

Education

2021 – **Ph.D. in Computer Science**, *Northeastern University, Boston, MA.*

Advised by Hongyang R. Zhang

2016 – 2020 **B.Eng. in Computer Science**, *Shanghai Jiao Tong University, Shanghai, China.*

Minor in Mathematics and Applied Mathematics

Research Interests

My current research focuses on building principled methodologies for learning with weak supervision, including transfer learning, multitask learning, data augmentation, and contrastive learning.

Research Experience

2022 **Task Modeling: Approximating Multitask Predictions for Cross-Task Transfer**, *with Huy L. Nguyen and Hongyang R. Zhang.*

- Modeled higher-order multitask transferability by sampling source tasks and estimating linear surrogate functions to extrapolate multitask predictions; Optimized cross-task transfer performance by selecting source tasks with negative coefficients in task models.
- Studied task modeling on 51 tabular and 25 text datasets; Showed a nearly linear sample complexity of estimating task models to the number of tasks; Achieved an average correlation coefficient of 0.8 between task model predictions and true multitask performance.
- Applied the algorithm to a multitask weak supervision benchmark and showed up to 3.6% accuracy improvement over the benchmark baselines and 6 multitask learning methods; Improved group robustness and fairness measures on a US Census dataset over 10 baselines.

2022 **Robust Fine-Tuning of Deep Neural Networks with Hessian-based Generalization Guarantees**, *with Haotian Ju and Hongyang R. Zhang.*

- Studied the generalization properties of fine-tuned neural networks through a PAC-Bayesian analysis with the Hessian matrix of model weights; Developed Hessian-based generalization bounds that highly correlate with empirical generalization errors for various fine-tuning algorithms.
- Proposed a fine-tuning algorithm that incorporates statistically-consistent losses and distance-based regularization for improving robustness against label noise.
- Achieved an average of 3.26% accuracy improvement on 6 weakly-supervised image classification tasks over 11 prior approaches; Observed 2.91% and 2.42% performance improvement from our approach in fine-tuning RoBERTa and Vision Transformers on noisy labels.

2021 **Improved Regularization and Robustness for Fine-tuning in Neural Networks**, *with Hongyang R. Zhang.*

- Analyzed the generalization properties of fine-tuned neural networks with a PAC-Bayesian bound that depends on the layer-wise distance from initialization and the noise stability of the fine-tuned model.
- Proposed a regularized self-labeling algorithm that interpolates between layer-wise regularization and self-labeling methods to improve the generalization performance and robustness.
- Evaluated the algorithm on 7 image classification tasks and observed an average accuracy improvement of 1.76% and 3.56% on clean and noisy labels; Extended the approach to few-shot learning, medical image classification, and text classification tasks with improved performance.

- 2021 **Optimal Intervention on Weighted Networks via Edge Centrality**, *with Tina Eliassi-Rad and Hongyang R. Zhang*.
- Studied intervention strategies by reducing edge weights to control a spreading process such as epidemic propagating on weighted networks; Formulated the problem as graph eigenvalue minimization with edge reduction procedures.
 - Identify edge centrality scores as gradients of largest singular values; Proposed a Frank-Wolfe algorithm that optimally minimizes the largest singular values by iteratively reducing the edges with the highest edge centrality scores and extended the algorithm to time-varying networks.
 - Validated the efficacy of our algorithm in controlling the infections and reducing the largest singular value on 11 static graphs and 4 time-varying networks across SEIR, SIR, and SIS epidemic models.

Publications and Preprints

Preprints

- 2022 Task Modeling: Approximating Multitask Predictions for Cross-Task Transfer.
Dongyue Li, Huy L. Nguyen, Hongyang R. Zhang.
- 2022 Optimal Intervention on Weighted Networks via Edge Centrality.
Dongyue Li, Tina Eliassi-Rad, Hongyang R. Zhang.

Conference Publications

- 2022 Robust Fine-Tuning of Deep Neural Networks with Hessian-based Generalization Guarantees.
Haotian Ju^{*}, **Dongyue Li**^{*}, Hongyang R. Zhang.
International Conference on Machine Learning (ICML), 2022.
- 2021 Improved Regularization and Robustness for Fine-tuning in Neural Networks.
Dongyue Li, Hongyang R. Zhang.
Advances in Neural Information Processing Systems (NeurIPS), 2021.
- 2022 DTQAtten: Leveraging Dynamic Token-based Quantization for Efficient Attention Architecture.
Tao Yang, **Dongyue Li**, Zhuoran Song, Yilong Zhao, Fangxin Liu, Zongwu Wang, Zhezhi He and Li Jiang.
Conference on Design Automation and Test in Europe (DATE), 2022.
- 2021 AdaptiveGCN: Efficient GCN Through Adaptively Sparsifying Graphs.
Dongyue Li^{*}, Tao Tang^{*}, Zhezhi He, Li Jiang.
Conference on Information and Knowledge Management (CIKM), 2021. Short paper.
- 2021 PIMGCN: A ReRAM-Based Processing-in-Memory Accelerator for Graph Convolutional Network.
Tao Yang, **Dongyue Li**, Yilong Zhao, Yibo Han, Zhezhi He, Li Jiang.
Design Automation Conference (DAC), 2021.
- 2021 ReRAM-Sharing: Fine-Grained Weight Sharing for ReRAM-Based Deep Neural Network Accelerator.
Dongyue Li^{*}, Zhuoran Song^{*}, Zhezhi He, Li Jiang.
International Symposium on Circuits and Systems (ISCAS), 2021.

Workshop Papers

- 2022 Task Modeling: Approximating Multitask Predictions for Cross-Task Transfer.
Dongyue Li, Huy L. Nguyen, Hongyang R. Zhang.
NeurIPS Workshop on Distribution Shifts (DistShift), 2022.
Previous version on ICML Workshop on Principles of Distribution Shift (PODS), 2022.
- 2022 Optimal Intervention on Weighted Networks via Edge Centrality.
Dongyue Li, Tina Eliassi-Rad, Hongyang R. Zhang.
KDD Workshop on Epidemiology meets Data Mining and Knowledge Discovery (epiDAMIK), 2022.

- 2022 Robust Fine-Tuning of Deep Neural Networks with Hessian-based Generalization Guarantees.
Haotian Ju*, **Dongyue Li***, Hongyang R. Zhang.
ICML Workshop on Updatable Machine Learning (UpML), 2022.
- 2021 Personalized and Environment-Aware Battery Prediction for Electric Vehicles.
Dongyue Li*, Guangyu Li*, Bo Jiang*, Zhengping Che, Yan Liu.
KDD Workshop on Mining and Learning from Time Series (MiLeTS), 2021.

Remark: Asterisk indicates equal contribution

Work Experience

- 08/20–05/21 **Full-time Researcher**, supervised by Li Jiang.
Shanghai Qi Zhi Institute, Shanghai, China
Designed efficient machine learning algorithms for accelerating deep neural networks, including convolutional neural networks, graph neural networks, and transformers.
- 06/19–09/19 **Research Intern**, supervised by Yan Liu.
Didi Chuxing AI Lab, Beijing, China
Conducted time-series analysis on electric vehicle operating data and incorporated neural networks with extended Kalman filter for battery prediction with environmental and battery sensory data.

Services

Reviewer for AISTATS 2023, WSDM 2023, WWW 2022, KDD 2022, and NeurIPS 2022.

Skills

Python, PyTorch, Tensorflow, C++, MATLAB, Java.

Honors and Scholarships

- 2020 Excellent Undergraduate Thesis Award from Shanghai Jiao Tong University
- 2018 Merit Student of Shanghai Jiao Tong University
- 2016-2019 Academic Excellence Scholarship of Shanghai Jiao Tong University