Yi Ding

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EDUCATION

Tianjin University, Tianjin, China **Sep. 2021 - Expected Jun. 2025**

- **Major & School:** Data Science and Big Data Technology, School of Mathematics Cumulative GPA: 87.67/100, 3.52/4, Rank: 6/33
- **Mathematical courses:** *Mathematical Analysis (98), Theory of Probability (92), Real Variable Function (98), Mathematical Models (97), Complex Function (94), Topology (90), Combinatorial mathematics (93)*
- **Computer Science courses:** *Algorithm Design & Analysis (95), Machine Learning (95), Programming Language (92), Data Structure (94), Deep Learning (93), Data Visualization (100)*

PAPER&PUBLICATION

** indicates author with equal contribution. † indicates corresponding authors.*

[1] Predictive Dynamic Fusion

Bing Cao (Advisor), Yinan Xia, **Yi Ding***, Changqing Zhang†, Qinghua Hu†* **ICML 2024**

RESEARCH EXPERIENCE

***Research assistant,* Multi-modal Vision Project, Machine Learning & Data Mining Team, Tianjin University** **Jul. 2023 - Present**

Advisor: Dr. Bing Cao & Prof. Qinghua Hu, School of Artificial Intelligence, Tianjin University

- Provided an intuitive and rigorous multimodal fusion paradigm from the perspective of generalization error theory and derived a new Predictive Dynamic Fusion (PDF) framework based on the covariance of the fusion weight and loss function.
- Transformed the loss prediction to a more robust Collaborative Belief prediction, which naturally satisfies the covariance relationship to reduce the upper bound of generalization error without additional computational cost, and significantly enhance the prediction stability.
- Developed a relative calibration strategy to calibrate the potential prediction uncertainty and reveal the relative dominance in dynamic multimodal systems.
- Proved the superiority of dynamic image fusion over static image fusion and provides the generalization error upper bound of image fusion by decomposing the fusion image into uni-source components provably.
- Proposed a simple but effective test-time adaptation fusion paradigm based on the generalization theory.
- Conducted extensive experiments on multi-modal, multi-exposure, and multi-focus datasets, and additional exploration of gradient in constructing fusion weight demonstrates the reasonability of our theory and its expandability.

***Research assistant,* UNITES Lab, The University of North Carolina at Chapel Hill** **Mar. 2024 - May. 2024**

Advisor: Dr. Tianlong Chen, Computer Science, The University of North Carolina at Chapel Hill

- Developed an efficient fine-tuning system for time series foundation models (EFT-TSFM) to achieve parameter-efficiency, and memory-efficiency.
- Decomposed network weight update space to enable parameter-efficient fine-tuning of FMs on the target application via low rank decomposition.
- Utilized zero-order optimization substantially reduces the memory consumption constant even with longer the sequence length.

***Research assistant,* RZ Lab, Purdue University** **Jun. 2024 - Present**

Advisor: Dr. Ruqi Zhang, Department of Computer Science, Purdue University

- Planning to develop a reliable and fairness decoding-time alignment framework of vision-language models (VLM).
- Design a safety prompt and use CLIP score to evaluate whether we need to give penalty when LLM decoding.

***Group leader,* Research on Pre-training Consistency Model of Data Augmentation, National Innovation Project** **May. 2023 - Present**

Advisor: Prof. Ou Wu, Center of Applied Mathematics of Tianjin University

- Organized two members to conduct this national project
- Solved PF ODE equitation by consistency model, conducted comprehensive pre-training ideas to optimize the robustness of the model

- Enhanced data augmentation by employing the optimized consistency model and producing immense realistic data including image

SELECTED AWARDS

- ***Trio-Excellent Student Award,*** Tianjin University **Oct. 2023**
- ***Honor Award,*** US Mathematical Contest In Modeling in 2023 **May. 2023**
- ***Star of Hope Scholarship***, Tianjin University **May. 2023**
- ***Scholarship of Outstanding Student Cadre,*** Tianjin University **Feb. 2023**
- ***"Beiyang Qihang" Independent Award,*** Tianjin University **Sep. 2021**

SKILLS

- **Computer programming:** Python (Proficient), MATLAB (Proficient)
- **Deep learning skills:** PyTorch (Proficient)

OTHERS

- **Mathematics proficiency:** Strong foundation in mathematics major courses with outstanding grades
- **Computer proficiency:** *Programming Languages* (92), *Data Structures* (94), *Algorithm Design and Analysis* (95), *Machine Learning* (95)
- **English proficiency:** TOEFL (102)