is an advantage.
Fluency in technical and scientific English, written and oral expression, and scientific communication are essential.
You know how to work in a team and communicate information. You ensure that the contributions are well coordinated, while being autonomous.

## 4. Location

| Place | Located in Nogent-sur-Marne (at the Jardin Tropical de Paris) |
|---|---|
| Access | 15 min from the center of Paris by RER A (Nogent-sur-Marne station), Highway A4 - exit 4 "Saint Maur - Joinville" - by car. |

## 5. Applications

Category A position: civil servant or contract employee (3-year renewable contract) and possibility of secondment.
Full-time position. Statutory remuneration or according to profile and experience.

Send CV + cover letter via the application link or by email to the following address:
Fabien Leurent, ENPC-CIRED, Director of the Chair: fabien.leurent@enpc.fr

Applications are due by April 2, with a view to an interview in April/May and a position starting in the summer of 2021. Applications will be examined on a case-by-case basis as they are received.

## 6. Bibliographic references

Berrada, J., Andreasson, I., Burghout, W. & Leurent, F. (2019). Demand modelling of autonomous shared cabs mixed with scheduled transit. Proceedings of the 98th Transportation Research Board (TRB) Annual meeting, https://www.researchgate.net/publication/339747740
De Lauretis, S. (2017). Modélisation des impacts énergie/carbone de changements de modes de vie. Une prospective macro-micro fondée sur les emplois du temps. Paris-Saclay University. HAL tel-01746139.
Leurent F. (2013) Travel Demand for a One-Way Vehicle Sharing System: a model of traffic assignment to a multimodal network with supply-demand equilibrium. In Albrecht T., Jaekel B. and Lehnert M. (eds), Proceedings of the 3rd International Conference on Models and Technologies for Intelligent Transportation Systems 2013. Verkehrstelematik Vol. 3, pp. 523-534. TUDpress, Dresden. ISBN: 978-3-944331-34-8
Leurent F., Chandakas E., Poulhès A. (2014) A traffic assignment model for passenger transit on a capacitated network: Bi-layer framework, line sub-models and large-scale application, Transportation Res. C, 47/1: 3-27.
Poulhès A., Pivano C., Leurent F. (2017) Hybrid Modeling of Passenger and Vehicle Traffic along a Transit Line: a sub-model ready for inclusion in a model of traffic assignment to a capacitated transit network. Transportation Research Procedia, 27-2017: 164-171. https://doi.org/10.1016/j.trpro.2017.12.079.
Poulhès A., Berrada J. (2019) Single vehicle network versus dispatcher: user assignment in an agent-based model. Transportmetrica A: Transport Science, pp.1-23. ⟨hal-02042955⟩
Trouvé M. (2020) Mobility tools holding and intermodality modelling in Paris. Doctoral thesis from the Université Paris-Est defended on October 23, 2020.
Trouve, M., Leurent, F. (2018). Modeling Urban Mobility at a Metropolitan Scale: a Comparison of Paris Transportation Models. Presented to Transport Research Arena 2018, TRA 2018, Vienna. ⟨hal-01939140⟩
http://www.omnil.fr/ Website of the Ile-de-France Mobility Observatory.