

Zhuowei Li

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Bio

I am a 4th year Ph.D. candidate at Rutgers University, conducting research under the supervision of Professor **Dimitris N. Metaxas**. Prior to my doctoral studies, I earned my M.S. degree from Columbia University and gained industry experience as a computer vision researcher at SenseTime. My broad research interests encompass Machine Learning, Computer Vision, and Medical Image Analysis. Of late, my research focuses on **inference-time intervention** of **Large Language Models (LLMs)** and **Multi-modal Large Language Models (MLLMs)** to enhance their **efficiency and reliability**, as well as leveraging **Reinforcement Learning** to strengthen their **reasoning** capabilities.

Education

Rutgers University

NJ, US

Ph.D. candidate in Computer Science

Sept 2021 - Current

- Full-time research assistant.
- **Courses:** Artificial Intelligence, Design of Algorithms, Computational Robotics, Brain-inspired Computation, Game Theory, etc.

Columbia University

NY, US

M.S. in Biomedical Engineering

Sept 2017 - Feb 2019

- Winner group of Lab-to-Market program (3 out of 20 groups).
- **Courses:** Deep Learning for Computer Vision, Machine Learning, Reinforcement Learning, Biostatistics, Computational Modeling, etc.

Northeastern University

Shenyang, CN

B.S. in Biomedical Engineering

Sept 2013 - July 2017

- Graduated with distinction (rank 5%)
- Twice First Prize in Merit-Based Scholarship and Shuzhou Park Industrial Scholarship.
- Specialised in Medical Image Analysis, Digital Signal Processing and Software Development.

Work Experience

Amazon AWS AI Labs

Seattle, US

Applied Scientist Intern

May 2024 - Aug 2024

- Innovated a new few-shot adaptation method for Face Anti-spoofing task.
- Utilized large vision-language model to enhance representation learning and generalization ability.
- Achieved state-of-the-art performance under both zero-shot and few-shot settings.

NEC Laboratories America

Princeton, US

Research Intern

May 2023 - Aug 2023

- Developed a structured latent space, informed by physical properties, for the representation of semantic signals in spatial-temporal data.
- Utilized a Large foundation model and differentiable rendering to optimize parameterized primitives in the latent space.
- Achieved high-dimensional space reconstruction with minimal parameters, ensuring compatibility for prior knowledge injection.

SenseTime

Peking, CN

Computer Vision Researcher

Mar 2019 - July 2021

- Designed a comprehensive deep learning framework for CAD diagnosis, encapsulating segmentation, labeling, centerline extraction, and plaque detection.
- Streamlined CAD diagnostic procedures on CTA images, achieving radiologist-level accuracy while cutting the analysis time by 75%.
- Successfully deployed and maintained the framework across ten+ hospitals, ensuring model robustness.

Research Experience

Research Assistant

NJ, US

CBIM center, Rutgers University

Sept 2021 - current

- **Inference-time Intervention of LLM/MLLMs.** Proposed Implicit In-context Learning (I2CL) framework to achieve few-shot performance on LLM with zero-shot inference cost. Innovated VISTA method to reduce hallucination of MLLM by around 40% without leveraging external supervision.
- **Continual Learning:** Introduced a novel rehearsal-free continual learning approach, the contrastive prototypical prompt (CPP). CPP adeptly tackles both semantic drift and prototype interference, showcasing 3%-6% accuracy gains over contemporary methods.
- **Self-supervised Learning:** Pioneered a self-supervised, weight-preserving Neural Architecture Search (NAS) dubbed SSWP-NAS. This technique concurrently optimizes architecture and pre-trained weights, leading to state-of-the-art performance and superior initialization weights.

Computer Vision Researcher

Peking, CN

Intelligent Medical Group, SenseTime Research

Mar 2019 - July 2021

- **Contrastive Learning:** Innovated a supervised contrastive segmentation module coupled with an uncertainty-guided embedding selection. These enhancements can seamlessly integrate with existing segmentation models, resulting in up to a 2% IOU boost.
- **Reinforcement Learning:** Crafted a deep reinforced tree-traversal agent (DRT) that, when paired with a bifurcation discriminator, extracts tree-structured vessel centerlines. DRT eliminates the need for pre-segmentation or post-pruning steps.

Research Student

NY, US

DVMM Lab, Columbia University

June 2018 - Sept 2018

- **One-shot Segmentation:** In partnership with a postdoctoral researcher, devised a one-shot segmentation technique using a support mask, targeting functional region segmentation in mouse brains.

Publications

1. **Zhuowei Li**, Haizhou Shi, Yunhe Gao, Di Liu, Yuxiao Chen, Long Zhao, Hao Wang, and Dimitris N. Metaxas. The hidden life of tokens: Reducing hallucination of large vision-language models via visual information steering. (*pre-print*)
2. **Zhuowei Li**, Zihao Xu, Ligong Han, Yunhe Gao, Song Wen, Di Liu, Hao Wang, and Dimitris N. Metaxas. Implicit in-context learning. (*ICLR 2025*)
3. Zhenting Wang, Shuming Hu, Shiyu Zhao, Xiaowen Lin, Felix Juefei-Xu, **Zhuowei Li**, Ligong Han, Harihar Subramanyam, Li Chen, Jianfa Chen, Lingjuan Lyu Nan Jiang, Shiqing Ma, Dimitris N Metaxas, and Ankit Jain. Mllm-as-a-judge for image safety without human labeling. (*pre-print*)
4. Yunhe Gao, **Zhuowei Li**, Di Liu, Mu Zhou, Shaoting Zhang, and Dimitris N. Metaxas. Training like a medical resident: Universal medical image segmentation via context prior learning. (*CVPR 2024*)
5. **Zhuowei Li**, Long Zhao, Zhizhao Zhang, Han Zhang, Ting Liu, and Dimitris N. Metaxas. Steering prototypes with prompt tuning for rehearsal-free continual learning. (*WACV 2024*)
6. Di Liu, Xiang Yu, Meng Ye, Qilong Zhangli, **Zhuowei Li**, Zhixing Zhang, and Dimitris N. Metaxas. Deformer: Integrating transformers with deformable models for 3d shape abstraction from a single image. (*ICCV 2023*)
7. **Zhuowei Li**, Yibo Gao, Zhenzhou Zha, Zhiqiang Hu, Qing Xia, Shaoting Zhang, and Dimitris N. Metaxas. Towards self-supervised and weight-preserving neural architecture search. In *Self Supervised Learning: What is Next? (ECCV 2022 workshop)*
8. Zihao Liu, **Zhuowei Li**, Zhiqiang Hu, Qing Xia, Ruiqin Xiong, Shaoting Zhang, and Tingting Jiang. Contrastive and selective hidden embeddings for medical image segmentation. *IEEE Transactions on Medical Imaging (TMI 2022, IF: 11.037)*
9. **Zhuowei Li**, Qing Xia, Zhiqiang Hu, Wenji Wang, Lijian Xu, and Shaoting Zhang. A deep reinforced tree-traversal agent for coronary artery centerline extraction. In *Medical Image Computing and Computer Assisted Intervention (MICCAI 2021)*
10. Jinxi Xiang, **Zhuowei Li**, Wenji Wang, Qing Xia, and Shaoting Zhang. Self-ensembling contrastive learning for semi-supervised medical image segmentation. *CoRR*, abs/2105.12924, 2021
11. Wenji Wang, Qing Xia, Zhiqiang Hu, Zhennan Yan, **Zhuowei Li**, Yang Wu, Ning Huang, Yue Gao, Dimitris Metaxas, and Shaoting Zhang. Few-shot learning by a cascaded framework with shape-constrained pseudo label assessment for whole heart segmentation. *IEEE Transactions on Medical Imaging (TMI 2021, IF:11.037)*
12. **Zhuowei Li**, Qing Xia, Wenji Wang, Zhennan Yan, Ruohan Yin, Changjie Pan, and Dimitris Metaxas. Segmentation to label: Automatic coronary artery labeling from mask parcellation. In *Machine Learning in Medical Imaging (MIML 2020)*
13. Xu Zhang, **Zhuowei Li*** (co-first), Pei-Jie Wang, Katelyn Y. Liao, Shen-Ju Chou, Shih-Fu Chang, and Jung-Chi Liao. One-shot learning for function-specific region segmentation in mouse brain. In *2019 IEEE 16th International Symposium on Biomedical Imaging (ISBI 2019)*

Skills

Programming	Python (PyTorch, Tensorflow, Keras, NumPy, Scikit-learn, Pandas, etc.), Matlab, C/C++
Miscellaneous	Linux, Shell (Bash/Zsh), \LaTeX (Overleaf/R Markdown), Microsoft Office, Git.
Soft Skills	Time Management, Teamwork, Problem-solving, Documentation, Engaging Presentation.