

# Yiran Li

PhD Candidate @ Visualization & Interface Design Innovation Lab, VID  
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## RESEARCH FOCUS

My research specializes in Machine Learning (ML) interpretability, aiming to enhance **mechanistic understanding**, **diagnosis** of model weaknesses, and **improvement** of model capability through Visual Analytics (VA). I develop streamlined applications that combine frontend and backend integration for large-scale data processing, visualization, and interaction, enabling scalable and intuitive exploration of model interpretations.

## EDUCATION

- Sep. 2018 – **PhD Candidate in Computer Science**  
Jun. 2024 (Expected) University of California – Davis, United States  
Advisor: Dr. Kwan-Liu Ma  
Thesis: Visual Analytics Assistance to Interpreting, Analyzing and Improving Machine Learning Models
- Sep. 2014 – **Bachelor of Science in Mathematics and Applied Mathematics, Bachelor of Arts in English**  
Jun. 2018 Chu Kochen Honors College, Zhejiang University, Hangzhou, China  
Advisor: Dr. Zhiyi Tan  
Thesis: A Survey on Integer Programming Solvers in MATLAB and Python
- Jun. 2017 – **Exchange Undergraduate Researcher**  
Sep. 2017 University of California – Davis, United States  
Advisor: Dr. Kwan-Liu Ma  
Project: Uncertainty-Aware Visual Analytics of Dark Matter Simulation Data
- Jun. 2016 – **Exchange Undergraduate Student**  
Sep. 2016 Harvard University, United States

## PROFESSIONAL EXPERIENCE

- Sep. 2018 – Present **University of California – Davis**  
*Graduate Research Assistant, with Dr. Kwan-Liu Ma*
- Jun. 2023 – Sep. 2023 **Visa Research**  
*Research Internship, with Dr. Junpeng Wang*  
The research focuses on improving the analysis and application of pre-trained vision-language models such as CLIP and BLIP, which process both visual and textual information. It utilizes visual analytics to interpret cross-attentions in these models, addressing challenges in data-centric AI, model evaluation, and incorporating human input into model direction. Further information is available in the paper “Visual Analytics for Efficient Image Exploration and User-Guided Image Captioning”.
- Jun. 2022 – Sep. 2022 **Visa Research**  
*Research Internship, with Dr. Junpeng Wang*  
The research investigates the self-attention mechanisms in Vision Transformers (ViT) focusing on identifying and reasoning about important attention head. This work uncovers patterns in head attentions and contributes to the advancement of foundation models by providing actionable insights for machine learning professionals. The findings and potential applications are detailed in the paper “How Does Attention Work in Vision Transformers? A Visual Analytics Attempt”.
- Jun. 2017 – Sep. 2017 **University of California – Davis**  
*Summer Research Program, with Dr. Annie Preston and Dr. Kwan-Liu Ma*  
The research centers on uncertainty visualization of dark matter simulations and the development of a novel bootstrapping method to accurately quantify uncertainty with small data samples.

## PUBLICATIONS

- 2024 **Visual Analytics for Efficient Image Exploration and User-Guided Image Captioning**  
Yiran Li, Junpeng Wang, Prince Aboagye, Chin-Chia Michael Yeh, Yan Zheng, Liang Wang, Wei Zhang, and Kwan-Liu Ma  
**TVCG** *IEEE PacificVis TVCG Journal Track, **Acceptance Rate: 11.5% (15 out of 131)***
- 2023 **How Does Attention Work in Vision Transformers? A Visual Analytics Attempt**  
Yiran Li, Junpeng Wang, Xin Dai, Liang Wang, Chin-Chia Michael Yeh, Yan Zheng, Wei Zhang, and Kwan-Liu Ma  
**TVCG** *IEEE PacificVis Conference, **Best Paper Honorable Mention and published in TVCG***
- Visual Analytics of Neuron Vulnerability to Adversarial Attacks on Convolutional Neural Networks**  
Yiran Li, Junpeng Wang, Takanori Fujiwara, and Kwan-Liu Ma  
**TIIS** *ACM Transactions on Interactive Intelligent Systems, Special Issue on Human-Centered Explainable AI*

### **A Study of Healthcare Team Communication Networks using Visual Analytics**

Hsiao-Ying Lu, **Yiran Li**, Brittany Garcia, Shin-Ping Tu, and Kwan-Liu Ma

ICMHI

ACM International Conference on Medical and Health Informatics

2021 **A Visual Analytics System for Water Distribution System Optimization**

**Yiran Li**, Erin Musabandesu, Takanori Fujiwara, Frank J. Loge, and Kwan-Liu Ma

VIS

IEEE Visualization Conference (Short Paper)

### **ChartStory: Automated Partitioning, Layout, and Captioning of Charts into Comic-Style Narratives**

Jian Zhao, Shenyu Xu, Senthil Chandrasegaran, Chris Bryan, Fan Du, Aditi Mishra, Xin Qian, **Yiran Li**, and Kwan-Liu Ma

TVCG

IEEE Transaction on Visualization and Computer Graphics

2020 **A Visual Analytics System for Multi-Model Comparison on Clinical Data Predictions**

**Yiran Li**, Takanori Fujiwara, Yong K. Choi, Kathering Kim, and Kwan-Liu Ma

Visual Informatics

IEEE PacificVis Conference (VisMeetsAI Workshop), published in Visual Informatics

### **Comparative visual analytics for assessing medical records with sequence embedding**

Rongchen Guo, Takanori Fujiwara, **Yiran Li**, Kelly M. Lima, Soman Sen, Nam K. Tran, and Kwan-Liu Ma

Visual Informatics

IEEE PacificVis Conference (VisMeetsAI Workshop), published in Visual Informatics

### **Umbra: A Visual Analysis Approach for Defense Construction Against Inference Attacks on Sensitive Information**

Xumeng Wang, Chris Bryan, **Yiran Li**, Rusheng Pan, Yang Liu, Wei Chen, and Kwan-Liu Ma

TVCG

IEEE Transaction on Visualization and Computer Graphics

2018 **Visual Analysis of Simulation Uncertainty Using Cost-Effective Sampling**

Annie Preston, **Yiran Li**, Franz Sauer, and Kwan-Liu Ma

LDAV

IEEE Symposium on Large Data Analysis and Visualization

## **AWARDS AND HONORS**

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2024 Research Fellowship for Spring 2024 from the Graduate Group in Computer Science of UC Davis

2023 Research Fellowship for Spring 2023 from the Graduate Group in Computer Science of UC Davis

2023 Best Paper Honorable Mention on IEEE PacificVis

## **COMPUTER SKILLS**

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### **Programming Languages**

Python, JavaScript/CSS/HTML, C/C++, MATLAB

### **Frontend/Backend Libraries**

D3, Bootstrap, Vue, Flask

### **Machine Learning**

PyTorch, TensorFlow

## **SERVICE AND OUTREACH**

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### **Program Committee**

2023 Workshop on Visual Analytics in Healthcare (VAHC)

### **Paper Reviewer**

2024 IEEE PacificVis TVCG Track Papers

2023 IEEE VIS Full Papers

2023 IEEE PacificVis Full Papers

2023 ChinaVis Full Papers

2023 The Journal of Supercomputing

2023 IEEE VIS VAHC Workshop

2022 ChinaVis Full Papers

2021 IEEE VIS TREX Workshop