Postdoctoral position in Web of Things for Industry of the future and smart city

Henri Fayol Institute

Intelligent Systems and Informatics Department

Context

Mines Saint-Étienne, an IMT graduate school under the supervision of the Ministry of the Economy and Finance, is responsible for training, research and innovation, transfer to industry and scientific, technical and industrial culture.

Mines Saint-Etienne represents: 1,800 engineering students and researchers in training, 420 employees, a consolidated budget of €50 million, two campuses (one in Saint-Étienne (Loire) with three sites, one located in Gardanne (Bouches-du-Rhône), 5 training and research centres, 7 research laboratories, a scientific, technical and industrial culture centre ("La Rotonde") and development projects in France and abroad.

The Henri Fayol Institute is a training and research center that brings together Mines Saint-Étienne's teacher-researchers in industrial engineering, applied mathematics, computer science, environment and management. The Henri Fayol Institute contributes to decision support for companies and territories through a quantitative, IT and managerial vision for sustainable development purposes.

The Computer Science department (called Intelligent Systems and Informatics (ISI)) is a component of the Fayol Institute. The research developed within this department also takes place within the Connected Intelligence team[1] within the Computer, Image, Telecom department of the Hubert Curien UMR 5516 Laboratory of the CNRS. ISI aims to contribute to the development of computer models, algorithms and architectures for the interconnection of the physical, digital and social worlds. It is a question of taking into account all the dimensions necessary for the deployment of applications in an increasingly complex socio-technical environment such as the "Industry of the future" and the "City of the future". In order to study these systems in all their complexity, the department has acquired appropriate hardware and software resources as well as places to carry out experiments to combine the physical and digital dimensions of these systems. Thus, the computer science laboratory has two components: 1) Connected Object Laboratory (*COL*) in which small connected objects are designed and developed by students and researchers, then deployed and operated in research and teaching activities; 2) Connected Systems Laboratory (*CSL*) in which digital systems are developed and tested by students and researchers on a heterogeneous machine network. The two labs support thus the development of cyber-physical systems combining connected objects sensing and acting on the physical world with digital systems from *CSL*.

To validate, enhance and disseminate the results carried out within the institute in real conditions, two technological platforms have been developed. The first is dedicated to the city of the future (**Territoire** platform) and the second to the industry of the future (**ITM'Factory** platform):

- The **Territoire** platform (https://territoire.emse.fr/) was designed to combine software architecture and expertise for the integrated management of territories through data. Accessible from the web, it aims to integrate and aggregate elementary components to

[1] https://laboratoirehubertcurien.univ-st-etienne.fr/en/teams/connected-intelligence.html

digitize, analyze and simulate cities and territories on the themes of logistics, transport, energy and housing.

- The **ITM'Factory** platform is composed of a physical and virtual digital factory and a collaboration space that brings together companies, researchers and student engineers. It thus integrates the know-how of the Fayol Institute in the fields of Industrial Engineering, Human and Organizational Management, Environment, Mathematics and Computer Science and beyond, other school skills (connected objects, computer security...)

These application domains are to be considered as cyber-physical environments in which heterogeneous connected objects are sources of information and actions. Currently, access to this physical environment is often compartmentalized into application silos (e.g. dedicated information and action systems). It is then complex, if not impossible to design transversal uses of connected objects without having to completely rethink their integration into applications. The web of things is a promising approach to breaking this silo organization and allowing direct interaction with these objects according to web standards.

Scientific project

The objective of this scientific project is the implementation of artificial intelligence work carried out within the ISI department to address the problem of automating the collection and exploitation of data in a cyber-physical environment. This will include testing the deployment of a software infrastructure to perform the collection according to a description of the services that use them. The work done in the semantic web and multi-agent system will serve as a basis for this infrastructure

The application case is the demonstrator of the Territory platform for which the in vivo simulation of a connected neighbourhood is planned. The infrastructure will act as an intermediary between the sensors deployed in this simulated neighbourhood and the platform in which the services and data will be described using Semantic Web technologies. Agents are deployed to coordinate and adapt the data workflows and service calls.

Candidate profile: web of things, multiagent systems

The candidate must hold a PhD with knowledge of multiagent modeling and/or semantic web

Recruitment conditions

- 12-month research engineer position on fixed-term contract
- Position based in Saint-Etienne (Loire).
- Desired start date: as soon as possible and no later than 1 December 2019

How to apply

CV + cover letter should be sent at first to Christine Jamen, Director of Personnel and Human Resources: christine.jamen@mines-stetienne.fr

For additional information

For any information on the position, please contact:

- Henri Fayol Institute director:
  Bruno LEGER, Tel + 33 (0)4 77 49 97 37, email: bruno.leger@emse.fr
- Intelligent Systems and Informatics department responsible:
  Pr. Flavien BALBO, Tel +33 (0) 04 77 42 01 71, email: flavien.balbo@emse.fr

For other administrative information:

- Amandine HIRONDEAU

  Tel + 33 (0)4 77 42 01 03, email: amandine.hirondeau @emse.fr