Postdoctoral Position

Exploratory Research on Numerical Tools for Optimal Sensor Placement in Digital Twin Systems

Start	: Available immediately, preferably before April 2026, subject to French ZRR eligibility verification
Duration	: 12 months (with possible extension up to 12 additional months)
Location	: University of Lille, France
Net salary	: Approximately €2,400 per month
Application	: Cover letter, CV, and at least two recommendation letters
Contacts	: Zuqi Tang (zuqi.tang@univ-lille.fr)
	Abdelkader Benabou (abdelkader.benabou@univ-lille.fr)

Context and objective

There is a growing need for Electrical Rotating Machines (ERM) in various applications: energy production, automotive, marine and aerospace propulsion, machine tools, medical equipment, etc. Today, in most of these applications, their reliability, efficiency, performance, energy consumption, and operational safety have become critical issues. To tackle these issues, the world of ERM industries currently faces many challenges: from embedded intelligence inside machines to customer requirements for more customized machines, from environmental and government regulations to requirements of Industry 4.0 and other smart factory initiatives. The key to solve these issues is not only to fully consider the factors affecting the operation of ERM at the beginning of the design but also to strengthen the monitoring and analysis during the operation of the equipment and to become more innovative from design and development to the end of the product lifecycle. All these issues indicate that ERM needs to become smarter and smarter, enabling the implementation of its digital twin (DT) model. The DT is a virtual copy of the physical system that must represent as much as possible the real behavior of the machine. For most industrial organizations, this approach is becoming a way to digitize industrial assets, systems, and processes to understand better, predict, and optimize industrial performance. The advantages of the DT are not only to replicate the machine and watch its evolution but also to optimize business operations for equipment suppliers and consumers. A key enabling technology for DT implementation is low-cost, easy-to-deploy sensing methods that monitor diverse physical quantities.

This postdoctoral position is partially funded by the "Electrical Energy (EE) 4.0" project under the Hauts-de-France State-Region Planning Contract (CPER). The recruited researcher will join the OMN team at the L2EP laboratory. The main objective of this position is to develop advanced numerical tools capable of extracting and reconstructing the maximum amount of information from a limited set of measurements in electrical machines, taking into account multiple factors such as thermal, vibration, and magnetic conditions. Based on the previous works of the OMN team on this subject, the ultimate goal is to enhance conventional machine diagnostics and support the development of digital twin models by providing more complete and accurate estimations of key quantities from sparse measurement data.

Expected profile

A Ph.D. degree is required for this position. The candidate should have a strong background in numerical simulation in electrical engineering. Additional expertise in statistics, machine learning, reduced-order modeling, or data assimilation is highly appreciated.

Recent References

Z. Gong, Z. Tang and A. Benabou, "Real-Virtual sensor Parameterized-Background Data-Weak method for digital twin state estimation," IEEE Transactions on Instrumentation and Measurement, vol. 74, pp. 1-11, 2025.

Z. Guo, Z. Tang, and Z. Ren, "Tensor decomposition-based DEIM for model order reduction applied to nonlinear parametric electromagnetic problems", Journal of Computational Physics, 2025.

M. Alahyane, Z. Tang, and A. Benabou, "Optimal sensor placement for electromagnetic problems: A PBDW-based approach with positional constraints," submitted for publication.

Z. Guo, Z. Tang, and Z. Ren, "Tensor decomposition-based MOR applied to multi-parameter electromagnetic problems in the context of digital twins", High Voltage, 2024.

M. Alahyane, Z. Tang, and A. Benabou, "Optimal sensor placement via parameterized background data weak method applied to magnetostatic problems including anisotropy," IEEE Transactions on Magnetics, vol. 59, no. 5, pp. 1–4, May 2023.

Etablissement de votre correspondant

UNIVERSITE DE LILLE - CAMPUS CITE SCIENTIFIQUE
L2EP - Bât. ESPRIT - 59655 Villeneuve d'Ascq Cedex (France)
Téléphone : +33 (0)3 6226 8215
Web : http://l2ep.univ-lille.fr/