ANDREW HANZHUO ZHANG

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EDUCATION

University of Toronto — Sep 2025 - Jun 2030 (Expected)
MSc, **PhD** in Computer Science supervised by Prof. Anna Goldenberg — MSc conferral in Jan 2027 (Expected)
Research Areas: Machine Learning, Computational Biomedicine
Affiliations: Vector Institute, SickKids Research Institute

University of Toronto — Sep 2020 - Jun 2025
HBSc with 16 months **ASIP** co-op internship placement — Graduation with High Distinction
Triple Majors: Computer Science, Physics, Cognitive Science

RESEARCH INTEREST

ML methods for extracting and modelling biological signals, particularly in time series and transcriptomic modalities.

PUBLICATIONS, MANUSCRIPTS, & PRESS

[1] **Andrew H. Zhang***, Alex He-Mo*, Richard Fei Yin*, Chunlin Li, Yuzhi Tang, Dharmendra Gurve, Veronique van der Horst, Aron S. Buchman, Nasim Montazeri Ghahjaverestan, Maged Goubran, Bo Wang, and Andrew Lim. "*Mamba-based Deep Learning Approach for Sleep Staging on a Wireless Multimodal Wearable System without Electroencephalography*". In: *arXiv; Accepted: SLEEP* (Dec. 2025).

[2] Chloe Wang*, Haotian Cui*, **Andrew H. Zhang**, Ronald Xie, Hani Goodarzi, and Bo Wang. "*scGPT-spatial: Continual Pretraining of Single-Cell Foundation Model for Spatial Transcriptomics*". In: *bioRxiv; Under Review: Nature Methods* (Feb. 2025).

[3] **Andrew H. Zhang**, Chunlin Li, Yuzhi Tang, Alex He-Mo, Nasim Montazeri Ghahjaverestan, Maged Goubran, and Andrew Lim. "*A Deep Learning Model for Inferring Sleep Stage from a Flexible Wireless Dual Sensor Wearable System without EEG*". In: *SLEEP* 47 (May 2024), A481–A482.

[4] Julie Choi, on behalf of the **Applied ML Team**. *Cerebras Selects Qualcomm to Deliver Unprecedented Performance in AI Inference*. Cerebras Systems Press Release. Mar. 2024.

*These authors contributed equally.

CURRENT PROJECTS

Forecasting Paediatric ICU Patient Deterioration Risk — Sep 2025 - Present
Supervisor(s): Prof. Anna Goldenberg

· MSc thesis on contrastive learning and survival analysis modelling approaches for building a multi-modal clinical early warning system for forecasting patient deterioration in the paediatric ICU at The Hospital for Sick Children (SickKids) in Toronto.

Causal Discovery on Chronic Disease Patient Trajectories — Sep 2025 - Present
Supervisor(s): Prof. Anna Goldenberg & Prof. Ricardo Silva

· Developing approaches to uncover the causal interplay between psychological stress and individual symptom trajectories of chronic diseases tracked by wearable devices in studies conducted by 4YouandMe.

Detecting Neurodegenerative Disease from Sleep Physiology — Sep 2025 - Present
Supervisor(s): Prof. Anna Goldenberg & Prof. Andrew Lim

· Leveraging state space embeddings of a wearable device sleep staging model [1] to extract signals for neurodegenerative diseases from ambulatory sleep recordings on the Sibel Health ANNE One wearable device.

Single-cell Foundation Model for Gene Perturbation — Jun 2025 - Present
Supervisor(s): Prof. Bo Wang

· Part of the team working on scGPT (Cui et al., 2024) architecture foundation models for single-cell gene perturbation.

University of Toronto, Vector Institute, SickKids Research Institute, University Health Network, Sunnybrook Research Institute, University College London

EMPLOYMENT HISTORY

University of Toronto — Sep 2025 - Present
Teaching Assistant — Toronto, ON, Canada

· Part-time teaching assistant as a graduate student at the department of computer science (see Teaching & Mentoring).

University Health Network — Jun 2025 - Sep 2025
Researcher — Toronto, ON, Canada

· Full-time researcher at WangLab supervised by Prof. Bo Wang to work on scGPT (Cui et al., 2024) architecture single-cell transcriptomics foundation model for gene perturbation.

Vector Institute — May 2024 - Sep 2024
Research Intern — Toronto, ON, Canada

· Full-time research internship at WangLab supervised by Prof. Bo Wang to work on scGPT-Spatial (Wang et al., 2025) [2].

· scGPT-Spatial continual pretrainings single-cell foundation model scGPT (Cui et al., 2024) on spatial transcriptomic modalities such as Visium, Xenium, and MERFISH to address the unique complexities of these data distributions.

· Developed embedding-based methods for spatial cell-type deconvolution and gene imputation downstream tasks, improving Visium deconvolution by over 10% and spatial highly variable gene imputation by over 20% (Xenium) and 40% (MERFISH).

Cerebras Systems — May 2023 - May 2024
Co-op ML Research Engineer — Toronto, ON, Canada

· Full-time 12 months ASIP co-op internship placement as a part of the applied ML team.

· Focused on using LLaMA-based LLMs with unstructured sparsity trained on world's largest computer chip for Speculative Decoding (Leviathan et al., 2023) as a part of a collaboration with Qualcomm [4] to deliver high throughput inference solutions.

· Investigated methods for improving speculative decoding token acceptance rate that improved inference throughput up to 2×.

· Further explored single-model speculative decoding methods such as Medusa (Cai et al., 2024) and Hydra (Ankner et al., 2024) more suitable for the Cerebras CS-X inference stack.

Sunnybrook Research Institute — Sep 2022 - Sep 2023
Student Researcher — Toronto, ON, Canada

· Part-time student researcher at the Sleep and Brain Health Laboratory supervised by Prof. Andrew Lim.

· Led research project investigating deep learning approaches for ambulatory sleep staging using the Sibel Health ANNE One — a wireless wearable system measuring ECG, PPG, accelerometry, and temperatures.

· Poster presented at the SLEEP 2024 conference in Houston, Texas; Abstract published in the journal *SLEEP* [3].

· Further extension [1] using Mamba (Gu & Dao, 2023) achieves state-of-the-art sleep staging performance among models of comparable wearable devices.

Sunnybrook Research Institute — May 2022 - Sep 2022
Co-op Software Engineer — Toronto, ON, Canada

· Full-time 4 months ASIP co-op internship placement as a full-stack software engineer developing the medical time series annotation platform CrowdEEG (Schaekermann et al., 2020).

· Adapated CrowdEEG from its initial demo platform into a fully functional open-source project to support clinical studies at the Sleep and Brain Health Laboratory; oversaw its deployment into production at the Augmented Intelligence Lab at the University of Waterloo.

TEACHING & MENTORING

Course/Organization	Instructor	Role	Term
CSC199H: Intelligence, Artificial and Human	Gerald Penn	Teaching Assistant	Winter 2026
CSC236H: Intro. Theory of Computation	Francois Pitt, Gary Baumgartner, & Amir R. Peimani	Teaching Assistant	Fall 2025
ESC499Y: Engineering Science Thesis	Anna Goldenberg	Research Mentor (for Kai Li)	Fall 2025 - Winter 2026
NeurotechUofT	N/A (Student-run)	Signal Processing Team Lead	Fall 2021 - Fall 2023

ADVANCED COURSES

Course Code	Title	Instructor/Supervisor	Term
Graduate - Computer Science			
CSC2541H	Topics in ML: AI for Drug Discovery	Chris J. Maddison	Winter 2026
CSC2541H	Topics in ML: Introduction to Causality	Rahul G. Krishnan	Fall 2025
CSC2631H	Mobile & Digital Health	Alex Mariakakis	Fall 2025
Undergraduate - Computer Science			
CSC412H/2506H	Probablistic Learning & Reasoning	Denys Linkov	Winter 2025
CSC486H/2502H	Knowledge Representation & Reasoning	Bahar Aameri	Fall 2024
CSC494H/495H	Research: Single-cell Foundation Model	Bo Wang	Fall 2023, Winter 2024
CSC413H/2516H	Neural Networks & Deep Learning	Bo Wang & Jimmy L. Ba	Winter 2023
Undergraduate - Cognitive Science			
PHL342H	Minds & Machines	Sara Aronowitz	Winter 2025
COG402H	Cognitive Scientific Theories of Consciousness	John Vervaeke	Fall 2024
BME445H	Neural Bioelectricity	Berj Bardakjian	Fall 2022
Undergraduate - Physics			
PHY405H	Electronics Lab	Ziqing Hong	Winter 2025
PHY478H	Research: Wearable Device Bio-signal Modelling	Andrew Lim & Paul Kushner	Fall 2023
PHY408H	Time Series Analysis	Dylan Jones	Winter 2023
MIE438H	Microprocessors & Embedded Microcontrollers	Alireza A. Bazargani	Winter 2023

AWARDS & HONOURS

Title	Institution	Term
Dean's List Scholar	University of Toronto, Faculty of Arts & Science	Fall 2021, 2022, 2023, 2024
6T5 Scholarship	University of Toronto, Trinity College	Fall 2021
University of Toronto Scholar	University of Toronto	Fall 2020

PRESENTATIONS & TALKS

Speculative Decoding - High Throughput LLM Inference on Training Hardware — Nov 2024
WangLab, Vector Intitute & University Health Network — Toronto, ON, Canada

Insights into the Functions and Nature of Consciousness through Generalizing Global Workspace Theory to Artificial Neural Networks — Oct 2024
Department of Cognitive Science, University of Toronto — Toronto, ON, Canada

A Deep Learning Approach for Sleep Staging on a Flexible Wireless Dual-sensor Wearable System without EEG — Jun 2024
SLEEP 2024 Conference — Houston, TX, USA

ENGINEERING PORTFOLIO

Project Luminous Flow

· Real-time fluid simulation rendered on a LED matrix display by a custom-built physical graphics engine at over 70 FPS.

Gesture Imitation Robotic Hand

· A 3D-printed robotic hand that imitates your hand gestures with computer vision in real-time.

brainblots

· Co-founded brainblots – an EEG algorithmic art initiative that enables us to express ourselves through our brainwaves with the Muse EEG headband.

· Artwork displayed at time square, New York City in June 2022.