Tony Xu

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EDUCATION

University of Toronto   Sept. 2022 - expected Jan. 2027
PhD Candidate in Medical Biophysics   *Cumulative GPA: 4.0/4.0*
- **Awards**: Google PhD Fellowship (Nov. 2024), Postgraduate Scholarships – Doctoral Program (Apr. 2024), Vector Scholarship in Artificial Intelligence (Sept. 2022), Canada Graduate Scholarships - Master's (Sept. 2022)

University of British Columbia   Sept. 2017 - May 2022
BASc Electrical Engineering, Biomedical specialization, Minor in Physics   *Cumulative GPA: 3.92/4.0*

RESEARCH EXPERIENCES

Graduate Research Assistant   Sept. 2022 – Present
UofT Medical Biophysics, supervised by Anne Martel and Maged Goubran   *Toronto, ON*
- Working on self-supervised learning (SSL) methods applied to huge 2D whole-slide images and 3D tissue-cleared fluorescence microscopy images to learn useful image representations from unlabelled data [1,2,3,4]
- Aiming to reduce the reliance of deep learning methods on detailed image labels in medical applications

Undergraduate Thesis   Sept. 2021 - May 2022
UBC Artificial Intelligence in Medicine Lab, supervised by Ali Bashashati   *Vancouver, BC*
- Undergraduate thesis in Electrical Engineering on the application of Vision Transformer (ViT) models to subtype whole-slide histopathology images of ovarian cancer
- Multiresolution patches extracted from the whole-slide using novel method involving tumor classification with heatmaps, patches are embedded into ViT using resolution encoding

Undergraduate Research Student   May 2019 – May 2021
Sunnybrook Research Institute, supervised by Anne Martel   *Toronto, ON*
- Investigated SSL approaches applied to histopathology image data [5]
- Used deep learning and computer vision techniques to analyse digitized breast cancer WSIs for cancer detection and classification with PyTorch [6]
- Developed resource and data efficient SSL technique using domain specific double pretraining on a variety of SSL methodologies [7]
- 3rd place on 470-participant breast histology competition: BreastPathQ

RELEVANT PUBLICATIONS

[1] **ModalTune: Fine-Tuning Slide-Level Foundation Models with Multi-Modal Information for Multi-task Learning in Digital Pathology**   2025
T. Xu*, V. Ramanathan*, P. Pati, A. Faruk, M. Goubran, A. L. Martel
ICCV 2025, Honolulu

[2] **A generalizable 3D framework and model for self-supervised learning in medical imaging**   2025
T. Xu, S. Hosseini, C. Anderson, A. Rinaldi, R. G. Krishnan, A. L. Martel, M. Goubran
npj Digital Medicine

[3] **AI-assisted detection of breast cancer lymph node metastases in the post-neoadjuvant treatment setting**   2025
T. Xu, D. Bassiouny, C. Srinidhi, M. S. W. Lam, M. Goubran, S. Nofech-Mozes, A. L. Martel
Laboratory Investigations

[4] **Masked image modeling for label-efficient segmentation in two-photon excitation microscopy**   2023
T. Xu, M. Rozak, E. Ntiri, A. Dorr, J. Mester, B. Stefanovic, A. L. Martel, M. Goubran
Medical Image Learning with Limited and Noisy Data at MICCAI 2023, Vancouver

[5] **Self supervised contrastive learning for digital histopathology**   2022
O. Ciga, T. Xu, and A. L. Martel
Machine Learning with Applications

[6] **Overcoming the limitations of patch-based learning to detect cancer in whole slide images**   2021
O. Ciga, T. Xu, S. Nofech-Mozes, S. Noy, F. I. Lu, and A. L. Martel
Scientific Reports

Preprints

[7] Resource and data efficient self supervised learning 2021
T. Xu*, O. Ciga*, and A. L. Martel
arXiv preprint

Professional Experiences

Computational Scientist Intern
Jun. 2022 – Sept. 2022

Samsung Research America – Think Tank Team *Mountain View, CA*

- Ideated, researched, and designed experiments to push the frontier of Samsung technology
- Implemented efficient signal processing, computer vision detection and Simultaneous Localization and Mapping algorithms to prototype new products

Software Development Engineering Intern
Jun. 2021 – Aug. 2021

Amazon *Vancouver, BC*

- Designed and built an operational dashboard to consolidate and securely manage team workflows
- Deployed solution using AWS Services (Lambda Step Functions, CDK, DynamoDB, S3, CloudFront, etc.)
- Created an authenticated UI using React/TypeScript, infrastructure code using AWS CDK in TypeScript, and implemented security measures using AWS Cognito to properly secure access of confidential data

Machine Learning Engineering Intern
May 2020 – Jan. 2021

Flex Artificial Intelligence Inc. *Vancouver, BC*

- Developed an end-to-end patented computer vision pipeline to detect fine-grained form errors in real world exercise videos, such as raising toes during deadlift, to provide insight on a user's exercise performance
- Researched and implemented approaches to analyse video data, including pose detection, spatio-temporal attention, self-supervised temporal alignment, deformable convolutions, and triplet models for anomaly detection
- Improved frame-level error classification accuracy by 17.3% with fully completed pipeline

Selected Projects

FLARE 2025 Challenge Task 4
Jun. 2025 – Sept. 2025

- 1st place on FLARE 2025 Task 4: Foundation Models for 3D CT and MRI, presented at MICCAI 2025 workshop
- Formulated 3D SSL algorithm paired with LoRA to train multimodal foundation model for CT and MRI images
- Improved performance on diverse set of downstream tasks in medical imaging (segmentation, classification, survival prediction, regression, etc.)

SELMA3D 2024 and 2025 Challenges
Sept. 2024 – Sept. 2025

- 1st and 3rd place on SELMA3D 2025 and 2024: challenges on using SSL to improve segmentation of 3D light-sheet microscopy images, presented algorithm at MICCAI 2024 and 2025 workshop
- Implemented novel 3D SSL and segmentation pipeline integrating 3D-DINOv2, nnUNet and LoRA frameworks
- Used SSL representations to curate unlabelled dataset and pseudolabelled to improve out-of-domain generalization

Diffusion-Based MRI Subsampled K-Space Reconstruction
Dec. 2023 – Feb. 2024

- Used DDNM to formulate MRI K-space subsampling as inverse problem
- Trained 2D and 3D diffusion models to perform zero-shot MRI reconstruction from arbitrary K-space subsampling patterns (including non-Cartesian patterns using nonuniform FFT)
- Achieved strong results on various 2D and 3D MRI datasets, conference paper in progress

SemiCOL Challenge
Feb. 2023 – Jun. 2023

- 2nd place on arms 1 and 2 in SemiCOL: challenge using semi-supervised learning for colorectal cancer detection, presented algorithm at ECDP 2023: the 19th European Congress on Digital Pathology
- Created efficient tissue segmentation pipeline using an ensemble of UNet and UNETR models respectively using PAWS and DINO semi- and self-supervised pretrained ResNet50 and ViT encoders

Technical Skills

Languages: Python, JavaScript/TypeScript, C, SQL, MATLAB
Deep Learning: PyTorch, Keras/TensorFlow, scikit-learn, OpenCV, Gym
Tools and Frameworks: Git, Bash/Linux, Docker, AWS, React, HPC