

Post-doc position in Computer Science – Manufacturing system (H/F)  
Fixed-term contract - 12 months  
Laboratory of Decision and Information Systems for Production systems – UR4570  
Villeurbanne

### Context

This recruitment takes place as part of the ANR Digital Twin for Cyber Physical System (DT4CPS) project led by a consortium of 3 research laboratories (CReSTIC, QUARTZ and DISP). CPS (Cyber-Physical Systems) are systems composed of autonomous and collaborative entities equipped with computing capacity allowing them to interact with the physical world and making data available on the network. The DT4CPS project focuses more particularly on Cyber-Physical Production Systems (CPPS).

There are a multitude of definitions of a Digital Twin (DT) depending on the use cases and the associated value creation. The chosen definition of DT will correspond to the vision of the automation engineer and the manufacturing engineer. As such, the AIF (Alliance Industrie du Futur) recently published a report on the DT and the “Major lever of the digital transformation of industry”. It is defined there as being:

- an organized set of digital models representing a real-world entity to respond to specific issues and uses,
- updated in relation to reality, at a frequency and precision adapted to its problems and its uses,
- equipped with advanced operating tools to understand, analyze, predict and optimize the operation and management of the real entity.

Depending on this definition, the first problem is to be able to construct and validate a digital twin of a CPPS. The first scientific objective is therefore to propose a methodology allowing the implementation of a digital twin integrating the models and data necessary for both the automation engineer at level of industrial control system and the manufacturing engineer at the level of manufacturing operations management. For this, a data-oriented DT architecture must be proposed to manage the different data flows between twins (physical and digital) at each stage of their life cycle, in line with existing data standards in this context.

### Candidate profile

The candidate, holder of a doctorate in industrial and/or computer engineering (obtained before January 1, 2024), will have skills in the following areas: manufacturing system, manufacturing operations management, industrial supervision, industrial control system, data modeling, reference architecture for smart manufacturing, industrial communication protocols (OPC UA).

### Missions

Propose a methodology and architecture for a multi-scale Digital Twin (equipment & production line) integrating models and data flows between physical twin and DT in order to provide technical interoperability solutions in the operational phase (implementation of a functional vector of data between the systems) and semantic (understanding of the data by the systems) between the DT and its physical twin by including all input/output flows.

Indeed, this interoperability is not ensured today due to the diversity of existing standards and partial observability which is limited to the functions currently deployed (control-command, traceability, quality, performance analysis, etc.) without integrating the needs of the DT. Please note, the geometric modeling phase of the DT (CAD) is time-consuming, so it will be considered available. The work will be based on models already existing at each partner.

As part of this post-doc, three deliverables are expected:

- State of the art on technical interoperability for manufacturing system
- Mapping of standards for technical and semantic interoperability
- Proposal of a DT architecture and data model for other work packages

#### Assessment criteria

The main evaluation criteria are the following (non-exhaustive list):

- Scientific production: publications in indexed journals and conferences
- Research experience and contribution to producing deliverables, collaborations

#### Recruitment conditions

Candidates must hold a doctorate or a recognized qualification at least equivalent to the national diploma required.

- The missions will be carried out in the Villeurbanne (69) Campus of Lyon Tech la Doua, DISP Lab, Bât. Léonard de Vinci, 21 av. Jean Capelle.
- The duration of the contract is a 12-month fixed-term contract
- Remuneration will be set according to the candidate's profile, in line with the rules defined by the Université Lyon 1's management framework.
- Desired start date: between 01 November 2023 and 01 January 2024
- Minimum recruitment criteria: PhD or equivalent

#### Application procedure

The application file includes the following:

- Application cover letter
- Curriculum vitae outlining research activities, and where appropriate relations with industrial sectors
- Copy of an identity document

#### Further information

For further information concerning the position and application procedure, contact:

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