

Chenxi Liu

Master ◇ ECE Department ◇ Northwestern University
chenxiliu2020@u.northwestern.edu | [Github](#)

RESEARCH INTEREST

Machine learning (*transfer learning, self-supervised learning, continual learning, federated learning, etc.*), Application of Machine Learning (*cyber-physical systems, quantum systems, etc.*), Computer Vision, Natural Language Processing, Speech Processing

EDUCATION

Northwestern University

Sep. 2021 ~ present

M.S in Electrical Engineering, Department of Electrical and Computer Engineering (GPA: 4.0/4.0)

Relevant Courses: Machine Learning, Deep Learning; Computer Vision, Machine Learning in Medical Imaging, Deep Learning for Natural Language Processing, Theory of Data and Decisions, Distributed Optimization, Block Chain, etc.

Sun Yat-Sen University

Sep. 2020 ~ Jun. 2021

M.S in Condensed Matter Physics, School of Physics (not pursuing a degree)

Relevant Courses: Algorithm Design and Complexity, Advanced Quantum Mechanics, Group Theory, etc.

Sun Yat-Sen University

Sep. 2016 ~ Jun. 2020

B.S in Opto-Electronics Information Science and Engineering, School of Physics (GPA: 3.6/4.0)

Relevant Courses: Linear Algebra, Advanced Mathematics, Signal and Systems, Quantum Mechanics, Thermodynamics and Statistical Physics, Principles of Communication, Information Optics, etc.

PUBLICATIONS

- [1] **Chenxi Liu**, Lixu Wang, Lingjuan Lyu, Chen Sun, Xiao Wang, Qi Zhu. **Twofer: Tackling Continual Domain Shift with Simultaneous Domain Generalization and Adaptation**. International Conference on Learning Representations (ICLR), Jan.2023. [\[Paper\]](#)
- [2] Zewang Zhang, Shuo Yang, Yihang Wu, **Chenxi Liu**, Yimin Han, Ching Hua Lee, Zheng Sun, Guangjie Li and Xiao Zhang. **Predicting Quantum Many-Body Dynamics with Transferable Neural Networks**. Chinese Physics Letters, Dec. 2019. [\[Paper\]](#)

RESEARCH EXPERIENCE

Data Imbalance in Self-Supervised Federated Learning

Sep. 2022 ~ present

Advisor: Prof. Qi Zhu

Northwestern University

- Aim to address global class imbalance problem in self-supervised federated learning.
- Sample a balanced subset for finetuning.

Tackling Continual Domain Shift with Simultaneous Domain Generalization and Adaptation

Apr. 2022 ~ Sep. 2022

Advisor: Prof. Qi Zhu, Prof. Xiao Wang

Northwestern University

- The first work to consider performance before adaptation in continual domain adaptation setting.
- Proposed a training-free data augmentation module for domain generalization, a cluster-based pseudo-labeling method for source-free domain adaptation, and a Prototype Contrastive Alignment loss to simultaneously address domain generalization, adaptation and catastrophic forgetting.
- Extensive experiments on three datasets showed high effectiveness compared to other SOTA methods, especially when target domain is much more complicated than source domain.

Fairness in Continual Learning

Jan. 2022 ~ Mar. 2022

Advisor: Prof. Qi Zhu

Northwestern University

- Explored the accuracy of different sensitive attributes drop along with continual learning, but we found that obvious unfairness

only existed in small network.

Generalize to larger Fractional Quantum Hall Effect System using Neural Networks

Mar. 2020 ~ Jun. 2021

Advisor: Prof. Xiao Zhang

Sun Yat-Sen University

- Developed a feature disentanglement model only trained on low-cost data of small FQHE systems, and aim to predict the phase condition of larger FQHE systems without any high-cost training data.
- It is a very hard task because it can be seen as a domain generalization task with very limited source domain data. The students in the group are still working on this topic.

Predicting Quantum Many-Body Dynamics with Transferable Neural Networks

Sep. 2017 ~ Dec. 2019

Advisor: Prof. Xiao Zhang

Sun Yat-Sen University

- A RNN based model is used to autoregressively predict the time sequence evolution of an Ising model from its initial state. Furthermore, the model is trained on sufficient low-cost source data from small Ising systems, and then adapts to larger Ising systems using only a few high-cost data.
- The model achieved very high efficiency (100 times faster on only 7-spin system) and kept high accuracy compared to traditional physical algorithm.

SELECTED PROJECTS

Automatic Music Transcription

Mar. 2022 ~ Jun. 2022

Advisor: Prof. Thrasyvoulos N. Pappas

Northwestern University

- Jointly transcribed arbitrary combinations of musical instruments simultaneously using a general-purpose Transformer model.

Swarm Learning

Jan. 2022 ~ Mar. 2022

Advisor: Prof. Ermin Wei

Northwestern University

- Swarm learning used a blockchain framework to encrypt the parameters aggregation process in federated learning.
- Applied swarm learning to traffic light classification in connected vehicles scenario. [\[code\]](#)

Conversational Agent

Jan. 2022 ~ Mar. 2022

Advisor: Prof. David Demeter

Northwestern University

- Finetuned GPT2 and T5 model on conversational data, and explored the performance in different conversation scenarios.

Face Mask Images Generation and Recognition

Sep. 2021 ~ Mar. 2022

Advisor: Prof. Aggelos Katsaggelos

Northwestern University

- Used GAN to generate face mask images as a data augmentation technique and trained a CNN to classify if a person wears a mask in the right way.

ML for Medical Images Classification

Sep. 2021 ~ Dec. 2021

Advisor: Prof. Lee A Cooper

Northwestern University

- Applied different data manipulations to improve classification accuracy of breast cancer cellular images using ResNet.

AWARDS

Scholarship of Sun Yat-sen University

2017, 2018, 2019

SKILLS

Programming Languages

Python (Pytorch, Tensorflow), Latex, C++, C, Verilog, Vasp

Techniques

Git, Anaconda, MPI, Docker