

Chenwei Wu

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EDUCATION

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|--|-----------------|
| University of Michigan, Ann Arbor, MI | 09/2023-Present |
| M.S./Ph.D. Student | GPA: 4.00/4.00 |
| Harvard University, Cambridge, MA | 09/2021-05/2023 |
| S.M. in Data Science | GPA: 3.94/4.00 |
| University of Rochester, Rochester, NY | 09/2016-05/2020 |
| B.S. in Data Science (Highest Distinctions), B.A. in Financial Economics (Distinctions) | GPA: 3.92/4.00 |
| Undergraduate Teaching: CS Department Tutor, Intermediate Statistical Methods, Data Mining, Economics of Globalization | |
| Graduate Teaching: Harvard Introduction to Data Science, Michigan 2024 Electrify AI Magic Summer Camp Co-organizer | |
| Peer Reviews: IEEE TMI, Medical Physics, MICCAI, IEEE ICHI, ICLR, MLHC, CHIL, RECOMB, Academy Health ARM. | |

SELECTED RESEARCH EXPERIENCES

Research Focus 1: Multimodal Fusion of Medical Data

❖ Multimodal Multitask Learning with Dynamic Soft Mixture of Experts

University of Michigan, Dr. Liyue Shen

05/2024-10/2024

- Proposed M4oE, a **multimodal multitask mixture-of-experts model** for **4-modality** medical image fusion, tackled both dynamic sample-adaptive modality fusion and dynamic modality-task dependence modeling.
- Devised a **conditional mutual information loss** to encourage experts to adaptively learn diverse patterns of task-dependent modality-shared information for different target tasks. M4oE provides both sample-level and dataset-level interpretation of modality contribution to different prediction tasks. [Under review in ICLR 25](#).

❖ Multimodal Embeddings Alignment and Fusion

Harvard Medical School, Dr. Leo A Celi, Dr. Michael Morley & Dr. Luis Nakayama

09/2023-10/2024

- Proposed a **disentangled transformer architecture** and a novel mutual information loss to fuse spatiotemporal satellite images and text data for dengue predictions, reduced cross-modality redundancy. [Published in Nature Scientific Data](#).
- Designed an efficient **total-correlation alignment loss** framework for **3-modality** ophthalmology embeddings, including images, patient records and 3D scans. Analyzed alignment from information and geometric perspective. [Under review in Artificial Intelligence Review](#).
- Utilized a **masked lab test modeling transformer** and **pretrained LLMs** to learn representations from multimodal EHR data. Devised a **partial information decomposition loss** for downstream fusion. [Published in CIKM 24](#), [Nature Scientific Reports](#).

Research Focus 2: Data and Model Efficiency

❖ Diffusion Transformers for Zero-Shot Training-Free Image Editing

University of Michigan, Dr. Liyue Shen

05/2024-09/2024

- Explored and modeled the **latent space disentanglement** effect for Text-to-Image diffusion transformers. Proposed a zero-shot training-free image editing method based on this observation. [Multimodal AI TTIC'24](#), [Under review for TMLR](#).

❖ Efficient SAM (Segment Anything) Adaptation to Medical Domain via Visual Prompt Selection

University of Michigan, Dr. Liyue Shen

09/2023-02/2024

- Proposed MVPS, a **meta-learning** framework to train visual prompt retrievers for pretrained SAM models to perform in-context medical image segmentation. Achieved near-supervised learning performance using only 7% parameters and few-shot labels. [Publication in MICCAI 24](#).

❖ Modality Agnostic Self-supervised Learning for Medical Signals, Sensors and Images

Harvard Medical School, Dr. Pranav Rajpurkar

11/2021-12/2022

- Designed BenchMD, a medical **modality-agnostic** benchmark that evaluates how different architectures and training techniques perform on domain shifts; Devised three **SSL** techniques (Emix, Shed, Input-Agnostic MAE) and achieved SOTA few-shot and zero-shot OOD performance on EEGs and Dermatology. [Preprint on Arxiv](#).

Research Focus 3: Fairness and Privacy

❖ Large Language Models (LLM) for Global Population

MIT, Dr. Leo A Celi, Dr. Michael Morley and Dr. Luis Nakayama

01/2023-05/2024

- Developed Multi-Opthalingua, a **multilingual medical LLM QA benchmark dataset** designed to assess performance shifts of LLMs across different languages and cultural contexts. [Published in IEEE ICHI 24](#).
- Devised a **Multi-Agent Retrieval Augmented Generation** system to improve LLM QA performance and reduce cross-lingual gaps on Multi-Opthalingua dataset. [Under revision in AAAI 25](#).
- Designed Dr. Academy, a benchmark for evaluating questioning capability in education for LLMs, **shifting focus from LLM as learners to LLM as educators**. [Published in ACL 24](#).

❖ Medical Image Obfuscation for Private Data Sharing & Surveys Papers

MIT, Dr. Leo A Celi, Dr. Luis Nakayama and Dr. Liyue Shen

09/2022-02/2024

- Developed a clinical-inspired retinal fundus **obfuscation algorithm** to de-identify retinal fundus images without hurting down-stream disease classification performance. [Published in MICCAI 23 FAIMI](#), [Investigative Ophthalmology & Visual Science](#). Developed a **multi-objective adversarial image obfuscation** method for general medical image de-identification and shortcut removal. [Under revision in ACM TIST](#).
- Performed a comprehensive **scientometric analysis** of LLM research for healthcare and revealed significant disparity in author representation. [Under revision in PLOS digital Health](#). **Surveyed** recent research on identifying and mitigating Clever Hans Effects in medical computer vision. [Accepted to JIIM](#).

Research Focus 4: Deep Learning for Mental Health

❖ Deep Learning for Schizophrenia.

University of Rochester, Dr. David Dodell-Feder

04/2019-04/2022

- Analyzed and performed **text topic modeling** of patient behavioral data in an fMRI study to understand the relationship between functional connectivity in the Default Mode Network and social pleasure. *Published in [SRP 2019](#), and [Nature Schizophrenia](#) 2022.*
- Applied **semi-supervised** CNNs, optical flow and OpenFace on patient videos to analyze group differences in nonverbal social synchrony between schizophrenia patients and healthy controls. *Presented at [CNS 2020](#).*

WORK EXPERIENCES

Co-founder, Lead ML Scientist, (Part-time) Evident Battery Inc. Somerville, MA

10/2023-Present

- Developed and deployed the world's first [non-invasive battery defect detection solution](#) leveraging robotics and signal processing deep foundational models. Fundraised a \$3.2 M+ seed round.

Analyst, Investment Banking Group, Credit Suisse, New York, NY

07/2020-06/2021

- Developed a company-wide live chatbot on Bloomberg TOMS that used NLP to offer real-time product and client analysis, and automate booking, compliance approval, and trading processes.

RESEARCH OUTCOMES

Under Revision & Arxiv Preprints

- [1] C Wu et al. "[Dynamic modeling of patients, modalities and tasks via multi-modal multi-task mixture of experts](#)", *ICLR* 25
- [2] C Wu*, D Restrepo* et al. A multilingual benchmark for assessing and debiasing LLM ophthalmological QA in LMICs, *AAAI* 25
- [3] Z Shuai*, C Wu*, Z Tang* et al. [Latent space disentanglement in diffusion transformers enables zero-shot fine-grained semantic editing](#), *TMLR*
- [4] D Restrepo*, C Wu* et al. [Analyzing diversity in healthcare LLM research: A scientometric perspective](#), *PLOS Digital Health*
- [5] C Wu et al, Promoting medical AI fairness and privacy via obfuscation of patient-sensitive attributes in Medical Images, *ACM TIST*
- [6] D Restrepo, C Wu et al. [DF-DM: A foundational process model for multimodal data fusion in the artificial intelligence era](#), *Artificial Intelligence Review*
- [7] C Wu et al. [mBRSET: A portable retina fundus photos benchmark dataset for clinical and demographic prediction](#), *Nature Scientific Data*
- [8] C Ding, T Yao, C Wu et al. [Deep learning for personalized electrocardiogram diagnosis: A review](#), *Biosensors and Bioelectronics*
- [9] K Wantlin*, C Wu* et al. [Benchmd: A benchmark for modality-agnostic learning on medical images and sensors](#), Preprint
- [10] D Restrepo*, C Wu* et al. [Multimodal Deep Learning for Low-Resource Settings: A Vector Embedding Alignment Approach for Healthcare Applications](#), Preprint

Accepted

- [11] T Phan*, C Dao*, C Wu et al. [MEDFuse: Multimodal EHR data fusion with masked lab-test modeling and LLMs](#), *CIKM* 24
- [12] C Wu et al. [Efficient in-context medical segmentation with meta-driven visual prompt selection](#), *MICCAI* 24
- [13] Y Chen, C Wu et al. [Dr. Academy: A benchmark for evaluating questioning capability in education for LLMs](#), *ACL* 24
- [14] J Ding et al. (Co-author) [Large language multimodal models for new-onset type 2 diabetes prediction using five-year cohort electronic health records](#), *Nature Scientific Reports* 24
- [15] C Vásquez, C Wu et al. Detecting and mitigating the Clever-Hans effect in medical imaging: A scoping review, *Accepted to JIIM*
- [16] D Moukheiber et al. (Senior Author) [A multimodal framework for extraction and fusion of satellite images and public health data](#), *Nature Scientific Data* 24
- [17] D Restrepo, L Nakayama, C Wu et al. [Seeing beyond borders: Evaluating LLMs in multilingual ophthalmological question answering](#), *IEEE ICHI* 24
- [18] C Wu*, X Yang* et al. [De-identification and obfuscation of gender attributes from retinal scans](#), *MICCAI 23 FAIMI*
- [19] Y Liu, H Yang, C Wu (Communication Author) [Unveiling patterns: A study on semi-supervised classification of strip surface defects](#), *IEEE Access* 23
- [20] L Nakayama et al. (Co-author) [Pixel snow and differential privacy in retinal fundus photos de-identification](#), *Investigative Ophthalmology & Visual Science* 23
- [21] B Shovestful, A Saxena, S Reda, E Dudek, C Wu et al. [Social affective forecasting and social anhedonia in schizophrenia-spectrum disorders: a daily diary study](#), *Nature Schizophrenia* 22
- [22] S Cajas, D Restrepo, D Moukheiber, K Kuo, C Wu et al. [A multimodal satellite imagery dataset for public health analysis in Colombia](#), *Physionet*
- [23] Z Shuai*, C Wu*, Z Tang* et al. Exploring Disentangled Latent Space of Text-to-Image Diffusion Transformer for Fine-grained Semantic Editing, *Multimodal AI TTIC* 24
- [24] H Xu et al. (Co-author) [Effective clustering of nursing homes using unsupervised machine learning focusing on dementia and mental illness](#), *Academy Health ARM* 2020
- [25] L Lin, C Wu et al. [Using optical flow to quantify movement differences in responses to emotional stimuli among people with schizophrenia](#), *Cognitive Neuroscience Society* 2020
- [26] B Shovestful, E Dudek, C Wu et al. [Does functional connectivity within the DMN predict individual differences in social pleasure in schizophrenia?](#), *Society for Research in Psychopathology* 2019

OUTREACH

Talks

- "Self-supervised Learning for Survival Rate Prediction of Histopathology Images", *Johnson & Johnson Data Science R&D Symposium*, Philadelphia, PA, 08/2022
- "[Remote Working on a Cluster for Medical AI Practitioners](#)", "[Ensemble of Averages: Improving Model Selection](#)", "[Docker for ML Practitioners](#)", *Harvard Medical AI Talk Series*, Boston, MA, 01/2022-08/2022

President, Rochester Data Science Society, Rochester, NY

10/2018-05/2020

- Led the development of a social app for teens with addictions to alcohol and opioids to support and advocate each other.
- Led the collaboration with Dr. Catherine Glenn to develop a web app for monitoring of cognitive states for suicidal teens.
- Invited industry and academia alumni to share experiences and job opportunities for minority students.