Internship Title : How AI can advances the building of Domain Specific Languages ?

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Keywords: AI, Software Engineering, MDE, IoT, Signals, Distributed System.

Topic Abstract: Both Software Engineering and Artificial Intelligence (AI) could be used side-by-side for better dealing with modelling, checking and validating IoT-based systems. Our aim is to suggest a rigorous domain specific language (DSL) applied to, yet not exhaustively, healthcare systems. In a such context, we apply our approach to real-world case studies where, particularly, two medical sensors, namely, EEG and ECG are dealt with.

This topic follows data-driven approaches to provide models based on the observed data. We aim at using AI concepts such as Machine or Deep Learning for modelling (including syntax and semantics levels) of a target IoT Domain Specific Language (DSL). The use of AI enables us to create more precise and efficient models, and this eventually implies better data analysis (control) applications. Models would be regularly updated and refined, e.g. once in a week or once in a month, etc. w.r.t. the historical data accumulated from the domain environment, and which can be gathered from e.g. a big data warehouse, etc.

This work aims at gathering together skills from Software Engineering and Signal communities. Here, we are interested in, among other issues, signal synchronisation as the main feature handled in this topic. The student will develop a framework taking into consideration several parameters at different levels such as behavioural (interoperability, opacity or security), signals, deployment (connexion throughout blue-tooth, wifi, cloud, etc.).

The intern-ship will proceed following several steps. A very first step will study the state of the art AI4MDE and MDE4AI. Then, several AI techniques should be experimented (surveyed) and adapted for MDE. A prior DSL version should be extended with AI techniques. Then, several parsers will be be encoded to generate java or python executable codes to be deployed on real devices. The prototype tool will be implemented using Eclipse Modelling Framework as supporting tool.

Required Background :

- Scientific Domains : Artificial Intelligence, Model Driven Engineering, IoT, Signals
- Tool : Eclipse Modelling Framework

Internship Duration : 5-6 months.

Internship Starting date : March-April 2023.

Hosting Lab : IRIT[1] at ENSEEIHT[2] Toulouse-INP.

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[1] `https://www.irit.fr`
[2] `https://www.inp-toulouse.fr`