

DATA-DRIVEN APPROACHES FOR DESIGNING NEXT-GENERATION SPINTRONIC INFORMATION SYSTEMS

Keywords: Machine learning, Spintronics/magnonics, Data analysis, Experimental design, Numerical simulations

DESCRIPTION

Context and Objectives

Theoretical evaluation of the performance of nanoelectronic (especially spintronic) systems is essential for targeting the most suitable parameters to design real devices, determining their optimal operating points and for their integration into information processing architectures. The classical approach is to use intensive numerical simulations, but their complexity usually prevents their exploitation in the analysis of complex nanotechnological information processing architectures. The first objective of this project will be to combine the expertise in spintronics and nanotechnology within the Institut Jean-Lamour (IJL, Nancy, France) and the skills in modeling complex systems of the LMOPS Laboratory (Metz, France) for **the development of new methods based on the analysis of large volumes of data and statistical learning for the establishment of data-driven models for the prediction of the dynamic behavior of complex spintronic systems**, more specifically systems currently studied at the Institut Jean-Lamour (IJL). The second objective will be to exploit these data-driven models for **the analysis of spintronic architectures as building blocks of telecommunication networks**.

Candidate profile

The post-doctoral candidate needs a Ph.D. in Physics or a related field with, if a possible, a background in Solid State Physics / Spintronics, and solid programming skills. **The candidate must have at least two of the following skills: (i) background in spintronics systems (ii) advanced knowledge in numerical simulation techniques (e.g., micro-magnetic simulations) (iii) high proficiency in Matlab and/or python for advanced modeling and data analysis. Knowledge of concepts related to complex physical systems is recommended but not mandatory.** Knowledge of basic machine learning concepts will help immediately be operational on the project but is not mandatory. Expected qualities for the candidate: creativity, autonomy, scientific rigor, agility in tackling interdisciplinary topics, strong programming skills, and the willingness to work in a team. Proficiency in English speaking and writing is mandatory; French is optional, although welcomed.

Research environment

The post-doctoral candidate will be part of two well recognized interdisciplinary research teams. The first research team is within the Institut Jean-Lamour (IJL) located in the heart of Artem (Arts and technology) Campus in Nancy. The second team is within the Chair in Photonics / LMOPS laboratory located in a technological cluster of universities and research centers in Metz. State-of-the-art research equipment in spintronics and computing (including access to a supercomputer for simulations) will be made available by the two laboratories. In addition to their core scientific objectives, the candidate will be associated to the SPINCOM project, which is part of the ongoing nation-wide research effort PEPR SPIN. In this context, the candidate will have scientific exchange with collaborating laboratories such as the C2N (Paris-Saclay), CEA in Paris-Saclay or Spintec



POSTDOCTORAL FELLOWSHIP



OPEN POSITION

(Grenoble) to consolidate a collective effort on the development of novel spintronic-based architecture for information processing. The recruited person will present their results at international conferences and will have the freedom also to explore different ideas and concepts in the framework of this Lorraine University of Excellence (LUE) postdoctoral fellowship.

About the host Institutions

The University of Lorraine is a public institution dedicated to higher education and research. It comprises ten scientific divisions regrouping more than 60 laboratories and nine collegiums with 43 teaching departments, including 11 schools of engineering. It has 7 000 faculty and staff and more than 62 000 students. The university has multiple sites across the northeastern part of France, with its two main campuses located in Nancy and Metz.

CentraleSupélec is a French, leading graduate institute in Science and Technology and a founding member of the world-class University Paris-Saclay. It has more 450 faculty and researchers and more than 4000 students. It has four locations in France: Metz, Reims, Rennes, and Saclay.

About the host laboratories

The institute Jean-Lamour (IJL) is a laboratory focusing on fundamental and applied research in material sciences. It is a joint Unit (UMR 7198) between the CNRS's Institute of Chemistry and the University of Lorraine. Its research portfolio overseas material sciences and engineering, nanoscience, plasmas, and surface sciences, electronics. It comprises 25 teams organized in four scientific divisions. The IJL is mainly located in the Artem Campus in Nancy.

The LMOPS Laboratory is a laboratory focusing on fundamental and applied research in material, photonics, and systems. It is a joint research unit (UR 4423) between the University of Lorraine and CentraleSupélec. It is organized around three scientific divisions and hosts the Chair in Photonics, a project dedicated to the promotion of teaching, research, and outreach in the field of photonics. The LMOPS is mainly located in the Technopole Campus in Metz.

TERMS AND TENURE

This two-year position will be based at the two laboratories:

Primary location :

Institut Jean Lamour (IJL)

UMR 7198 CNRS & Université de Lorraine - F-54011 Nancy – France

Secondary location :

Laboratoire Matériaux, Optique Photonique et Système (LMOPS)

UR 4423 CentraleSupélec & Université de Lorraine – F-57070 Metz – France

The duration of the postdoc position is **24 months**.

The target start date for the position is the **Spring Semester 2024**, with flexibility on the exact start date.



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HOW TO APPLY

Applicants are requested to submit the following materials:

- A cover letter applying for the position
- Full CV and list of publications
- Academic transcripts (unofficial versions are fine)
- Recommendation Letters (ideally two)

Deadline for application is ***until the position is filled***. Applicants will be interviewed by an Ad Hoc Commission **early Spring 2023**.

Applications are only accepted through email. All document must be sent to Damien.rontani@centralesupelec and/or Sebastien.petit@univ-lorraine.fr

JOB LOCATION

Nancy, Région Grand-Est, France (main location)
Metz, Région Grand-Est, France (secondary location)

REQUIREMENTS

DOCUMENTS

- Curriculum Vitae - Your most recently updated C.V. including list of publications
- Cover Letter
- Statement of Research
- Recommendation Letters (Ideally two)