

Postdoctoral Fellow in Advanced Machine Learning Techniques in Neuroscience

Job Title:	Postdoctoral Fellow in Advanced Machine Learning Techniques in Neuroscience
Department:	Sunnybrook Research Institute
Location:	Sunnybrook Health Science Centre 2075 Bayview Avenue, Toronto, Ontario
Reports to:	Dr. Maged Goubran & Dr. Sandra Black

Description

Our **AICONS** and **Brain** labs at the Centre for Brain Resilience & Recovery, Sunnybrook Research Institute & University of Toronto are seeking a postdoctoral fellow to lead development of novel, machine learning algorithms for the analysis of MRI and 3D (light-sheet) microscopy/tissue cleared data. Our work combines technical and translational research, focusing on the development of novel AI and computational tools to probe, predict and understand neuronal and vascular circuit alterations, and model brain pathology in neurological disorders, including Alzheimer's disease, stroke, and traumatic brain injury. This position is in support of a new CIHR-funded project to study early structural and functional network dysfunction in Alzheimer's disease, building on our established pipelines for novel tissue clearing techniques and imaging technology. There will also be opportunities to develop AI algorithms for multimodal image analysis, connectomics, and prediction of cognitive decline using large multi-site clinical imaging studies and trials (with hundreds or thousands of subjects each), including the Ontario Neurodegenerative Disease Research Initiative (ONDRI), Canadian Consortium on Neurodegeneration in Aging (CCNA), Canadian Alliance for Healthy Hearts and Minds (CAHHM), Toronto Dementia Research Alliance (TDRA), Brain-Eye Amyloid Memory Study (BEAM), and Medical Imaging Trials Network of Canada-C6 (MITNEC-C6).

Key Responsibilities:

The position requires working closely with the PIs Dr. **Goubran** (expertise in AI, computational neuroscience, neuroimaging), Dr. **Black** (internationally recognized expert in neurology, small vessel disease, cognition) and with graduate students, imaging analysts and software developers in the lab. The key responsibilities include but not limited to developing and applying novel computational approaches to challenging multimodal image and connectivity analyses, and patient outcome prediction problems (using structural, diffusion and functional MRI, and PET imaging data, along with clinical, genomic, and cognitive data). This will be performed in collaboration with our internal and external international collaborators (in USA, Switzerland, and Germany), including neurologists, radiologists, surgeons, psychologists, physicists, and computer scientists. This dynamic and collegial research environment provides opportunities to participate in pioneering techniques that will be used to understand and treat neurodegenerative and neurovascular disease. Our team also leads the computational and neuroimaging analyses for several cutting-edge trials at the Harquail centre for Neuromodulation at Sunnybrook, including those focused on Alzheimer's disease, Parkinson's disease and refractory obsessive-compulsive and major depressive disorders. There will be opportunities for multiple publications and conference presentations focused on novel computational tools for dementia, stroke, and neuroscience research.

Existing imaging infrastructure within SRI includes three research-dedicated 3T MRI scanners (GE, Philips, Siemens), a Bruker 7T horizontal bore small animal MRI scanner, and a Bruker 7T vertical bore NMR system. A 7T human scanner (first in Toronto) will be installed in 2023. The centre also houses a 3T MR/PET system (Siemens Biograph MMR) as well as an MR-Linac system (Elekta Inc) for MR guided radiation therapy. The centre also houses a comprehensive infrastructure for studying animal models and histological analyses, with numerous microscopes including a twin two-photon laser scanning microscope from Olympus (MPERS), a microPET/CT system from Bruker, a 32-channel electrophysiological recording amplifier (AM Systems 3600), and dedicated operating theatres and behavioural testing suites.

Required Qualifications/Special Skills include:

- PhD received within the last 3 years or graduating PhD candidate (within the next three months) in computer science, biomedical engineering, neuroscience, biological science, or related discipline
- Experience with machine and deep learning libraries Scikit-learn, Tensorflow, Keras or Pytorch
- Strong research record
- Excellent verbal and written communication skills
- Proficiency with programming languages (Python/MATLAB, C/C++, etc.)
- Intermediate knowledge of Linux and scripting
- Ability and willingness to work in a dynamic interdisciplinary team environment

Assets:

- Advanced knowledge of machine learning models for image processing, segmentation, or registration
- Advanced knowledge of computer vision
- Experience with designing data analysis workflows and incorporating existing tools
- Working knowledge of neuroimaging software: FSL, FreeSurfer, SPM, ITK or microscopy software: Fiji/ImageJ, Ilastik
- Python software packaging, virtual environments, Anaconda/Conda, Jupyter/IPython
- Experience with statistical analyses and relevant software: example R or SPSS
- Experience with version control systems (Git) and software testing
- Demonstrated ability to learn quickly and problem-solve

This is a funded position. Stipend levels are in line with experience and CIHR stipend levels. A 2-year commitment is required. Contract is renewable contingent on performance.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

Application screening will continue until a suitable candidate is identified.

To apply for this position, please send:

1) cover letter, 2) Curriculum Vitae, 3) a writing sample (e.g., manuscript), and 4) the names and contact information for three potential references to: christopher.scott@sunnybrook.ca

We thank you in advance for your interest. Only those candidates selected for an interview will be contacted. No phone calls please.

More information about the Sunnybrook Research Institute can be found at: www.sunnybrook.ca/research

The Sunnybrook Research Institute is committed to providing accessible employment practices that are in compliance with the Accessibility for Ontarians with Disabilities Act ('AODA'). If you require accommodation for disability during any stage of the recruitment process, please indicate this in your cover letter.

Sunnybrook Research Institute is strongly committed to inclusion and diversity within its community and welcomes all applicants including but not limited to: visible minorities, all religions and ethnicities, persons with disabilities, LGBTQ persons, and all others who may contribute to the further diversification of ideas.

Links

- [Black Centre for Brain Resilience & Recovery](#)
- [University of Toronto](#)
- [Sunnybrook Research Institute](#)
- [Harquail Centre for Neuromodulation](#)