

Internship proposal (6 months)

Digitalization of Business Procedure: combined use of AI and Formal Methods

(reference INSIN063)

Internship supervisor

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Overall context

With over 90 years of experience in providing reliable, high-quality products, MITSUBISHI ELECTRIC CORPORATION is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. This internship will take place within the Information and Network Systems team of MITSUBISHI ELECTRIC R&D CENTRE EUROPE which has focused its research for several years on the use of Artificial Intelligence and Formal Methods.

Internship subject

Mitsubishi Electric, like other industrial groups of similar size, relies for its daily work on codified procedures that should be followed by all employees. A given procedure specifies each step of a business procedure, documents to complete, checks to perform, approval to request from other employees, etc. For a long time those procedures were formalized as paper forms that were progressively filled, following a guide documenting the procedure. Nowadays, those procedures are handled digitally, through emails and other digital documents exchanges. But digitalizing a former paper procedure requires more than just putting the form in electronic format. It requires a rethinking of the procedure and the development of digital tools like web servers to support the procedure and ease its application by employees. Several Enterprise Procedure Management Tools already exist on the market like Camunda, jBPM, Flowable, Bonita, etc. But those tools require heavy configuration, often by an expert of the tool. Moreover, those tools do not guarantee the correctness of the procedure. Indeed, if not properly planned, a procedure might contain blocked states, missing next steps, infinite loops, etc. Those issues mean that digitalizing a procedure is often a long-term process with many errors and retrials. Moreover, when the procedure is updated, this heavy work should be done again.

Purpose of this internship is to evaluate how the combination of Artificial Intelligence (AI) and Formal Methods could help digitalize, enhance and guarantee the correctness of business procedures. The considered vision would be to feed an AI with current paper procedure information (guide, forms, ...) and generate (i) a digital procedure encoded as a configuration of an Enterprise Procedure Management Tool, and (ii) a formalization of the procedure amenable to formal verification using Formal Methods tools like Model Checker and SMT solvers.

Detailed objectives

During the internship, the student will have to:

- Review of the different open-source Enterprise Procedure Management Tools available on the market and their capabilities, especially regarding support of digital procedure and update of procedure
- Select one specific tool and investigate how a procedure should be configured
- Investigate and prototype how a paper procedure documented through its form(s) and user guide(s) can be transformed through AI into a digital procedure on the previously selected tool
- Investigate and define the different kinds of errors that can occur in a digital procedure
- Investigate formal verification techniques that could be used to detect those errors
- Investigate and prototype the transformation of the previously generated digital procedure in one or several formal models amenable to formal verification to detect typical errors

An internship report will also be written by the intern as part of the training course in which this internship is included.

Prerequisites

The candidate should have:

- Knowledge and practical experience in at least one of the following fields, Artificial Intelligence or Formal Methods, and interest in the other
- Rigorous approach to design and evaluation of systems
- Capacity to develop prototypes
- Knowledge in Information Technology (typically Linux/Unix, AI frameworks, ...) to install and configure relevant tools (AI, Formal Methods, Enterprise Procedure Management Tools, ...)
- Autonomy
- Good English reading and writing skills

Duration: 6 months

Period: from February/March 2027 (possibility of flexibility, depending on schools' internships periods)

Contact : Magali BRANCHEREAU (jobs@fr.mercede.mee.com)

Please send us a cover letter and CV, mentioning the internship reference.

The signature of an Internship Agreement with your school is mandatory.