JIAQING CHEN

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Summary

Ph.D. candidate in Computer Science with extensive research experience in interactive machine learning, explainable AI, and topological data analysis, proven at Lawrence Berkeley National Lab. Developed latent space representations and advanced visualization techniques to enhance scientific machine learning. Demonstrates robust coding skills in Python, Java, and Scala with a strong record in collaborative research and publications. Eager to integrate novel ML paradigms into production systems.

Education

Arizona State University   **Jan 2021 - May 2026**
Ph.D. student, Computer Science   *Tempe, AZ, USA*
  • **GPA:** 3.90/4.0

University of California, Riverside   **Sep 2018 - Mar 2020**
Master of Science, Computer Science   *Riverside, CA, USA*
  • **GPA:** 3.69/4.0

University of California, Riverside   **Sep 2017 - Jun 2018**
GPP-E Program Exchange student, Computer Science   *Riverside, CA, USA*

Wuhan University of Technology   **Sep 2014 - Jun 2018**
Bachelor of Engineering, Computer Sci&Tech   *Wuhan, Hubei, P.R.China*
  • **GPA:** 3.924/5.0

Work Experience

VADER Lab, ASU   **Aug 2022 - Present**
Research Associate   *699 S. Mill Avenue, Tempe, AZ 85281*
Conducted interactive machine learning projects integrating explainable AI and topological data analysis to visualize high-dimensional scientific data, demonstrating analytical thinking to map complex problems to appropriate machine learning paradigms.

Lawrence Berkeley National Lab   **May 2025 - Aug 2025**
Internship   *Building 59, Chu Rd, Berkeley, CA 94720*
Developed latent space representations to improve uncertainty modeling in scientific machine learning models, applying advanced topological data analysis and 3D graph neural networks to enhance predictive accuracy while collaborating with cross-functional teams.

Lawrence Berkeley National Lab   **May 2024 - Aug 2024**
Internship   *Building 59, Chu Rd, Berkeley, CA 94720*
Devised topological data analytics methods and tools to understand scientific machine learning models for the DOE ASCR project, defining high-dimensional global subspaces through diverse sampling and mode connectivity techniques and rigorously testing visual analytics algorithms.

Lawrence Berkeley National Lab   **May 2023 - Aug 2023**
Internship   *Building 59, Chu Rd, Berkeley, CA 94720*
Extended image classification methodologies to address regression challenges in Physics-Informed Neural Networks, employing random and Hessian projections along with testing unstructured grid and image representations to optimize high-dimensional loss functions.

CACTUS Data-intensive systems Lab   **Jan 2021 - Dec 2021**
Research Assistant   *699 S. Mill Avenue, Tempe, AZ 85281*
Developed and deployed machine learning models within relational database systems, analyzing data patterns and ensuring robust integration with existing data infrastructures.

Arizona State University   **Jan 2022 - May 2022**
Teaching Assistant   *699 S. Mill Avenue, Tempe, AZ 85281*
Facilitated learning in Database Management for the School of Computing and Augmented Intelligence, clearly conveying technical concepts to diverse student audiences.

The Big Data Lab   **Sep 2018 - Dec 2020**
Research Assistant   *900 University Avenue, Riverside, CA 92521*
Investigated and enhanced big data management and spatial data processing techniques, contributing to research on scalable database solutions and collaborative academic publications.

Networks and Communications Lab   **Sep 2017 - Jun 2018**
Research Assistant   *446 N Campus Dr, Riverside, CA 92507*
Engineered sophisticated software solutions for network communications, leveraging research insights to address technical challenges and optimize system performance.

University of California, Riverside   **Sep 2019 - Dec 2019**
Teaching Assistant   *900 University Avenue, Riverside, CA 92521*

Supported the Software Construction course by effectively communicating complex programming and software design concepts to undergraduate students.

Linux Open Mainframe Mentorship Project   Jun 2022 - Aug 2022

Mentorship Project   *Remote*
  • Transformed ONNX graphs into executable code using LLVM/MLIR compiler technology, and developed a Python toolkit to streamline model conversion, thereby enhancing collaborative research and integration of advanced ML techniques.

Selected Projects

Landscaper: Visualizing and Quantifying Loss Geometry   Sep 2024 - Apr 2025
  • Introduce Landscaper, which is an open-source Python package for multi-dimensional loss landscape analysis in scientific machine learning.
  • Present the first topological study of 3D GNN loss landscapes in a real-world chemistry task.
  • Novel TDA-based tools reveal structural patterns invisible to traditional visualization methods.
  • Introduce SMAD, a metric that quantifies loss landscape smoothness and generalization potential.
  • Our findings show that domain-guided data augmentation improves optimization more effectively than manual input design.

Visualizing Loss Functions as Topological Landscape Profiles   May 2024 - Aug 2024
  • Introduce a new representation based on topological data analysis that enables the visualization of higher-dimensional loss landscapes named 1D profile landscapes, to combine key information in both merge trees and persistence barcodes in higher dimensions.
  • Use an unstructured grid representation of the loss landscape for visualization and further TDA quantitative analysis.
  • Show how the shape of loss landscapes can reveal new details about model performance and learning dynamics, highlighting several use cases.
  • Provide new insights into how loss landscapes vary across distinct hyperparameter spaces.

Evaluating Loss Landscapes from a Topology Perspective   May 2023 - Apr 2024
  • Propose a loss landscape computation approach using a scalable coordinate-based method, generating high-fidelity representations of the landscape.
  • Quantify these representations using efficient data structures from topology (e.g., persistence diagrams, merge trees)
  • Relate findings to the machine learning literature (e.g., accuracy, error) and further characterize the local structure of loss landscapes using Hessian-based metrics (e.g., trace, density)
  • Provide visualizations of loss landscapes using contour plots and embedded topological structures.

Diagnostics for Machine Learning Models through Loss Landscape   Sep 2022 - Mar 2024
  • A visual analytics framework for exploring multi-scale loss landscapes across local, semi-global, and global scales.
  • A cohesive visual representation that links metrics evaluated at these different scales, that forms connections between metrics for global, semi-global, and local loss landscapes.
  • Three case studies demonstrating how this framework can be used to visualize and extract novel insights from neural networks' loss landscapes about different aspects of model development.
  • https://arxiv.org/abs/2412.13321

Linux ONNX-MLIR Open Mainframe Project   May 2022 - Oct 2022
  • ONNX-MLIR provides compiler technology to transform a valid Open Neural Network Exchange (ONNX) graph into code that implements the graph with minimum runtime support. It implements the ONNX standard and is based on the underlying LLVM/MLIR compiler technology.
  • This project proposes a Python toolkit to simplify model conversion to ONNX and provide Python APIs to use the ONNX-MLIR model compiler.
  • https://onnx.ai/onnx-mlir/

Decision Forest Inference Comparison from Database   Jan 2021 - May 2022
  • Propose an in-database decision forest inference framework.
  • A comprehensive performance comparison.
  • A series of interesting observations that may benefit future database and AI/ML systems design.
  • https://arxiv.org/abs/2302.04430

Serving Deep Learning Models with Deduplication from RDBMS   Jan 2021 - Apr 2022
  • Explore the storage optimization for DNN models in RDBMS, with an overall goal of supporting deep learning models serving natively from RDBMS.
  • Propose three synergistic storage optimizations.
  • Implement a system in an object-oriented relational database.
  • https://arxiv.org/abs/2201.10442

Student Advisor Chatbot in IBM Watson   Aug 2020 - Oct 2020

IBM Watson
  • Provide a front-end logic of the Chatbot with Artificial Intelligence. The back-end and connection operations use Python to implement in Jupyter Notebook, and connect with the front-end through IBM API.

- Machine Learning and Artificial Intelligence are used in the training of Chatbot. The Chatbot will parse customers' words and sentences during the chat with the user. The most likely intention of users is given by probability analysis from the training model and the corresponding reply according to the most likely intention.

Interactive Visualization for Geospatial Data in UCR-STAR   **Jan 2019 - Mar 2020**

UCR-STAR
- Speed up the response time of submitted requests by creating an intermediate cache structure, which keeps small images in memory to save the computation cost of generating these images.
- Allow users to submit requests to visualize new datasets and it automatically adds it to the system by calling back-end operations.
- Store the dataset information in a NoSQL database, MongoDB, to allow the system to support a large number of datasets and provide datasets' information while the front end sends requests.
- https://star.cs.ucr.edu/

R'Home Software Development   **Sep 2017 - Jun 2018**
- Provide a platform for the Riverside homeless people to give them a more convenient life and more intuitive help, working with the Riverside government.
- Provide a basic real-time positioning lightweight Android application with some information publishing and query functions using Google API with two Android clients.

FindNow Android Platform Software Development   **Dec 2016 - Jun 2017**
- A project based on geographic information and big data analysis, which serves people's daily lives and is a small part of intelligent urban design.
- Use Java in Android Studio for development. This software system has three Android clients and is dedicated to providing convenient city life. The system integrates a wide range of online shopping platforms and the convenient search of the map.
- The basic functions are realized by calling the API of the Baidu map and positioning of the system. The database in the background is MySql.
- Obtain the highest prizes and bonuses in the iSoftStone & Y.E.S Software Programming Competition and the Best Smart City Design Award and a software copyright in P.R. China.

Healthband Monitoring Software Development   **Jan 2016 - Dec 2016**
- An independent innovation foundation project funded by Ministry of Education of P.R.China.
- Propose an algorithm for judging the fall of the human body based on Microsoft bracelet API, which is now applied to many intelligent wearable products based on the Android system.
- Use Java in Android Studio for development. Get the data of the bracelet through the Microsoft bracelet API. Through the API of the Android system, the APP gets the geographical location, automatically makes phone calls, sends SMS, and other functions. The new algorithm is applied in this software.
- Obtain software copyright in P.R. China and win several awards in different levels of independent innovation foundation project competitions.

Skills

- **Programming Languages & Tools**: Python, JavaScript, C/C++, SQL, Scala, Java, Android Studio
- **Machine Learning & AI**: Machine Learning, Deep Learning
- **Research & Analytical Skills**: Advanced Coding Skills, Collaborative Research, Analytical Thinking

Certificate & Specialization

- **Certificate**: IBM Data Science Professional Certificate
- **Certificate**: IBM Applied AI Professional Certificate
- **Specialization**: IBM Introduction to Data Science Specialization
- **Specialization**: IBM Applied Data Science Specialization
- **Specialization**: IBM AI Foundations for Everyone Specialization

Recent Publications

- Jiaqing Chen*, Nicholas Hadler*, Tiankai Xie*, Rostyslav Hnatyshyn, Caleb Geniesse, Yaoqing Yang, Michael W. Mahoney, Talita Perciano, John Hartwig, Ross Maciejewski, Gunther H. Weber. Landscaper: Understanding Loss Landscapes Through Multi-Dimensional Topological Analysis. Under Review.
- Nicholas Hadler, N. Ian Rinehart, Masha Elkin, Jeremy Nicolai, Golsa Gheibi, Jiaqing Chen, Matthew Avaylon, Ross Maciejewski, Gunther H. Weber, Michael W. Mahoney, Talita Perciano, and John F. Hartwig. A 3D, Structure-Based, Deep Learning Approach for Predicting the Regioselectivity of Transition-Metal Catalysis. Under Review.
- Olivia Weng, Andres Meza, Jiaqing Chen, Caleb Geniesse, Nhan Tran, and Ryan Kastner. PrioriFI: Efficient Fault Injection for Edge Neural Networks. Under Review.
- Olivia Weng, Marta Andronic, Danial Zuberi, Jiaqing Chen, Caleb Geniesse, George A Constantinides, Nhan Tran, Nicholas Fraser, Javier Duarte, and Ryan Kastner. Greater than the Sum of its LUTs: Scaling Up LUT-based Neural Networks with AmigoLUT. ACM/SIGDA International Symposium on Field-Programmable Gate Arrays (2025)
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Tiankai Xie*, Jiaqing Chen*, Yaoqing Yang*, Caleb Geniesse*, Ge Shi, Ajinkya Jeevan Chaudhari, John Kevin Cava, Michael W. Mahoney, Talita Perciano, Gunther H. Weber, and Ross Maciejewsk. LossLens: Diagnostics for Machine Learning Models through Loss Landscape Visual Analytics. IEEE Computer Graphics and Applications (2024)

- Caleb Geniesse*, Jiaqing Chen*, Tiankai Xie*, Ge Shi, Yaoqing Yang, Dmitriy Morozov, Talita Perciano, Michael W. Mahoney, Ross Maciejewski, and Gunther H. Weber. Visualizing Loss Functions as Topological Landscape Profiles.. NeurIPS 2024 Workshop on Symmetry and Geometry in Neural Representations (NeurReps).
- Tiankai Xie*, Caleb Geniesse*, Jiaqing Chen*, Yaoqing Yang, Dmitriy Morozov, Michael W. Mahoney, Ross Maciejewski, and Gunther H. Weber. Evaluating Loss Landscapes from a Topology Perspective.. NeurIPS 2024 Workshop on Scientific Methods for Understanding Deep Learning (SciForDL).
- Lixi Zhou, Jiaqing Chen, Amitabh Das, Hong Min, Lei Yu, Ming Zhao, and Jia Zou. Serving Deep Learning Models with Deduplication from Relational Databases.. VLDB 2022, PVLDB Volume 15 Issue 10.

Scholarships & Awards

- ASU Engineering Graduate Fellowship(May 2025)
- Excellent League Member (2017)
- ASU Engineering Graduate Fellowship(March 2023)
- Hardworking Advanced Individual(2017)
- Third-Class Scholarship(Top 7.8% in Computer Science) (2017)
- Highest Prize in iSoftStone & Y.E.S Software Programming Competition (2017)
- National Scholarship(Top 1 in Computer Science) (2016)
- Merit Student (Top 2% in Computer Science) (2015,2016)
- First-Class Scholarship(Top 1.2% in Computer Science) (2015)
- Third-class Prize in ACM Programming Contest(2015)