

# TOF and multiple coincidences image reconstruction in PET

Record number : OPR-48

## Overview

### RESEARCH DIRECTOR

Jean-Baptiste Michaud, Chargé de cours à forfait - Department of Electrical and Computer Engineering

#### Information

[jean-baptiste.michaud@usherbrooke.ca](mailto:jean-baptiste.michaud@usherbrooke.ca)

### RESEARCH CO-DIRECTOR

Réjean Fontaine, Professeur - Department of Electrical and Computer Engineering

#### Information

[rejean.fontaine@usherbrooke.ca](mailto:rejean.fontaine@usherbrooke.ca)

### ADMINISTRATIVE UNIT(S)

Faculty of Engineering  
Department of Electrical and Computer Engineering  
Interdisciplinary Institute for Technological Innovation

### LEVEL(S)

Ph.D.  
Postdoctoral Fellowship

### LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique  
CIMS - Centre d'imagerie moléculaire de Sherbrooke

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## Project Description

The GRAMS and CIMS are world-renowned collaborators in the development of high-resolution PET instrumentation, starting with the "Sherbrooke-PET" in 1995, followed by the LabPET™ in 2004, the LabPET II in 2016, and new upcoming technology under development. The collaboration is very dynamic, regrouping 5 professors, close to 10 research professionals, and more than 20 graduate students, studying all instrumentation aspects from detector assemblies, front-end and DAQ electronics, signalprocessing, data analysis and image reconstruction.

On one hand, sensitivity and detection efficiency are critical in several applications where tracers are highly specific, where low doses are mandatory or when imaging beyond the brain-blood barrier, for instance. A new artificial intelligence method can recover a specific type of multiple coincidences to increase sensitivity, but several theoretical questions remain for their proper inclusion in images.

On another hand, TOF is the current evolution of choice to increase image CNR. TOF in high-resolution preclinical or brain instrumentation requires timing resolution in the order of 10 ps, with anticipated tradeoffs with sensitivity, and raises other theoretical reconstruction questions specific to that context.

Finally, sub-millimeter spatial resolution now requires systematic whole-body motion correction for subjects such as mice, yet raising more questions on the reconstruction side.

The collaboration has 1 PhD and/or 1 Post-Doc positions open, with financing, related to any of these topics. Candidates should have a background in applied mathematics or any discipline pertinent to PET, especially image reconstruction, with experience or a strong interest towards software engineering, and experience with mixed simulation/real data design environments. Candidates can submit a resume, list of publications and a cover letter to

Jean-Baptiste Michaud, eng., Ph.D.  
Adjunct Professor

Department of Electrical and Software Engineering  
jean-baptiste.michaud@usherbrooke.ca

References will be required later. No deadline is set, candidates will be considered until the positions are filled.

Discipline(s) by sector

Funding offered

**Natural Sciences and  
Engineering**

Yes

Electrical Engineering and Electronic  
Engineering

The last update was on 26 November 2020. The University reserves the right to modify its projects without notice.