



Internship Offer

Development of Neural Networks for Rapid Analysis of Synchrotron Data

Duration : 6 moisStart date: Feb/March 2025Workplace: Laboratoire Institut Jean Lamour Nancy

Background

X-ray diffraction is an essential technique for material characterization. However, with the rise of highthroughput characterization methods and the advent of fourth-generation synchrotrons, the amount of data generated has increased dramatically, reaching several terabytes within just a few minutes of experimentation. This explosion in data volume requires weeks or even months of analysis using conventional methods, such as the Rietveld method, which struggle to keep up. To address this challenge, automating data analysis has become crucial. Innovative approaches like deep learning could provide an effective solution for processing these massive datasets in real time. Moreover, deep learning based approch could help overcoming the limits of conventional methods such as quantifying minor phases (< 1%).

Objective

The objective of this internship is to develop and train a neural network capable of identifying and quantifying phase fractions in multiphase steels. The training will be based on existing experimental data, as well as synthetic data that will be generated to broaden the range of studied parameters.

Your Tasks

- Develop a deep learning model for the analysis of X-ray diffraction data obtained during in situ thermal treatment on steels.
- Generate synthetic data to complement the experimental data, enriching the variety of studied cases and covering a wide range of experimental conditions.
- Use this data to train the deep learning model, enabling the identification of present phases in steels and their fractions.
- Design an automated platform that can be implemented on specific synchrotron beamlines, allowing real-time analysis of diffraction patterns.

Your Profile

- Master's student or engineering school student specializing in materials science, physics, or data science.
- Skills in programming and developing machine learning / deep learning algorithms.
- Knowledge of X-ray diffraction and material characterization is a plus.
- Autonomy, initiative, and a passion for applied research projects.





About Institut Jean Lamour

The Institute Jean Lamour (IJL) is a joint research unit of CNRS and Université de Lorraine. Focused on materials and processes science and engineering, it covers: materials, metallurgy, plasmas, surfaces, nanomaterials and electronics. It regroups 183 researchers/lecturers, 91 engineers/technicians/administrative staff, 150 doctoral students and 25 post-doctoral fellows. Partnerships exist with 150 companies and our research groups collaborate with more than 30 countries throughout the world. Its exceptional instrumental platforms are spread over 4 sites; the main one is located on Artem campus in Nancy.

Modalités de candidature

For those interested, please send detailed CV and motivation letter to : Guillame Geandier (guillaume.geandier@univ-lorraine.fr) Imed-Eddine Benrabah (imed-eddine.benrabah@univ-lorraine.fr)