

MASTER: Scalable image reconstruction methods for large data : application to synchrotron CT of biological samples

CREATIS opens a Master internship of 5-6 months to address new questions in the emerging field of X-ray synchrotron imaging.

Context CREATIS is a research unit of CNRS/INSERM/INSA Lyon/University of Lyon devoted to medical imaging. Its different teams target various modalities (X-rays, Ultrasounds, MRI, PET and optics) and carry research from signal processing to medical applications. The candidate will join the *Tomographic Imaging and Radiotherapy* team, which has internationally recognized expertise in X-ray imaging and inverse problems.

Project X-ray Computerized Tomography (CT) is still progressing and contributing to the development of 3D imaging modalities. Currently a unique synchrotron nano-CT is being developed to reach isotropic spatial resolution down to 10 nm. This is extremely relevant for understanding bone diseases such as osteoporosis (OP), which requires investigating bone at the cellular level. Nevertheless, imaging biological tissue at this resolution sets technical constraints in radiation dose and data size. The recent developments in compressed sensing (CS) provide a framework that permit to reconstruct an image from a limited amount of data, which present the key mechanism to reduce radiation exposure in x-ray CT. However, it is still necessary to extend these methods to take into account large data sets and emerging modalities such as synchrotron nano-CT. The objective is to implement a new method for synchrotron nano-CT that satisfies these technical constraints and to assess it on OP.

Keywords X-Ray Imaging, synchrotron radiation, tomography, inverse problem, regularization.

Work Plan The goal of the internship is to perform tomographic reconstructions from synchrotron low-dose data. In particular, a new method will be implemented to allow accurate reconstructions from a reduced number of projections. The successful candidate will address the following points:

- Implement a new image reconstruction algorithm based on the CS technique.
- Assess the feasibility of the proposed methods on low-dose synchrotron data for OP.

Salary About 550€ net monthly

Skills The student must have a strong background in medical imaging and image processing. Knowledge in radiation physics would be appreciated but is not required. Programming skills: Matlab, C, C++.

How to apply?

Send your CV and academic records to

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