

Deep Learning Research in Vision-Language Modeling for Computational Pathology

We are pleased to announce open positions for PhD students to engage in cutting edge deep learning research. The primary focus of this research is to develop **Vision-Language Models (VLMs)** in deep learning for automating medical reports from gigapixel **Whole Slide Images (WSIs)** in clinical pathology. This initiative is part of highly cross-disciplinary research project, bringing together **Computer Vision (CV)** and **Natural Language Processing (NLP)** experts in deep learning as well as clinical pathologists for developing cutting edge solutions in computational pathology.

Project Overview. Computational Pathology (CPath) involves using computer methods to analyze medical images from tissue samples, aiding pathologists in diagnosis. It can assist in both the initial diagnosis stage (Analytical) and the subsequent report generation (Post-Analytical). While Analytical aspects of CPath are well-explored, Post-Analytical report creation remains largely unexplored, mainly due to the complexity of the gigapixel WSIs and the detailed language required for diagnosis. This research position aims to automate report generation by creating representation learning models that link tissue images with their corresponding reports. Specifically, it will develop VLMs to process slides and synthesize diagnostically relevant synoptic reports. The developed pipeline will be clinically validated through a statistically significant data cohort.

Academic Affiliation. Successful candidates will be enrolled at Concordia University and Mila institute as a core student member. The position is also linked to Department of Pathology and Cell Biology at Université de Montréal, and Polytechnique Montréal.

Supervision. Students will be directly co-supervised by [Prof. Mahdi S. Hosseini](#) (Concordia University), [Prof. Samira Ebrahimi Kahou](#) (Mila Institute) and [Prof. Christopher J. Pal](#) (Polytechnique Montréal/Mila Institute). The students will also benefit from the guidance of [Dr. Vincent Quoc-Huy Trinh](#) and [Dr. Bich Ngoc Nguyen](#) from Centre hospitalier de l'Université de Montréal (CHUM).

Minimum Qualifications. Successful candidates possess the following qualifications

- Master's degree in computer science or related field. Direct-PhD admission is available for exceptional undergraduate candidates.
- Proficiency in deep learning, computer vision, and natural language processing
- Excellent programming skills, particularly in Python and PyTorch
- Excellent communication skills and being able to work in multi-disciplinary research environments
- Preferred: previous research experience in medical imaging and computational pathology
- Highly considered: previous publications in ML conferences e.g. CVPR, ICCV, NeurIPS, ICML, etc.

Equity and diversity statement. We encourage applications from all qualified candidates. We are passionate about creating an inclusive workspace for everyone and we believe that diversity drives innovation.

Expected Starting Date. Start date as early as possible in 2024.

Funding support. This position is partially funded by [Amazon Research Award \(ARA\)](#) and [Mila institute](#). A highly competitive financial package will be considered for exceptionally qualified candidates.

- (a) Up to \$30,000 per annum supported from supervisors as a funding package.
- (b) \$45,000 International tuition award excellence disbursed over eight (8) terms when tuition is billed
- (c) The School of Graduate Studies at Concordia will provide a \$56K scholarship (\$14K per year for four years) for newly admitted students from Canadian citizens and permanent residents
- (d) [PhD scholarships](#) are available for both international and domestic students in program entrance
- (e) Tuition fees for [French citizens](#) are reduced to the Quebec rate for all international students
- (f) French citizens benefit from healthcare costs through [Protocole d'Entente Franco-québécois](#)

How to Apply? Please submit your application following the guideline below

- (A) Cover letter stating your interest in this position and why you are the right fit candidate.
- (B) A detailed Curriculum Vitae (CV)
- (C) Soft-copies of your (unofficial) transcripts from both bachelors and masters degrees
- (D) Please use email subject line [**PhD-VLM: `Your-Name`**] to be considered for screening and send your documents to Prof. Mahdi S. Hosseini mahdi.hosseini@concordia.ca in cc at Prof. Samira Ebrahimi Kahou samira.ebrahimi.kahou.lab@gmail.com and Prof. Christopher J. Pal christopher.pal@polymtl.ca

All applicants will be thoroughly reviewed and only short-listed candidates will be contacted for interview.

About Montreal.

The city of Montreal is an exceptional city with 1.7 million population and home to four major universities and several clinical research centres. It is named the best student city in the world. Montreal is a major global hub for AI research and is home of several AI institutions such as the Mila-Quebec AI Institute, the Institute for Data Vectorization (IVADO), and the Applied AI Institute at Concordia. Beyond being the incubator of many successful start-ups, companies including Amazon, Google, Samsung, Microsoft, IBM, Nuance, and Meta have setup AI labs in Montreal.

Related Links

- [CSSE Department](#) at Concordia University
- [Mila Institute](#)
- [Centre hospitalier de l'Université de Montréal \(CHUM\)](#)