18 months postdoctoral position

Tracking of nanoparticles in 2D/3D Transmission Electron Microscopy images

Context

In the framework of the French EUR project SLEIGHT, we propose a post-doc position corresponding to the research program DiONisOS: Diffusion Of Nanoparticles On Surfaces. This research program associates 3 labs of the University of Lyon: MATEIS (INSA-Lyon/UCBL), Lab. Hubert Curien (St-Etienne) and CREATIS (INSA-Lyon/UCBL).

The general purpose of DiONisOS project is to study the characterization of the mobility of a population of nanoparticles (NPs) dispersed on a support, as in the very representative case of heterogeneous catalysis. When submitted to heat treatments under oxidizing or reducing conditions as generally required for conditioning such nanocatalysts, migration, coalescence or growth of NPs has to be avoided since larger sizes usually degrade the catalytic performances.

The **main originality** of the project is to combine two different modalities of Transmission Electron Microscopy (TEM) imaging: a 2D environmental temporal sequence during thermal treatment (ETEM) and a 3D surface analysis by stereo-photogrametry after the thermal treatment (SEM-SEI).

Objectives

To give an idea of the type of image we will consider in this project, this link presents a preliminary result obtained with a ETEM image sequence. The post-doc will be in charge of developing original image processing methods to solve the following problems:

1. denoising and registration of images,
2. joint 2D tracking and 3D particle positioning and sizing,
3. spatio-temporal characterization of NP's behavior (disappearance, coalescence/fusion, crossing,...).

Depending on the candidate's background, the methodology used to solve these problems may rely on machine learning (deep learning) or/and Sequential Monte Carlo estimation.

Profile of the candidate

We are looking for motivated candidates with a PhD degree in Image processing or Computer Vision and strong programming skills in C++ and matlab or Python. A background in any of the following fields will be appreciated: machine learning, materials science, electron microscopy (SEM and/or TEM).

Information to apply

Send an extended CV with research and programming experiences and a detailed list of publications (English) + motivation letter and possible referents to: ducottet@univ-st-etienne.fr, thierry.epicier@insa-lyon.fr

Practical information

— **Duration:** 18 months starting between February, 1 st 2019 and Jun 6 th 2019
— **Net Salary/month:** 2192 € (minor bonus possible depending upon the situation)
— **Location:** Lab. Hubert Curien, campus Carnot, University of St-Etienne. Frequent daily missions to Lyon (Villeurbanne, MATEIS /CREATIS, INSA de Lyon, about 1 and a half hour by public transportation, cost covered).
— **Supervisors:** Prof. Christophe Ducottet, LabHC, St-Etienne. Co-supervisors: Dr. Thomas Grenier, CREATIS, Prof. Thierry Epicier, MATEIS