Large-scale deployment of multi-pollutant environmental forecasts based on big data and numerical simulation

Engineer position
July 2016

Context

In July 2015, the SoundCity mobile application was launched with support from Paris city during a press conference that drew attention and established a large user base in Paris region. The application allows to evaluate individual and collective exposures to noise pollution. SoundCity is indeed monitoring the user exposure to noise pollution throughout the day, and volunteers can contribute their measurements for collective exposure analysis. One year after the launch, over 54 million measurements have been collected. Based on this big data and numerical simulation, the SoundCity team develops unique algorithms to improve the monitoring of noise pollution.

In 2016, the SME Numtech launched the NOA service which provides air quality forecasts and gives health-related advice. This service is delivered on the mobile phone after a QR code is scanned. This innovation is available world-wide, with street-level resolution in certain cities. The service just received the Teratec innovation trophy.

Capitalizing on these innovations, the partners are in the process of creating the Ambiciti startup to launch a global service delivering multi-pollutant environmental forecasts and analyses.

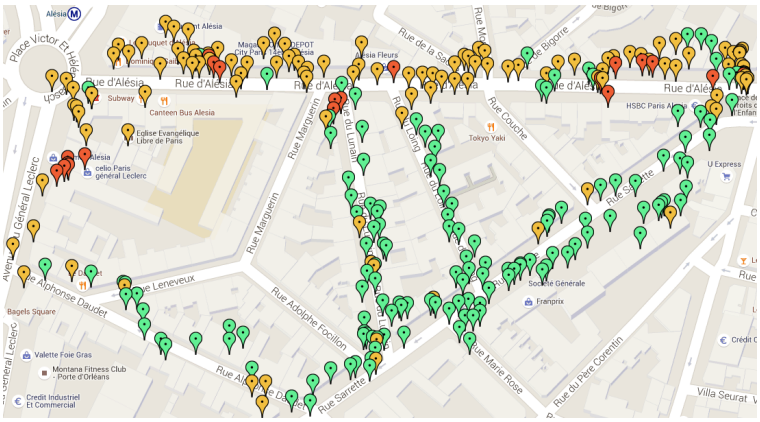

Figure 1: Noise levels collected with the SoundCity mobile application.

Objectives

The objective of the position is to help Ambiciti to have efficient processing of the pollution databases and simulations, and to scale world-wide.

The processing of the large noise database is currently carried out by a Python module that needs improvements for easier access, post-processing and visualization. The current visualization tool, also in Python (Qt/PySide), has an independent loading mechanism which should be replaced.

The global simulations and the street-level simulations in several cities (Paris, cities in San Francisco Bay Area, Helsinki, etc.) should be better handled, e.g., improving processing speed, increasing robustness to miscellaneous failures (like missing data), using more data sources. Several gigabytes of simulations need to be quickly processed every day.

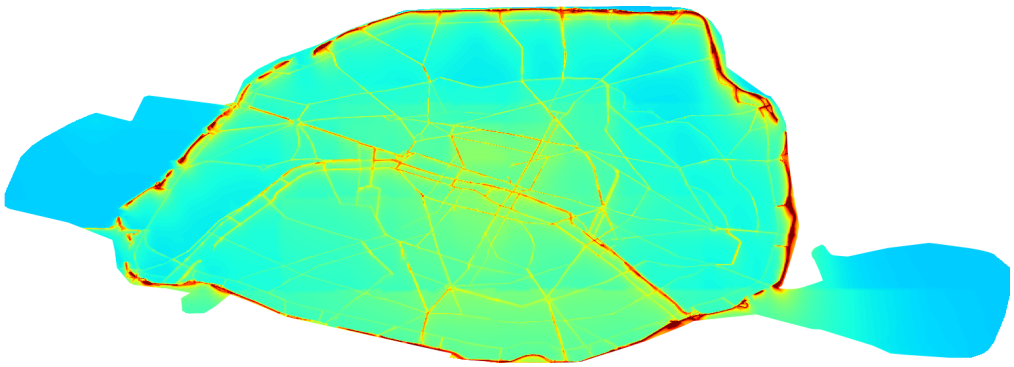

Figure 2: Map of air quality index as provided for Paris in the Ambiciti platform.

Ambiciti merges observational data and simulations. Automatic download of new observation sources will allow the application to provide even better information. The merging between the different information sources, called data assimilation, is written in C++ and needs to better scale, especially with a more efficient parallelization and a new algorithm for uncertainty quantification.

Hosting team

The hosting Inria team, Clime, works on uncertainty quantification and data assimilation for environmental applications. It leads the development of the data assimilation library Verdandi. It takes part to various projects connected to smart cities, in particular the CityLab initiative.

The work will be conducted in the framework of the European project Env&You (funded by EIT Digital), lead by Inria, and in close collaboration with the emerging startup Ambiciti. The other involved partners are the SME Numtech (urban air quality), Forum Virium (Helsinki), Inria@SiliconValley and The Civic Engine (Bay Area).

Conditions and contacts

Expected profile:

- Engineer (with master degree or equivalent) interested in computer science, especially for environmental applications involving big data and numerical simulation
- With or without professional experience
- Ability to adapt in a fast moving project, in connection with a startup

Starting date: as soon as possible in 2016

Duration: 12 to 15 months

Salary: depending on experience (if any)

Localization: Inria Paris

- Address: 41 rue du Charolais, Paris (12e arrondissement)
- Within walking distance of gare de Lyon (RER A and D, subway 1 and 14), Montgallet (subway 8) et Dugommier (subway 6)

Contact: Vivien Mallet, vivien.mallet@inria.fr, 01 80 49 41 24 (from abroad: +33 1 80 49 41 24)