UIR | COLLEGE OF DOCTORAL STUDIES

PhD research pre-proposal

Code: TICLab-2021/PhD2	
Title: Machine learning based 3D software sensors for partial differential equations	
Supervisors: Oudani Mustapha (UIR), Mohamed Boutayeb (Univ. de Lorraine), Mounir Ghogho (UIR)	
Host college: College of Engineering and Architecture	**Host research unit:** TICLab

SUMMARY OF THE RESEARCH PRE-PROPOSAL

The research subject falls within the field of estimation theory and artificial intelligence (AI) for very large dynamic systems with a significant numerical component. The aim is to develop software sensors, also called observers or digital twins, using techniques of artificial intelligence and distributed computing algorithms for an efficient implementation. The thesis subject will focus on a class of nonlinear PDE. Because of their complexities, for almost all of these systems, an analytical solution is very difficult to calculate and therefore the analysis, synthesis and simulation of these models requires the use of discretization techniques which leads us to the solving of very large systems of differential equations which could last, on a single processor, several days or weeks depending on the size of the problem. Practically all fields are concerned, e.g. biology, medicine, transport, fluid mechanics, heat transfer, finance, chemistry or nuclear physics.

REQUIRED ACADEMIC QUALIFICATIONS & SKILLS

Applicants should have a master or an engineering degree in Applied or Computational Mathematics, operations research, or any related discipline. Applicants should have strong background in mathematical modeling and numerical analysis methods. Experience with machine learning algorithms is desirable. Fluency in English is required.