Linhai Ma

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Introduction

He is currently a machine learning engineer in Cadence Design Systems, in California. He obtained his Ph.D. in Computer Science, University of Miami and his research interests include deep learning, medical signal/image analysis. He did his postdoctoral work at the medical school, University of Florida, focusing on developing multi-modal deep learning methods to assist the diagnosis. He has experience in machine learning research and applications, including image classification, segmentation, landmark detection, generation, translation, etc. He also has industry-level experience in Large Language Model (LLM) and AI infra.

Education

University of Miami, Coral Gables, FL		2017/08-2023/12
Ph.D. in Computer Science		
Institute of Software, Chinese Academy of Sciences, Beijing, China		2014/09-2017/07
Master of Science in Comput	ter Science	
Northeastern University, Software College, Shenyang, China		2010/09-2014/06
Bachelor of Science in Information Security		
Courses: C\C++, Java, Data Structure, Computer Architecture, Operating System, Computer Network, etc.		
Programming Skills		
Programming Languages:	Python, C/C++, Java, C#, Ruby, R, SQL, Prolog, etc.	
Tools:	Pytorch, Pandas, Scikit-learn, Numpy, Kubernetes, Docker, PyQT5, Java Swing, etc.	
Industry Experiences		
Cadence Design Systems, Inc., San Jose, CA		2024/07-now
Lead Software Engineer		

- Deployed Llama3.1-8b and Llama3.1-70b models and set up rules to routine the URL to them via Kubernetes.
- Improved the RAG speed (from 10 sec level to 100 ms) through profiling the productive code and modify the filters' settings in vector database.
- Improved the accuracy of document retrieval in RAG by tuning the underlying HNSW algorithm.

Cadence Design Systems, Inc., San Jose, CA

Intern Software Engineer in Machine Learning

- Designed a machine learning system to accelerate the evaluation of worst-case measurement of Integrated Circuit (IC), which normally requires thousands of IC simulations, using Python, Pytorch, etc.
- Sampled simulation inputs from the input space using Latin Hypercube Sampling and performed simulations on these inputs to get simulation outputs, which form the initial training set to train a Gaussian Process regression model.
- Selected the next simulation input that most likely leads to the worst-case measurement using Bayesian optimization. Put this input with its simulation output into the training dataset for the next epoch of training.
- Performed forward feature selection to eliminate noisy input features that lead to outlier output of the simulation.
- Reduced the time needed to discover the worst-case measurement by over 90%.

Cadence Design Systems, Inc., San Jose, CA

Intern Software Engineer in Machine Learning

- Designed a machine learning system to predict the output of Integrated Circuit simulation via Python, Sk-learn, etc.
- Wrote a data pipeline preprocessing data from previous simulations of this evaluation to get the training set.
- Selected Random Forest to predict, which accommodated the highly diverse ranges of simulation input features. •
- Developed a UI to visualize the impact of each input feature via PyQT5 and Matplotlib. •
- Reached a prediction accuracy of a mean absolute error of 0.99 picoseconds.

Hillstone Networks, Inc., Beijing, China

Intern $C \setminus C + +$ *Developer*

• Wrote URI filters in the firewall machine to filter out abnormal requests using C ++, GDB, etc.

2015/06-2015/08

2022/05-2022/08

2021/05-2021/08

Huaxin Education Technology Co., Ltd., Shenyang, China

Intern Java Developer

- Developed a vulnerability scanner to discover the vulnerability of the web pages using Java, JSP, Oracle, etc.
- Developed the UI using Java Swing.

Research Experiences (Please find more details of the research projects on my page https://sarielma.github.io/)

University of Florida, Gainesville, FL

Postdoctoral Associate

- Designed a CNN-based model for Cervical Vertebrae Maturation (CVM) stage classification, reaching an accuracy of 76.67 %.
- Designed diffusion models to translate between medical images of different modalities.
- Developed a multi-modal deep learning system to assist the diagnosis of prostate tumor, via micro-ultrasound images and non-image information.

University of Miami, Coral Gables, FL

Research Assistant

- Designed adaptive adversarial training algorithms, by adapting the margin of each training sample, to improve DNNs' adversarial robustness against noises while keeping the deep learning model's accuracy.
- Designed a regularization method to reduce the affects of the input noise of the deep learning models. ECG signal data were used to evaluate this method.
- Developed an algorithm based on loss-defined margin to improve the robustness of DNNs on various medical image applications, including MR image segmentation, X-ray image landmark detection and blood cell object detection.

University of Miami, FL and Northwestern University, IL

Research Assistant

- Discovered the evolution pattern of successful academic groups via data mining.
- Parsed author and publication data from 1991 to 2018 from Microsoft Graph database via SQL, and built up millionlevel coauthor networks for each year, using Python, NetworkX, etc.
- Designed a Monte Carlo-based clustering algorithm to cluster the graph into author groups, via Python and R.
- Defined these author groups' evolution patterns (splitting, merging, etc.) in two adjacent years.
- Made statistics on frequency of each group's evolution patterns and the group's success (e.g., the number of citations) to conclude which pattern contributes more to the successfulness of each group, via Python and R.

Institute of Software Chinese Academy of Sciences, Beijing, China

Research Assistant

- Developed a generator to generate multi-thread C++ test cases based on the concurrent C++ data structure to be tested.
- Proposed three adaptive strategies to improve the C++ test case generation, which discovered up to 6% more potential concurrent errors and reduced the time cost by up to 10%.

Academic Reviewer Experience

• NeurIPS, ICML, ICLR, AISTATS, AI, ESWA, JBHI, Neurocomputing, etc.

Publications (<u>https://scholar.google.com/citations?hl=en&user=fbGAkioAAAJ&view_op=list_works&sortby=pubdate</u>)

- <u>Linhai Ma</u>, Jiasong Chen, Linchen Qian, Liang Liang, "A general approach to improve adversarial robustness of DNNs for medical image segmentation and detection." Medical Imaging 2024: Image Processing.
- Hongxu Jiang, M. Imran, <u>Linhai Ma</u>, et al. "Fast-DDPM: Fast Denoising Diffusion Probabilistic Models for Medical Image-to-Image Generation" arXiv e-prints, arXiv: 2405.14802.
- Jiasong Chen, Linchen Qian, <u>Linhai Ma</u>, Liang Liang, " Symtc: A symbiotic transformer-cnn net for instance segmentation of lumbar spine MRI" Computers in Biology and Medicine (2024).
- Jiasong Chen, Linchen Qian, <u>Linhai Ma</u>, Liang Liang, " Evaluation of Deep Neural Network Models for Instance Segmentation of Lumbar Spine MRI " bioRxiv, 2024.04. 02.587810.

2024/01-2024/06

2019/09-2023/12

2018/01-2019/09

2015/07-2017/06

- Linchen Qian, Jiasong Chen, <u>Linhai Ma</u>, et al. " A sequential geometry reconstruction based deep learning approach to improve accuracy and consistence of lumbar spine MRI image segmentation" Medical Imaging 2024: Image Processing.
- Linchen Qian, Jiasong Chen, <u>Linhai Ma</u>, et al. "Attention-based Shape-Deformation Networks for Artifact-Free Geometry Reconstruction of Lumbar Spine from MR Images" arXiv preprint arXiv:2404.00231.
- Yibo Dai, Peng Wu, Shecheng Cui, <u>Linhai Ma</u>," Intrathread Method Orders Based Adaptive Testing of Concurrent Objects "International Symposium on Theoretical Aspects of Software Engineering (2024).
- <u>Linhai Ma</u>, Liang Liang. "Increasing-Margin Adversarial (IMA) Training to Improve Adversarial Robustness of Neural Networks." Computer Methods and Programs in Biomedicine (2023).
- <u>Linhai Ma</u>, Liang Liang, "Improving Adversarial Robustness of Deep Neural Networks via Adaptive Margin Evolution." Neurocomputing (2023).
- <u>Linhai Ma</u>, Liang Liang, "Towards lifting the trade-off between accuracy and adversarial robustness of deep neural networks for medical image classification and segmentation." Medical Imaging 2023: Image Processing.
- <u>Linhai Ma</u>, Liang Liang. "A Regularization Method to Improve Adversarial Robustness of Neural Networks for ECG Signal Classification." Computers in Biology and Medicine (2022).
- <u>Linhai Ma</u>, Liang Liang. "Enhance CNN Robustness Against Noises for Classification of 12-Lead ECG with Variable Length." 19th IEEE international conference on machine learning and applications (ICMLA 2020).
- <u>Linhai Ma</u>, Liang Liang. "Improve robustness of DNN for ECG signal classification: a noise-to-signal ratio perspective." International Conference on Learning Representations (ICLR 2020) Workshop AI for Affordable Health.
- <u>Linhai Ma</u>, Liang Liang, "Adaptive Adversarial Training to Improve Adversarial Robustness of DNNs for Medical Image Segmentation and Detection." <u>https://arxiv.org/abs/2206.01736</u>..
- Liang Liang, <u>Linhai Ma</u>, Linchen Qian, Jiasong Chen. " An Algorithm for Out-Of-Distribution Attack to Neural Network Encoder." <u>https://arxiv.org/abs/2009.08016</u>..
- <u>Linhai Ma</u>, Peng Wu, Tsong Yueh Chen. "Diversity driven adaptive test generation for concurrent data structures." Information and Software Technology (2018).