XINHAI HOU

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EDUCATION

University of Michigan, Ann Arbor, U.S.
Ph.D. Candidate, Bioinformatics and Scientific Computing | GPA: 4.0 — Sep 2021 - May 2026 (expected)

- Advisor: Prof. Todd Hollon, Prof. Honglak Lee.

M.S. Bioinformatics | GPA: 4.0 — Sep 2021 - May 2024

- Advisor: Prof. Todd Hollon, Prof. Brian Athey.

The Chinese University of Hong Kong, Shenzhen, China
B.S. with First Class Honours (top 10%), Statistical Science | GPA: 3.6 — Sep 2016 - May 2020

PROFESSIONAL EXPERIENCE

Machine Learning Engineer | Tencent (Beijing), advised by Dr. Pengfei Xiong — Feb 2021 - Aug 2021

- Fine-tuned GPT-2 and UniLM on social media and news corpus for title generation used in WeChat Search.
- Doubled the training speed by distributed training and increased 5% on ROUGE score by beam search.
- Won **fifth** award out of 4335 participants in a ACM challenge: Multimodal Video Advertisement Competition by adopting CLIP and MoCo image encoders and gained 10.3% average precision.

RESEARCH HIGHLIGHTS

Visual foundation model for tumor infiltration detection with histopathology imaging — Nov 2022 - May 2024

- Developed and trained FastGlioma, a foundation model for tumor infiltration detection using Vision Transformers (ViT) and hierarchical objective with SimCLR.
- Achieved 92.1% AUC on infiltration detection with 10x less imaging time and zero-shot potentials.
- Proposed Slide Pretraining Transformer (SPT), a general framework for gigapixel WSI representation learning.
- Benchmarked foundation models with the SPT framework, demonstrating SPT robust performance.

Multimodal learning for patient prognosis predictions — Aug 2024 - present

- Proposed a novel vision-genomics model by prompting language model with patient clinical data for prototypical learning.
- Reduced the redundancy and improved interoperability using Gaussian mixture and optimal transport kernel embeddings.
- Structured pathology reports with prompt engineering and encoded them using Llama3 and OpenAI embedding models for joint training with pathology images.

Multimodal foundation model for MRI-Radiology report — Jan 2023 - present

- Developed a brain MRI and radiology report processing workflow by pretraining 3D image encoders using VQVAE.
- Optimized vision-language model using contrastive pretraining (CLIP) to enhance MRI feature extraction for diagnostic accuracy, worklist prioritization, and referral recommendations.
- Conducted prospective validation, achieving 93.2% balanced accuracy in radiologic diagnosis and workflow optimization.

Hierachical learning for histopathology — May 2022 - Nov 2022

- Introduced HiDisc, a novel hierarchical learning objective compatible with popular self-supervised learning (SSL) like SimCLR and DINO, outperforming baselines without extra computing requirements.
- Published paper Hierarchical Discriminative Learning Improves Visual Representations of Biomedical Microscopy. (CVPR 2023 highlights)

SELECTED PUBLICATIONS

Visual foundation models for fast, label-free detection of diffuse glioma infiltration
Nature, 2024
Akhil Kondepudi, Melike Pekmezci, **Xinhai Hou**, ..., Todd Hollon.

A self-supervised framework for learning whole slide representations
Neural Information Processing Systems (**NeurIPS**) Workshop on AIM-FM, 2024
Xinhai Hou, ..., Honglak Lee, and Todd C. Hollon.

Super-resolution of biomedical volumes with 2D supervision
CVPR Workshop on Computer Vision for Microscopy Image Analysis, 2024
Cheng Jiang, ..., **Xinhai Hou**, ..., Todd Hollon.

Hierarchical Discriminative Learning Improves Visual Representations of Biomedical Microscopy
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2023 (Highlight)
Cheng Jiang*, **Xinhai Hou***, ..., Honglak Lee, and Todd C. Hollon.

OpenSRH: Optimizing Brain Tumor Surgery Using Intraoperative Stimulated Raman Histology
Conference on Neural Information Processing Systems (**NeurIPS**) Datasets and Benchmarks Track, 2022
Cheng Jiang*, Asadur Chowdury*, **Xinhai Hou***, ..., Honglak Lee, and Todd C. Hollon.

Valproic acid-induced changes of 4D nuclear morphology in astrocyte cells
Molecular biology of the cell, 2021
Alexandr Kalinin, **Xinhai Hou**, ..., Brian Athey.

CORE COURSEWORK

Machine Learning	Computer Vision, Large Language Modeling, Optimization Theory
Statistics	Data Mining, Statistical Inference, Time Series, Nonparametric Statistics.
Computer Science	Data Structure and Algorithm, Parallel Computing, Database Management.
Bioinformatics	Bioinformatics concepts and algorithms, Biology for computational scientists

SKILLS

Programming languages	Python, Shell, R, C/C++, MATLAB
Framework	Pytorch, Tensorflow, Pandas, Scikit-Learn, Matplotlib, OpenMP, MPI, OpenCV
Tools	Git, Vim, VS Code, AWS, LaTeX, Adobe Illustrator

AWARDS

- **MICDE Graduate Fellowship** 2024-2025
  Michigan Institute for Computational Discovery and Engineering, U of M
- **CVPR 2023 Scholarship** 2023
- **Dean's List** (Top 5%), 2016 - 2020
  The Chinese University of Hong Kong, Shenzhen
- **Undergraduate Research Award** 2016 - 2020
  The Chinese University of Hong Kong, Shenzhen

ACADEMIC SERVICE

- Conference reviewer: **ICLR 2025, WACV 2025, NeurIPS 2024, ECCV 2024, CVPR 2024, WACV 2024, NeurIPS 2023, NeurIPS 2022**
- Journal Reviewer: **Journal of Digital Imaging**