Jiazhi Li

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Profile

I am a fourth-year Ph.D. student at the University of Southern California. My research interests primarily focus on **generative models, machine learning fairness, and debiased representation learning**. Furthermore, I possess hands-on experience in face recognition and biomedical engineering. Beyond my technical expertise, I excel in interpersonal communication, allowing me to engage effectively with diverse individuals. I am eager to learn, grow, and apply my knowledge in the real-world application. I am currently seeking a summer internship for the period from May 20, 2024, to August 30, 2024.

Education

University of Southern California — Los Angeles, CA, US
Ph.D. in Electrical Engineering (Generative Models, Machine Learning Fairness) — *Expected 05/2025*

University of Southern California — Los Angeles, CA, US
Master of Science in Electrical Engineering (Image Processing, GPA:3.82/4.00) — *08/2018 – 05/2020*

Beijing Institute of Technology — Beijing, P.R.China
Bachelor of Science in Electronic Science and Technology (GPA: 3.80/4.00) — *08/2014 – 07/2018*

Publications

[1] **Jiazhi Li**, Mahyar Khayatkhoei, Jiageng Zhu, Hanchen Xie, Mohamed E Hussein, Wael AbdAlmageed, "SABAF: Removing Strong Attribute Bias from Neural Networks with Adversarial Filtering", submitted to *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023.

[2] Hanchen Xie, Jiageng Zhu, Mahyar Khayatkhoei, **Jiazhi Li**, Mohamed E. Hussein, Wael Abd-Almageed, "A Critical View of Vision-Based Long-Term Dynamics Prediction Under Environment Misalignment", accepted by *International Conference on Machine Learning (ICML)*, 2023.

[3] **Jiazhi Li**, Mahyar Khayatkhoei, Jiageng Zhu, Hanchen Xie, Mohamed E Hussein, Wael AbdAlmageed, "A Critical Review of Predominant Bias in Machine Intelligence", submitted to *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023.

[4] **Jiazhi Li**, Wael Abd-Almageed, "Ethics and Fairness for Diabetes Artificial Intelligence", accepted as the book chapter in *"Diabetes Digital Health, Telehealth, and Artificial Intelligence, Elsevier"*, 2024.

[5] **Jiazhi Li**, Mahyar Khayatkhoei, Jiageng Zhu, Hanchen Xie, Mohamed E Hussein, Wael AbdAlmageed, "Information-Theoretic Bounds on The Removal of Attribute-Specific Bias from Neural Networks", accepted by *Conference on Neural Information Processing Systems (NeurIPS) Workshops on Algorithmic Fairness through the Lens of Time*, 2023.

[6] **Jiazhi Li**, Wael Abd-Almageed, "CAT: Controllable Attribute Translation for Fair Attribute Classification", accepted by *European Conference on Computer Vision (ECCV) Workshops on VISION WITH BIASED OR SCARCE DATA*, 2022.

[7] **Jiazhi Li**, Wael Abd-Almageed, "Information-Theoretic Bias Assessment Of Learned Representations Of Pretrained Face Recognition", accepted by *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 2021.

[8] Shumeng Wang, Huiqi Li, **Jiazhi Li**, Yanjun Zhang, Bingshuang Zou, "Automatic Analysis of Lateral Cephalograms Based on Multiresolution Decision Tree Regression Voting", accepted by *Journal of Healthcare Engineering*, 2018.

[9] Jiageng Zhu, Hanchen Xie, **Jiazhi Li**, Mahyar Khayatkhoei, Wael AbdAlmageed, "An Investigation on the Position Encoding in Vision-Based Dynamics Prediction", *In-Submission*, 2023.

[10] Jiageng Zhu, Hanchen Xie, **Jiazhi Li**, Mahyar Khayatkhoei, Wael AbdAlmageed, "Toward Generalized Causal Representation Learning with Hidden Confounders via ADMG", *In-Submission*, 2023.

[11] Jiageng Zhu, Hanchen Xie, Jianhua Wu, **Jiazhi Li**, Mahyar Khayatkhoei, Mohamed E Hussein, Wael AbdAlmageed, "Shadow Datasets, New challenging datasets for Causal Representation Learning", *Pre-Print*, 2023.

Awards

- Google Best Poster Award at IEEE International Conference on Automatic Face and Gesture Recognition (FG), 2021 (Jiazhi Li, Wael AbdAlmageed, "Information-Theoretic Bias Assessment Of Learned Representations Of Pretrained Face Recognition").

Professional Activities

- Reviewer at European Conference on Computer Vision (ECCV) 2022.
- Reviewer at Genetic and Evolutionary Computation Conference (GECCO) 2023.

Research Experiences

Visual Intelligence and Multimedia Analytics Laboratory (VIMAL), USC Los Angeles, CA, US
Graduate Research Assistant (Advisor: Prof. Wael AbdAlmageed) *05/2020 – Present*

Generative Models

- Designed a framework based on classifier-guidance latent diffusion model to achieve fair classification in diverse downstream tasks by learning protected-attribute-sensitive noise and adding it back into the original image.
- Applied image-to-image Adversarial Filtering to remove protected attribute (e.g., sex) information while preserving other attributes for downstream tasks in the filtered synthetic data.
- Developed Controllable Attribute Translation based on StyleGAN2 for generating synthetic face datasets with desired facial attributes to address minority group bias in facial attribute recognition and sex classification.

Machine Learning Fairness

- Revealed an important limitation of attribute bias removal methods in the presence of strong bias and derived a general non-vacuous information-theoretical upper bound on the performance of any attribute bias removal method in terms of the bias strength.
- Conducted an in-depth investigation to elucidate the distinction between two predominant biases, namely attribute bias and minority group bias, in machine intelligence.
- Conducted a comprehensive fairness evaluation for a wide range of debiasing techniques.

Debiased Representation Learning

- Proposed a method applied to models pre-trained on public large-scale web-scraped datasets to tackle strong attribute bias across various downstream tasks.
- Presented an independent bias assessment metric at the representation level to evaluate the effectiveness of bias mitigation strategies regarding both attribute bias and minority group bias.

Media Communications Lab (MCL), USC Los Angeles, CA, US
Graduate Research Assistant (Advisor: Prof. C.-C. Jay Kuo) *05/2019 – 04/2020*

- Implemented interpretable convolutional neural networks and explainable machine learning models tailored for image forensics.
- Designed a data-driven model using Subspace Learning for fully automatic detection and classification of artifacts on wafer and device surfaces with 90% accuracy (United Microelectronics Corporation project).
- Established a pipeline incorporating Subspace Approximation with Adjusted Bias (Saab) transform for ProGAN generated images detection with 98% accuracy (DARPA project).
- Developed a PixelHop-based model to enlarge the receptive field for splicing edge localization with 97% accuracy.

Research Group of Medical Information Processing, BIT Beijing, P.R.China
Undergraduate Research Assistant (Advisor: Prof. Huiqi Li) *09/2017 – 07/2018*

- Developed a program for the automatic identification of cephalometric landmarks using a shape model and enhanced the automatic detection through the mechanism of tag and distribution rules.
- Trained a Random Forest Classifier for landmark detection by extracting features based on anatomical structure.
- Acquired a dataset of 330 clinical X-ray cephalograms and evaluated landmark detection in the testing set, achieving 0.86 precision at 0.5 mm.

- Computed 17 angular measurements and 10 linear measurements using 45 detected landmarks for 330 cephalograms.

Advanced Integrated Cyber-Physical Systems Lab (AICPS), UCI Irvine, CA, US
Undergraduate Research Assistant (Advisor: Prof. Mohammad Al Faruque) *06/2017 – 09/2017*

- Implemented a data-driven approach to establish the relationship between sensor-collected data (acoustic, magnetic, and vibration) and the movement of a 3-D printer extruder.
- Conducted data preprocessing and visualization to identify the initiation time of 3D printers' printing process and optimized the placement of sensors.

Work Experiences

Beijing Institute of Heart Lung and Blood Vessel Diseases Beijing, P.R.China
Undergraduate Research Assistant (Advisor: Prof. Huiqi Li) *09/2017 – 07/2018*

- Collected a dataset comprising 5000 medical images of retinal vascular, discerning patterns in arteriovenous distribution.
- Collaborated with medical professionals to design a medical-aided application in C++, incorporating arteriovenous classification functionality.
- Developed retinal vascular auto-analysis software in C++, utilizing extracted parameters (Curvature, width, Bifurcation angle) from 5000 fundus images.

Projects

Machine Learning/Deep Learning | *Python, TensorFlow, Google Cloud Platform* 06/2019 – 08/2019

- Applied Support Vector Machine, Random Forest Classifier, Bag of Words Clustering, K-means clustering, Gaussian Mixture Models (GMM), Expectation-Maximization (EM) Clustering, and KNN for analysis on the Old Faithful dataset.
- Implemented Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Generative Adversarial Network (GAN), Policy Gradient method REINFORCE.
- Developed a caption generation model tailored for Instagram, employing personalized image captioning techniques.

Computer Vision/Image Processing | *C++* 01/2019 – 05/2019

- Constructed a bag of words model for object classification, utilizing extracted SIFI features.
- Implemented a texture classification and segmentation algorithm on the SIPI Texture dataset, achieving an accuracy of 87%.
- Applied boundary smoothing, hole filling, adaptive thresholding, and connected component labeling algorithms for preprocessing rice grain images and employed the K-means cluster algorithm to categorize rice grain types with an accuracy of 93%.
- Implemented a range of image processing algorithms, including Image De-mosaicing, enhancement, denoising, histogram manipulation, digital halftoning, geometric image modification, image warping, and morphological processing.

Technical Skills

Languages: Python (Pytorch, NumPy, pandas, Matplotlib), C/C++, JAVA, MATLAB
Developer Tools: Git, Google Cloud Platform, VS Code, Visual Studio, PyCharm, Eclipse