Zhengfeng (Jeff) Lai, Ph.D.

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CURRENT POSITION

AI/ML Research Scientist, Apple Nov. 2023 - Now

Team: Data & Machine Learning Innovation *Cupertino, CA*

- Foundation vision model, multimodal large language model.
- Data-centric approaches for large-scale pre-training.

EDUCATION

University of California, Davis Davis, CA

Ph.D. in Electrical and Computer Engineering *Sept. 2019 – Nov. 2023*

Zhejiang University Hangzhou, China

B.Eng. in Information Engineering *Sept. 2015 – June 2019*

Research Interest: Multimodal understanding, semi-supervised learning, computer vision, language-vision model, unsupervised domain adaptation, medical imaging, and AI healthcare.

Dissertation Advisors: Prof. Chen-Nee Chuah, Prof. Sen-ching Cheung, and Prof. Brittany N. Dugger

2024 ECE Best Dissertation Award and 2024 College of Engineering Excellence in Graduate Student Research Award

PREPRINTS

1. D. Chen, K. Patwari, **Z. Lai**, S. Cheung, C-N. Chuah, "Empowering Source-Free Domain Adaptation with MLLM-driven Curriculum Learning," under review by **NeurIPS 2024**.

2. A. Haydari, D. Chen, **Z. Lai**, M. Zhang, C-N. Chuah, "MobilityGPT: Enhanced Human Mobility Modeling with a GPT model," under review by **NeurIPS 2024**.

PUBLISHED/ACCEPTED PAPERS

1. **Z. Lai**, H. Zhang, B. Zhang, W. Wu, H. Bai, A. Timofeev, X. Du, Z. Gan, J. Shan, C-N. Chuah, Y. Yang, M. Cao, "VeCLIP: Improving CLIP Training via Visual-enriched Captions," **ECCV 2024**.

2. **Z. Lai**, J. Chauhan, B. Dugger, C-N. Chuah, "Path-CLIP: Efficient Adaptation of CLIP for Pathology Image Analysis with Limited Data," **ECCV 2024**.

3. **Z. Lai**, J. Chauhan, D. Chen, B. Dugger, S-C. Cheung, C-N. Chuah, "Semi-Path: An Interactive Semi-supervised Learning Framework for Gigapixel Pathology Image Analysis", **Elsevier Smart Health 2024**.

4. **Z. Lai**, H. Bai, H. Zhang, X. Du, J. Shan, Y. Yang, C-N. Chuah, M. Cao, "Empowering Unsupervised Domain Adaptation with Large-scale Pre-trained Vision-Language Models," **WACV 2024**.

5. **Z. Lai**, S. Vesdapunt, N. Zhou, J. Wu, X. Li, C. Huynh, C-N. Chuah, "PADCLIP: Pseudo-labeling with Adaptive Debiasing in CLIP for Unsupervised Domain Adaptation," **ICCV 2023**.

6. **Z. Lai**, C. Wang, H. Gunawan, S-C. Cheung, and C-N. Chuah, "Smoothed Adaptive Weighting for Imbalanced Semi-Supervised Learning: Improve Reliability Against Unknown Distribution Data," **ICML 2022**. (**Won Participation Grant**)

7. **Z. Lai**, C. Wang, S-C. Cheung, and C-N. Chuah, "SaR: Self-adaptive Refinement on Pseudo Labels for Multiclass-Imbalanced Semi-supervised Learning," 2022 **CVPR** Workshop on Learning with Limited Labelled Data for Image and Video Understanding. (**Best Paper Award**)

8. **Z. Lai**, L. Cerny Oliveira, R. Guo, W. Xu, Z. Hu, K. Mifflin, C. DeCarlie, S-C. Cheung, C-N. Chuah, and B. N. Dugger, "BrainSec: Automated Brain Tissue Segmentation Pipeline for Scalable Neuropathological Analysis," **IEEE Access**, 2022.

9. **Z. Lai**, C. Wang, L. Cerny Oliveira, B. Dugger, S-C. Cheung, C-N. Chuah, "Joint Semi-supervised and Active Learning for Segmentation of Gigapixel Pathology Images with Cost-Effective Labeling," **ICCV 2021** Workshop on Computational Challenges in Digital Pathology.

10. **Z. Lai**, C. Wang, Z. Hu, B. Dugger, S-C. Cheung, C-N. Chuah, "A Semi-supervised Learning for Segmentation of Gigapixel Histopathology Images from Brain Tissues," 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2021.

11. **Z. Lai**, P. Vadlaputi, D. J. Tancredi, M. Garg, R. I. Koppel, M. Goodman, W. Hogan, N. Cresalia, S. Juergensen, E. Manalo, S. Lashminrusimha, C-N. Chuah, and H. Siefkes, "Enhanced Critical Congenital Cardiac Disease Screening by Combining Interpretable Machine Learning Algorithms," 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2021.

12. H. Siefkes, L. Cerny Oliveira, R. Koppel, W. Hogan, M. Garg, E. Manalo, N. Cresalia, **Z. Lai**, D. Trancredi, S. Lakshminrusimha, and C-N. Chuah, "Machine Learning Based Critical Congenital Heart Disease Screening using Dual-Site Pulse Oximetry Measurements," **Journal of American Heart Association (JAHA), 2024**.

13. L. Cerny Oliveira, **Z. Lai**, D. Harvey, K. Nzenkue, L-W. Jim, C. DeCarlie, C-N. Chuah, and B. N. Dugger, "Pre-analytic variable effects on segmentation and quantification machine learning algorithms for amyloid beta analyzes on digitized human brain slides," **Journal of Neuropathology and Experimental Neurology**, 82(3):212-220, Feb 2023.

14. L. Cerny Oliveira, **Z. Lai**, H. Siefkes, C-N. Chuah, "Generalizable Semi-supervised Learning Strategies for Multiple Learning Tasks using 1-D Biomedical Signals," **NeurIPS** Workshop on Learning from Time Series for Health, Dec 2022.

15. L. Cerny Oliveira, **Z. Lai**, W. Geng, H. Siefkes, C-N. Chuah, "A Machine Learning Driven Pipeline for Automated Photoplethysmogram Signal Artifact Detection," 1st Workshop on Artificial Intelligence and Internet of Things for Digital Health (AIIOT4DH) at IEEE CHASE, Dec 16-17, 2021.

16. K. Doshi, G. Rehm, P. Vadlaputi, **Z. Lai**, S. Lakshminrusimha, C-N. Chuah, and H. M Siefkes, "A Novel System to Collect Dual Pulse Oximetry Data for Critical Congenital Heart Disease Screening Research," Journal of Clinical and Translational Science, pp. 1-25, October 2020.

17. C. Linghu, C. Wang, N. Cen, J. Wu, **Z. Lai**, J. Song, "Rapidly Tunable and Highly Reversible Bio-inspired Dry Adhesion for Transfer Printing in Air and a Vacuum," Soft Mater, 2019.

INDUSTRIAL EXPERIENCE

ML Research Intern at Apple — March 2023 – Sept. 2023
Team: AI/ML — *Cupertino, CA*
- Foundation vision model, multimodal understanding.
- Data-centric approaches for large-scale pre-training.

Applied Scientist Intern at Amazon — June 2022 – Sept. 2022
Team: Lab126 — *Sunnyvale, CA*
- Unsupervised domain adaption with CLIP.
- Causal inference and counterfactual reasoning.

PhD Data Science Intern at Electronic Arts — June 2021 – Sept. 2021
Advisor: Jason Park — *Redwood city, CA*
- Designed a few-shot toxic object detection pipeline with transfer learning.
- Explored zero-shot learning for unseen classes in the dataset.

National Science Foundation's Innovation Corps Program (I-Corps) — Jan. 2021 – Mar. 2021
Team with Dr. Heather Siefkes, Dr. Jim Swick, Pranjali Vadlaputi — *Washington, D.C.*
- Successfully completed the requirements of I-Corps by finishing more than 100 interviews in pediatric field.
- Named as one of the inventors on a patent application **"Systems and Methods for Classifying Critical Heart Defects."**

Artificial Intelligence Engineer Intern — June 2018 – Aug. 2018
DeepThink (Top 10 AI Startup Company in Hangzhou) — *Hangzhou, China*

- Implemented an ICO Scan Identification System based on RNN with real-world white books.
- Designed a LSTM model to predict Ethereum trends using blockchain activity data with 65% of accuracy.
- Maintained the Linux Server for 20 members in the group.

TEACHING & MENTORING EXPERIENCE

Lead Teaching Assistant for EEC 193AB
Sept. 2019 – Mar. 2021

University of California, Davis
Davis, CA

- Helped develop and teach EEC 193 AB (AI Systems Senior Design) for two years.
- Independently hosted lab sessions and mentored four teams over 2 academic quarters.
- Designed three lab assignments involving classical ML algorithms (Logistic Regression, SVM), CNN and basic Python in the application of ML on health.

Summer Undergraduate Research Mentor
June 2021 – Sept. 2021

University of California, Davis
Davis, CA

- Mentored one undergraduate on website design for visualizing waveform from photoplethysmogram signals.
- Mentored one undergraduate on waveform artifact detection by using machine learning algorithms.
- Designed three lab assignments involving classical ML algorithms (Logistic Regression, SVM), CNN and basic Python in the application of ML on health.

PROFESSIONAL SERVICES

Reviewer:

- NeurIPS 2021-2024
- ICML 2022 & 2023
- IEEE Transaction on Image Processing
- CVPR 2022-2024
- ICCV 2023
- ECCV 2024
- ICLR 2024

Organizer/Co-Organizer:

- **2nd workshop on Vision-based InduStrial InspectiON (VISION) at ECCV 2024**

TECHNICAL SKILLS

Programming: Python, C/C++, Matlab
Developer Tools: Git, Docker, Google Cloud Platform, VS Code, Visual Studio, PyCharm
Frameworks: PyTorch, Tensorflow, Caffe, OpenCV, Scikit-Learn

AWARDS

- 2018 Interdisciplinary Contest In Modeling: Meritorious Winner
- Outstanding Senior Design Project Award of UC Davis, 2019
- The Best Senior Design of ISEE, ZJU in 2019: Multiple Objects Detection
- 2019 ZJU Overseas Senior Design Scholarship
- 2022 Smita Bakshi Digital Learning and Teaching Award
- 2022 ICML Participation Award
- 2022 CVPR Workshop **Best Paper Award**
- 2022 AANP R13 Grant Travel Award
- **2024 College of Engineering (COE) Excellence in Graduate Student Research Award**
- **2024 ECE Best Disseration Anil Jain Memorial Award**