



## PhD research pre-proposal

**Title: IoT and AI-based Digital Twins for Electric Vehicles**

**Supervisors:**

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**Host research labs:** TICLab (UIR) and LORIA (Université de Lorraine)

### SUMMARY OF THE RESEARCH PRE-PROPOSAL

Building a digital twin of an electric vehicle and maintaining its condition require the modeling of physical systems, the collection of data via IoT systems, their transmission (possibly secure), and their analysis using machine learning. Digital twins for electric vehicles can be used for system health monitoring, diagnostics, prognostics, optimization, as well as scenario and risk assessment. The complex nature of the considered systems (physical systems, information networks, human-in-the loop system, etc.) requires a modular and incremental approach. The goal of this thesis is to develop such an approach using multi-modeling and co-simulation. The approach will be tested using real electric vehicles.

The PhD student will spend 18 months at UIR and 18 months at Université de Lorraine.

### REQUIRED ACADEMIC QUALIFICATIONS & SKILLS

He/she will be curious and have both conceptual and technical skills, especially :

- Good computer programming skills.
- Good background in machine learning
- Good background in IoT
- Good command of English
- Additional knowledge on electrical vehicle, cosimulation would be a plus