Haowen Wang

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Education

Tsinghua University, School of Software **Sep. 2021 - Jul. 2025 (Expected)**
Bachelor of Engineering in Software Engineering

- **Overall GPA:** 3.91/4.0, **Ranking:** 6/78 (Top **8%**)
- **Selected Courses:** Software analysis and verification(A^+), Computer Organization Principle(A^+), Computer Networks(A^+), Students Research Training(A^+), Probability and Statistics(A)

University of California, San Diego **Jun. 2024 - Sep. 2024**
Visiting Student at Department of Cognitive Science

Publications

(* *indicates equal contribution.*)

[1] **Haowen Wang***, Guowei Zhang*, Xiang Zhang, Zeyuan Chen, Haiyang Xu, Dou Hoon Kwark, Zhuowen Tu.
Mousterian: Exploring the Equivalence of Generative and Real Data Augmentation in Classification.
Under Review.

[2] Hang Zhou*, Yuezhou Ma*, Haixu Wu, **Haowen Wang**, Jianmin Wang, Mingsheng Long.
Unisolver: PDE-Conditional Transformers Are Universal PDE Solvers.
Under Review. [PDF]

[3] Haixu Wu, Huakun Luo, **Haowen Wang**, Jianmin Wang, Mingsheng Long.
Transolver: A Fast Transformer Solver for PDEs on General Geometries.
International Conference on Machine Learning (ICML), 2024. [PDF][Code][Slides] (**Spotlight Paper**)
☆ **Integrated into NVIDIA Modulus as the Latest Neural PDE Solver**

[4] Bingjun Luo, **Haowen Wang**, Jinpeng Wang, Junjie Zhu, Xibin Zhao, Yue Gao.
Hypergraph-Guided Disentangled Spectrum Transformer Networks for Near-Infrared Facial Expression Recognition.
AAAI Conference on Artificial Intelligence (AAAI), 2024. [PDF]

Research Experiences

Effectiveness of Generative Data Augmentation **Jun. 2024 - Nov. 2024**
Advisor: Zhuowen Tu, Professor *Department of Cognitive Science, UCSD*

- Explored a relatively underexplored area of generative data augmentation by leveraging diffusion models trained solely on the internal (provided) classification dataset.
- Investigated the impact of generative data augmentation regarding the synthetic data quality and the size of the training set on ImageNet and CIFAR-10.
- Demonstrated a **quantitative equivalence** between real and synthetic dataset augmentation, using diffusion models trained on either internal or large-scale external data to achieve comparable performance.

PDE-Conditional Transformers for Universal PDE **Mar. 2024 - Oct. 2024**
Advisor: Mingsheng Long, Associate Professor *School of Software, THU*

- Proposed **Unisolver**, a conditional Transformer-based model that leverages embedded partial differential equations (PDEs) to enhance generalizability and performance for solving PDEs.
- Defined a comprehensive set of PDE components and embedded them as domain-specific and point-wise conditions in Transformer PDE solvers, enhancing the incorporation of physics information to improve generalizability.
- Achieved an average improvement of **27.4%** in in-distribution test settings and **43.9%** in zero-shot generalization settings on real-world benchmarks across various tasks.

Fast Transformer Solver for PDEs on General Geometries **Sep. 2023 - Jan. 2024**

Advisor: Mingsheng Long, Associate Professor *School of Software, THU*

- Designed **Transolver**, a physics-informed model to solve partial differential equations (PDEs), featuring inherent geometry-general modeling capabilities to capture intrinsic physical states while maintaining linear complexity efficiency.
- Proposed a new Physics-Attention mechanism with linear complexity that adaptively divides the discretized domain into learnable slices based on similar physical states.
- Achieved consistent state-of-the-art performance with **22%** relative gain across six standard benchmarks like Electricity and Plasticity, and excelled in large-scale industrial simulations, including car and airfoil designs.

Near-Infrared Facial Expression Recognition **Aug. 2022 - Aug. 2023**

Advisor: Yue Gao & Xibin Zhao, Associate Professor *School of Software, THU*

- Proposed **NFER-Former** for facial expression recognition on near-infrared images, with a Self-Attention Orthogonal Decomposition module to learn the modality-invariant features from heterogeneous samples.
- Created a new dataset called Large-HFE, featuring **4.5** times more subjects than the previous dataset, to tackle the challenge of insufficient near-infrared training data.
- Achieved state-of-the-art results on all the existing datasets with an average improvement of **2.92%**.

Honors & Awards

[1] National Scholarship (**Top** scholarship in China; **0.2%** domestically), Ministry of Education (the **first and only female** recipient in the Class of 2021 from my department) **Sep. 2024**

[2] Software Innovation Competition (**4th** place), Tsinghua University **Mar. 2024**

[3] Comprehensive Excellence Scholarship (Top **1%**), Tsinghua University **Sep. 2023**

[4] Comprehensive Excellence Scholarship (Top **1%**), Tsinghua University **Sep. 2022**

Leadership Activities

Founder of Women in Computer Science Support Network: Established a mentorship platform for women, **empowering** them within the department.

Class President: Led a class of 31 students in organizing over 50 study sessions and campus events, earning the Comprehensive Development Class Award.

Social Practice Team Leader: Directed a 15-member team in researching the industry-university-research transformation in Beijing's big data sector.

Skills

Language: Chinese (native), English (TOEFL 108 [R30/L29/S24/W25], GRE 332 [V164/Q168/W3.5]).

Programming Languages: Python, C/C++, Java, JavaScript, HTML+CSS, RISC-V, Verilog.

Professional Software: PyTorch, Git, NumPy, Pandas, LaTeX.