Changbin Li

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SUMMARY

Ph.D. Candidate in machine learning, deep learning, computer vision, medical image processing, recommender system, NLP, with particular interests in Low-resource data-efficient learning (*e.g.,* meta/few(zero)-shot/transfer learning, semi/active/weakly/self-supervised learning); Hyperparameters Optimization (meta-learning); Trustworthy learning (*e.g.,* uncertainty estimation, robustness, fairness); Efficient learning (*e.g.,* parameter-efficient fine tuning or sparsity on foundation models, MoE, dynamic neural networks); Generative AI, etc.

EDUCATION

Doctor of Philosophy (Ph.D.), Computer Science (Intelligent Systems) Oct 2024 (flexible)
The University of Texas at Dallas | GPA:3.9/4.0 | Advisor: Prof. Feng Chen *Richardson, TX*

Master of Science (M.S.), Computer Science Aug 2017
Louisiana State University *Baton Rouge, LA*
- Thesis: A study on user demographic inference via ratings in recommender systems.

Master of Engineering (M.E.), Biomedical Engineering Apr 2014
Beijing Jiaotong University *Beijing, China*

Bachelor of Engineering (B.E.), Electrical Engineering Jul 2011
Beijing University of Chemical Technology *Beijing, China*

PROFESSIONAL EXPERIENCE

Incoming Research Scientist Intern May – Aug 2024
Meta (Facebook) AI | Team: *AI/ML Foundation* *Sunnyvale, CA*
- Project: Foundation Model Knowledge Transfer

Research Intern May – Aug 2023
Bosch Research, Bosch Center for AI | Supervisor: Dr. Sima Behpour, Dr. Liang Gou *Sunnyvale, CA*
- Developed and optimized efficient training and inference methods, such as parameter-efficient fine-tuning and sparsity techniques for Multimodal Foundation Models, like CLIP, enhancing their capabilities in Zero-Shot Out-Of-Distribution (OOD) detection on seven in-distribution (ID) datasets and four OOD datasets.

Research Intern May – Aug 2022
Meta (Facebook) AI | Team: *Modeling Foundation* | Supervisors: Dr. Wang Zhou, Dr. Yuxi Hu *Menlo Park, CA*
- Worked with cross-functional teams: *AI Platform*, *AI Infra*, and *Ads Ranking*, to enhance Ads recommendation/ranking systems. This involved the innovative use of pre-trained models in Recurring Transfer Learning.
- Researched and implemented an advanced Multimodal Recurring Transfer Learning framework: *Table Fusion*.

Machine Learning Research Assistant Mar – Aug 2020
Vistra Corp. | Supervisors: Nikolay Sidorenko, Angie Zeng *Irving, TX*
- Collaborated with scientists on applying machine learning approaches in sequential power forecasting.
- Refined Gradient Boosting Model (lightGBM, etc.) for time-series forecasting, *e.g.,* load, wind, and solar power of quantile regression in the energy market, and achieved comparable performance with their established models.

Algorithm Engineer May 2014 – Dec 2015
Intelligent Computing Center, Hylanda Info.Tech. | Mentor: Zhijie Li *Beijing, China*
- Developed and deployed deep learning algorithms (AlexNet on Caffe framework) to recognize different webpage blocks (83% accuracy), and LSTM for the application of part of speech tagger and sentiment analysis.

RESEARCH EXPERIENCE

Enhancing Sparsity in Multi-Modal Foundation Models and Generative Models   May 2023 – Present

- Applied neural network sparsity techniques to Vision-Language Foundation Models, such as CLIP, significantly improving Zero-Shot Out-of-Distribution detection performance across multiple in-distribution (ID) and out-of-distribution (OOD) datasets.
- Currently investigating the integration of sparsity normalization methods from evidential theory into generative models, such as diffusion models, to reduce dimensionality while preserving multimodality.

Hyper-domain Uncertainty Estimation through Evidential Deep Learning   Aug 2022 – Present

- Formulated an uncertainty-aware approach for Bird-Eye-View segmentation in autonomous driving systems.
- Advanced Evidential Deep Learning within hyper-domains, utilizing Dirichlet Hyper Probability Density Function and Grouped Dirichlet Distribution for composite/partial label learning scenarios.
- Assessed the uncertainty in intermediate layers of Early-Exit Neural Networks, achieving a 4% enhancement in the efficiency of inference for out-of-distribution (OOD) detection.
- Currently extending uncertainty evaluation techniques to Large Language Models (LLMs) and Vision-Language Models to improve their decision-making robustness.

Semi-Supervised Meta-Learning by Subset Selection   May 2021 – May 2022

- Devised an innovative subset selection mechanism for both the inner and outer loops using Submodular Mutual Information, resolving the complex challenge of adapting Model-Agnostic Meta-Learning (MAML) for robust semi-supervised meta-learning environments.
- Improved the performance of semi-supervised meta-learning in few-shot classification by around 3% accuracy.

Reweighting Algorithms in Robust Meta-Learning under Data Corruption   Mar 2020 – Dec 2021

- Introduced a cutting-edge *nested bi-level* optimization algorithm to dynamically assign weights to training instances or tasks, enhancing the model's adaptability to data variability.
- Iteratively optimized hyperparameter weights through a curated set of meta-validation tasks, yielding a 2% improvement in meta-learning performance under conditions of data corruption for few-shot learning scenarios.

Fairness in Meta-Learning   Oct 2019 – Jan 2020

- Developed a novel fast-adaptation strategy for few-shot meta-learning that proactively reduces bias during the meta-training phase by controlling the covariance of the decision boundary.

Other Research Projects   Before 2019

- **Generative Model**: Chinese Calligraphy Style Transfer with Conditional Generative Adversarial Networks.
- **Demographic Prediction in Recommender Systems**: Enhanced user profiling by extracting low-rank latent features using Word2Vec integrated with Singular Value Decomposition (SVD), leveraging item similarities for regularization to infer demographics in the cold start problem.
- **Neuroimaging Analysis of Cognitive Development**: Demonstrated a strong relationship between intelligence and the Parieto-Frontal Network in late childhood using Independent Component Analysis (ICA) on fMRI data, and developed a classification model with Support Vector Machine (SVM) to differentiate between ADHD and non-ADHD based on neuroimaging patterns.

SELECTED PUBLICATIONS

Preprint (* equal contribution)

[1] Enhancing Out-of-Distribution Detection: A Sparsity-Based Post-Hoc Method for Multi-Modal Models.
Changbin Li, Sima Behpour, Xin Li, Thang Doan, Wenbin He, Liang Gou, Feng Chen, Liu Ren. *preprint, 2024.*

[2] EarlyMix: Mixup-based Efficient OOD Detection using Early-exit Networks.
Mirazul Haque*, **Changbin Li***, Truong Quang Pham, Wei Yang, Feng Chen. *submitted to TPAMI, 2023.*

Conference and Journal

[1] Hyper Evidential Deep Learning to Quantify Composite Classification Uncertainty.
Changbin Li, Kangshuo Li, Yuzhe Ou, Lance Kaplan, Audun Jøsang, Jin-hee Cho, Dong-hyun Jeong and Feng Chen.
*International Conference on Learning Representations (**ICLR**)*, 2024.

[2] PLATINUM: Semi-Supervised Model Agnostic Meta-Learning using Submodular Mutual Information.
Changbin Li*, Suraj Kothawade*, Feng Chen, Rishabh Iyer.
*International Conference on Machine Learning (**ICML**)*, 2022. (Spotlight)

[3] A Nested Bi-Level Optimization for Robust Few Shot Learning.
Krishnateja Killamsetty*, **Changbin Li***, Chen Zhao, Rishabh Iyer, Feng Chen. **(* equal contribution)**
*AAAI Conference on Artificial Intelligence (**AAAI**)*, 2022. (acceptance rate: 15%)

[4] Fair Meta-Learning For Few-Shot Classification.
Chen Zhao, **Changbin Li**, Jincheng Li, Feng Chen.
The 11th IEEE International Conference on Knowledge Graph (ICKG), 2020.

[5] Vibration Based Bridge Scour Evaluation: A Data-Driven Method Using Support Vector Machines.
Zhiming Zhang, Chao Sun, **Changbin Li**, Mingxuan Sun.
Structural Monitoring and Maintenance, Vol.6, No.2, 2019.

[6] Inferring Private Demographics of New Users in Recommender Systems.
Mingxuan Sun, **Changbin Li**, Hongyuan Zha.
International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems(MSWiM), 2017.

[7] Association Between Resting-State Coactivation in the Parieto-Frontal Network and Intelligence During Late Childhood and Adolescence.
Changbin Li, and Lixia Tian.
American Journal of Neuroradiology, 35.6:1150-1156, 2014.

workshop

[1] Evaluating Uncertainty Quantification for Birds Eye View Semantic Segmentation.
Bowen Yang, Linlin Yu, Tianhao Wang, **Changbin Li**, and Feng Chen.
KDD *(Uncertainty Reasoning and Quantification in Decision Making)*, 2023.

[2] A Nested Bi-Level Optimization for Robust Few Shot Learning.
Krishnateja Killamsetty*, **Changbin Li***, Chen Zhao, Rishabh Iyer, Feng Chen. **(* equal contribution)**
Conference on Neural Information Processing Systems (**NeurIPS**) (*Meta-Learn*), 2021.

TECHNICAL SKILLS

Programming Languages: Python, C/C++, Java, MATLAB, SQL
Tools: PyTorch, TensorFlow, Linux, Git, Matplotlib, Plotly, Pandas, Transformers, NumPy, Jupyter, etc.

TEACHING EXPERIENCE

- CS6375 Machine Learning (Spring'19, '21, Fall'18, '19, '21)
- CS6364 Artificial Intelligence (Fall'20), CS5343 Data Structure and Algorithms (Java).

HONORS & AWARDS

- Travel Award, *Conference on Neural Information Processing Systems (NeurIPS)*   2022
- Participation Grant, *International Conference on Machine Learning (ICML)*   2022
- Outstanding Teaching Assistant Award, *The University of Texas at Dallas*   2021
- Qiuqi Graduate Scholarship (*1/600*), *Beijing Jiaotong University*   2013
- **National Scholarship for Encouragement**, *Ministry of Education China*   2009, 2010
- Excellent Student Award (**5%**), *Beijing University of Chemical Technology*   2008, 2009, 2010
- People's Scholarship, *Beijing University of Chemical Technology*   2008, 2009, 2010

INVITED PRESENTATIONS

- Semi-Supervised Model Agnostic Meta-Learning using Submodular Mutual Information.
  AI Time (Tsinghua University), Aug 2022   Beijing, China (*Virtual*)
- Semi-Supervised Model Agnostic Meta-Learning using Submodular Mutual Information.
  The 39th International Conference on Machine Learning (ICML), July 2022   *Baltimore, VA*
- A Nested Bi-Level Optimization for Robust Few Shot Learning.
  The 36th AAAI Conference on Artificial Intelligence (AAAI), Jan 2022   Vancouver, Canada (*Virtual*)

PROFESSIONAL SERVICE

Program Committee (PC) member/Reviewer: Transactions on Pattern Analysis and Machine Intelligence (TPAMI) | CVPR'24| ICLR'24 | ICML ('22,'24) | NeurIPS'23 | AAAI ('23,'24) | KDD ('20,'21,'22,'23,'24) | SDM'22 | AISTATS'21 | UAI'21 | AutoML'21 | NeurIPS (Meta-Learn)'21 | Big Data Research | Transactions on Knowledge Discovery from Data (TKDD)