Yifei Wang

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EDUCATION

Peking University, School of Mathematical Sciences **09 2017 – 06 2023 (expected)**
Ph.D. Candidate in Applied Mathematics *Beijing, China*
Member of ZERO Lab. *Advisors:* Yisen Wang, Jiansheng Yang, Zhouchen Lin

Peking University, School of Mathematical Sciences **09 2013 – 07 2017**
Bachelor of Science (*Major*) *Beijing, China*

Peking University, Department of Philosophy **09 2014 – 07 2017**
Bachelor of Art (*Minor*) *Beijing, China*

EXPERIENCE

Huawei Noah's Arch Lab **09 2021 – 03 2022**
Research Intern *Beijing, China*
- Research on energy-based approaches to self-supervised learning.

Huawei Noah's Arch Lab **09 2019 – 03 2020**
Research Intern *Beijing, China*
- Research on disentangling of robust and non-robust features through end-to-end learning.

Baidu's Phoenix Nest **09 2018 – 03 2019**
Research Intern *Beijing, China*
- Research on end-to-end AD selection with Reinforcement Learning and Transformer.

AWARDS

- **Best Machine Learning Paper Award**, ECML-PKDD, 2021 (**1/685**)
- **Silver Best Paper Award**, ICML AML workshop, 2021
- **National Scholarship**, 2021, 2022 (Highest scholarship given by Chinese government, top 1%)
- **Principal Scholarship**, 2022 (Highest scholarship given by PKU, one per department, top 1%)
- **Baidu Scholarship Nomination Award** (20 worldwide), Baidu Inc, 2022
- **Meritorious Winner** (**First Prize**), Mathematical Contest in Modeling, 2016
- **Yizheng Scholarship**, Peking University, 2016

RESEARCH INTERESTS

I am generally interested in uncovering the underlying mechanisms of foundational learning paradigms (to name a few, contrastive learning, masked autoencoding, adversarial training). Now I research on the following major subjects of modern machine learning to establish their theoretical foundations and improve real-world effectiveness:

- **Unsupervised Learning**: feature learning, generalization, transferability and robustness; generative models
- **Robust Learning**: out-of-distribution robustness; adversarial robustness; data privacy and copyright
- **Graph Learning**: understanding and designing feature propagation inside GNNs and Transformers

PUBLICATIONS

Note: * marks equal contribution; names of mentored students are underlined.

I. Unsupervised Learning (a.k.a. Self-Supervised Learning)

A Message Passing Perspective on Learning Dynamics of Contrastive Learning

- **Yifei Wang***, Qi Zhang*, Tianqi Du, Jiansheng Yang, Zhouchen Lin, Yisen Wang
- Eleventh International Conference on Learning Representations (**ICLR 2023**)

Towards a Unified Theoretical Understanding of Non-contrastive Learning via Rank Differential Mechanism

- Zhijian Zhuo*, **Yifei Wang***, Yisen Wang
- Eleventh International Conference on Learning Representations (**ICLR 2023**)

How Mask Matters: Towards Theoretical Understandings of Masked Autoencoders

- Qi Zhang*, **Yifei Wang***, Yisen Wang
- Thirty-sixth Conference on Neural Information Processing Systems (**NeurIPS 2022 (Spotlight)**)

Variational Energy-Based Models: A Probabilistic Framework for Contrastive Self-Supervised Learning

- Tianqi Du*, **Yifei Wang***, Yisen Wang
- **NeurIPS 2022 Workshop**: Self-Supervised Learning - Theory and Practice

AggNCE: Asymptotically Identifiable Contrastive Learning

- Jingyi Cui*, Weiran Huang*, **Yifei Wang**, Yisen Wang
- **NeurIPS 2022 Workshop**: Self-Supervised Learning - Theory and Practice

Chaos is a Ladder: A New Theoretical Understanding of Contrastive Learning via Augmentation Overlap

- **Yifei Wang***, Qi Zhang*, Yisen Wang, Jiansheng Yang, Zhouchen Lin
- Tenth International Conference on Learning Representations (**ICLR 2022**)

Residual Relaxation for Multi-view Representation Learning

- **Yifei Wang**, Zhengyang Geng, Feng Jiang, Chuming Li, Yisen Wang, Jiansheng Yang, Zhouchen Lin
- Thirty-fifth Conference on Neural Information Processing Systems (**NeurIPS 2021**)

Reparameterized Sampling for Generative Adversarial Networks

- **Yifei Wang**, Yisen Wang, Jiansheng Yang, Zhouchen Lin
- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (**ECML-PKDD 2021**)
- **Best Machine Learning Paper Award (1/685)**. Invited to **Machine Learning** Journal

Train Once, and Decode as You Like

- Chao Tian, **Yifei Wang**, Hao Cheng, Yijiang Lian, Zhihua Zhang
- Twenty-ninth International Conference on Computational Linguistics (**COLING 2020**)

II. Robust Learning

Rethinking the Effect of Data Augmentation in Adversarial Contrastive Learning

- Rundong Luo*, **Yifei Wang***, Yisen Wang
- Eleventh International Conference on Learning Representations (**ICLR 2023**)

On the Connection between Invariant Learning and Adversarial Training for Out-of-Distribution Generalization

- Shiji Xin, **Yifei Wang**, Jingtong Su, Yisen Wang
- Thirty-seventh AAAI Conference on Artificial Intelligence (**AAAI 2023 (Oral Representation)**)

Improving Out-of-distribution Robustness by Adversarial Training with Structured Priors

- Qixun Wang*, **Yifei Wang***, Hong Zhu, Yisen Wang
- Thirty-sixth Conference on Neural Information Processing Systems (**NeurIPS 2022 (Spotlight)**)

When Adversarial Training Meets Vision Transformers: Recipes from Training to Architecture

- Yichuan Mo, Dongxian Wu, **Yifei Wang**, Yiwen Guo, Yisen Wang
- Thirty-sixth Conference on Neural Information Processing Systems (**NeurIPS 2022 (Spotlight)**)

A Unified Contrastive Energy-based Model for Understanding the Generative Ability of Adversarial Training

- **Yifei Wang**, Yisen Wang, Jiansheng Yang, Zhouchen Lin
- Tenth International Conference on Learning Representations (**ICLR 2022**)
- **Silver Best Paper Award** at ICML 2021 AML Workshop

III. Graph Learning

ContraNorm: A Contrastive Learning Perspective on Oversmoothing and Beyond

- Xiaojun Guo*, **Yifei Wang***, Tianqi Du, Yisen Wang
- Eleventh International Conference on Learning Representations (**ICLR 2023**)

Unbiased Stochastic Proximal Solver for Graph Neural Networks with Equilibrium States

- Mingjie Li, **Yifei Wang**, Yisen Wang, Zhouchen Lin
- Eleventh International Conference on Learning Representations (**ICLR 2023**)

Optimization-induced Graph Implicit Nonlinear Diffusion

- Qi Chen, **Yifei Wang**, Yisen Wang, Zhouchen Lin
- Thirty-ninth International Conference on Machine Learning (**ICML 2022**)

G^2CN: Graph Gaussian Convolution Networks with Concentrated Graph Filters

- Mingjie Li, Xiaojun Guo, **Yifei Wang**, Yisen Wang, Zhouchen Lin
- Thirty-ninth International Conference on Machine Learning (**ICML 2022**)

Dissecting the Diffusion Process in Linear Graph Convolutional Networks

- **Yifei Wang**, Yisen Wang, Jiansheng Yang, Zhouchen Lin
- Thirty-fifth Conference on Neural Information Processing Systems (**NeurIPS 2021**)

ROLES AND RESPONSIBILITIES

- Conference Reviewer: ICML (2022), NeurIPS (2022), ICLR (2022), ACL (2021, 2022), CVPR (2023), ECML-PKDD (2022)
- Organizer of a regular reading group on self-supervised learning (around 15 members) @ PKU, 2021-now
- TA, **Optimization Methods in Machine Learning**, 2018. Instructor: Zhouchen Lin
- TA, **Advanced Mathematics**, 2019. Instructor: Chao Wang
- TA, **Introduction to Artificial Intelligence** (**Trustworthy ML Class**), 2020, 2022. Instructor: Yisen Wang

TALKS

- Theoretical Foundations of Self-Supervised Learning. KAIST. 2022.
- Towards Truly Unlearnable Examples for Data Privacy. Chinese Academy of Science. 2022.
- Contrastive Energy-based Models: A Unified Framework. Peking University. 2021.
- Reparameterized Sampling for GANs. Huawei Noah's Arch Lab. 2021.
- Reparameterized Sampling for GANs. Beijing Academy of Artificial Intelligence (BAAI). 2021.

SKILLS

Languages: Chinese (Native), English (Fluent).
Programming: Python, MATLAB, C.
Machine Learning: PyTorch, Tensorflow, Scikit-learn, JAX.