Open PhD Position: Deep Learning for Medical Image Analysis

Position and supervision

We are seeking applicants for PhD positions in deep learning for medical image analysis, under the supervision of **Prof. Tal Arbel**. Prof. Arbel is a full professor in the Dept. of Electrical & Computer Engineering at McGill University, where she is the director of the Probabilistic Vision Group (PVG) at the Centre for Intelligent Machines (CIM). She is a Canada CIFAR AI Chair, and a core member of MILA - Quebec Artificial Intelligence Institute. She has strong collaborations with clinicians at the Montreal Neurological Institute and the Goodman Cancer Research Center, where she is an associate member.

Research Project and Team

The PhD student will join Prof. Arbel's vibrant research team, whose focus is on the development of modern deep learning models for medical image analysis in the context of neurological diseases, such as Multiple Sclerosis (MS), as well as cancers. The student will help advance several open deep learning topics being worked on in the lab, assisting the team in attaining the long-term objective of new personalized treatment support based on medical images. This will involve the development of probabilistic deep models that will learn, for the first time, to capture the **temporal evolution of complex chronic diseases** through sequentially acquired medical images (along with clinical information), and predict plausible outcomes for patients on and off treatments. Topics of investigation include the development of new **explainable** models that permit the discovery of image-based markers predictive of future disease evolution as well as **fair** and **robust** models to ensure reliable predictions. In addition, the lab is pushing the frontier on **multimodal large language models (MLLMs)** and **agentic AI** frameworks that leverage **reinforcement learning** to plan and refine complex clinical-reasoning tasks. Ongoing projects on **multimodal foundation models** (integrating images, text, and other clinical data) and on **temporal 3D generative models** for longitudinal MRI offer students the freedom to explore these emerging directions and contribute novel ideas. The student will lead new innovative research in **causal representation learning, inference and discovery** in the context of medical image analysis, research which has the potential to lead to concrete improvements in patient care with trustworthy predictions. Our models will be general, and adaptable to complex chronic diseases such as multiple sclerosis and Alzheimer's, as well as brain tumours and other cancers.

The challenges presented by medical image analysis in real clinical contexts require the development of new innovative deep learning frameworks, with expertise from several fields. The PhD student will benefit from ongoing collaborations with researchers and clinicians at the Montreal Neurological Institute and the Goodman Cancer Research Centre at McGill, computer vision and machine learning researchers at McGill and MILA, and ongoing collaborations with academic (e.g. Oxford, Edinburgh) and industrial partners (e.g. Google, Microsoft Research, Meta). Furthermore, the student will have unique access to the largest, proprietary dataset of MS patient images acquired worldwide (i.e. over 10,000 patients over time) during multi-center clinical trials along with manual lesion labels, treatment codes and progression outcomes. High-end compute resources — hundreds of NVIDIA H100 GPUs available through shared MILA and Digital Research Alliance of Canada infrastructure — ensure rapid experimentation at scale. As part of Mila, the fellow will also enjoy access to a vibrant AI ecosystem that offers weekly seminars

by world-leading researchers, specialized workshops and reading groups, industry networking events, entrepreneurship support, and extensive professional-development programming — providing both technical depth and career-building opportunities.

In addition to conducting independent research and collaborating with other research teams, the PhD student will have opportunities to help mentor undergraduate and Master's students.

Qualifications

Candidates must hold (or be nearing completion of) a Master's degree in computer science, electrical/computer engineering, biomedical engineering, or a related field, with experience in applications in computer vision or medical image analysis and evidence of research potential through publications or high-quality projects (e.g. CVPR, MIDL, MICCAI, IPMI, PAMI, TMI, MIA, NeurIPS, ICML). Exceptional candidates with only an undergraduate degree and outstanding research experience will also be considered. Candidates must have strong mathematical skills, good programming skills, and knowledge and experience in the domain of machine learning and deep learning (e.g. Python, Tensorflow/PyTorch, C/C++, OpenCV).

How to Apply

Candidates should submit a CV, academic transcripts, a summary of scientific research areas or research statement, 1–2 significant publications or technical reports (if available), and the contact information for two referees willing to provide letters of recommendation. PhD studies can commence as early as Winter 2026; funding is guaranteed for four years with the possibility of an extension.

All interested candidates should contact Prof. Tal Arbel (tal.arbel@mcgill.ca or arbeltal@mila.quebec) and CC the MILA Research Scientist at Prof. Arbel's lab: Brennan Nichyporuk (nichypob@mila.quebec).