

# 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. **Z. Lai**, H. Zhang, W. Wu, H. Bai, A. Timofeev, X. Du, Z. Gan, J. Shan, C-N. Chuah, Y. Yang, M. Cao, "From Scarcity to Efficiency: Improving CLIP Training via Visual-enriched Captions," under review by **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," under review by **ECCV 2024**.
3. 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," to be appear on **Journal of American Heart Association (JAHA)**, 2024.
4. 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**.
5. 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**, 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 Journal** 2024.
2. **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**.
3. **Z. Lai**, S. Vedapunt, 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**.
4. **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)
5. **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**)

6. **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.
7. **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**.
8. **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.
9. **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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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

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### 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

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### 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

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### 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

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**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

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- 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 Dissertation Anil Jain Memorial Award**