Jiaqing Chen

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Education

Arizona State University **Jan. 2021 – Present**
Ph.D. student in Computer Science, Supervisor: Dr. Ross Maciejewski, GPA: 3.90/4.0 *Tempe, AZ, US*

University of California, Riverside **Sep. 2018 – Mar. 2020**
Master of Science in Computer Science, Supervisor: Dr. Ahmed Eldawy, GPA: 3.69/4.0 *Riverside, CA, US*

University of California, Riverside **Sep. 2017 – Jun. 2018**
GPP-E Program Exchange student in Computer Science, Supervisor: Dr. Michalis Faloutsos *Riverside, CA, US*

Wuhan University of Technology **Sep. 2014 – Jun. 2018**
Bachelor of Engineering in Computer Sci&Tech, Supervisor: Dr. Yanfen Cheng, GPA: 3.924/5.0 *Wuhan, Hubei, P.R.China*

Recent Publications

- 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)
- 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.

Selected Projects

Visualizing Loss Functions as Topological Landscape Profiles | *Python, JavaScript* **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 | *Python, JavaScript* **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 | *Python, JavaScript* **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 | *C/C++, Python* **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 | *C/C++, SQL, Python, Scala* **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 | *C++, Python* **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 | *Python* **Aug. 2020 - Oct. 2020**

- 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 | *Scala, Python, Java* **Jan. 2019 – Mar. 2020**

- 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 | *Java, Android Studio* **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 | *Python, Java, Android Studio* **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 | *Java, Android Studio* **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.

Scholarships & Awards

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

Certificate & Specialization

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

Industry Experience

Internship at Lawrence Berkeley National Lab **May 2024 – Aug. 2024**

- Building 59, Chu Rd, Berkeley, CA 94720
- Main duties were developing topological data analytics methods and tools to understand scientific machine learning models for the DOE ASCR project "Visualizing High-Dimensional Functions in Scientific Machine Learning".
- Define high-dimensional global subspaces using different methods (sampling and mode connectivity).
- Implement and test topological data analysis and visual analytics algorithms and techniques using landscape profiles.

Internship at Lawrence Berkeley National Lab **May 2023 – Aug. 2023**

- Building 59, Chu Rd, Berkeley, CA 94720
- Extend prior work on image classification to address more problems, such as regression problems in Physics-Informed Neural Networks (PINN).
- Define high-dimensional subspaces using different projection methods (Random projection and Hessian projection).
- Implement and test different representations (including unstructured grid representation and image representation) for high-dimensional loss cubes.
- Implement and test topological data analysis and visual analytics algorithms and techniques using Merge Tree and Persistence Barcode.

Linux Open Mainframe Mentorship Project **Jun. 2022 – Aug. 2022**

- This project 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.
- The IBM Telum AI accelerator was exploited by open-source packages such as ONNX and ONNX-MLIR. I explored and created a Python toolkit to simplify model conversion to ONNX and provide Python APIs to use the ONNX-MLIR model compiler.

Recent Academia Experience

Research Associate at VADER Lab, ASU **Aug. 2022 – Present**

- 342DB, 699 S. Mill Avenue, Tempe, AZ 85281
- Research Associate at VADER Lab at Arizona State University working with Dr. Ross Maciejewski on interactive machine learning, explainable AI, data, and model visualization, especially applying topological data analysis to visualize high-dimensional data, functions, and structures in Scientific Machine Learning.

Teaching Assistant at Arizona State University **Jan. 2022 – May 2022**

- 699 S. Mill Avenue, Tempe, AZ 85281
- Teaching Assistant in the School of Computing and Augmented Intelligence, Ira A. Fulton Schools of Engineering, Arizona State University(Tempe) on Database Management(CSE412).

Research Assistant at CACTUS Data-intensive systems Lab **Jan. 2021 – Dec. 2021**

- 699 S. Mill Avenue, Tempe, AZ 85281
- Research Assistant at CACTUS Data-intensive systems Lab at Arizona State University working with Dr. Jia Zou on deploying and serving machine learning models from relational database systems.

Teaching Assistant at University of California, Riverside **Sep. 2019 – Dec. 2019**

- Teaching Assistant in the School of Computer Science and Engineering, Marlan and Rosemary Bourns College of Engineering, University of California, Riverside on Software Construction(CS100).

Research Assistant at The Big Data Lab **Sep. 2018 – Dec. 2020**

- 900 University Avenue, MSE 243, Riverside, CA 92521
- Research Assistant at The Big Data Lab at the University of California, Riverside working with Dr. Ahmed Eldawy on databases with a focus on big data management and spatial data processing.

Research Assistant at Networks and Communications Lab **Sep. 2017 – Jun. 2018**

- 446 N Campus Dr, Riverside, CA 92507
- Research Assistant at Networks and Communications Lab at the University of California, Riverside working with Dr. Michalis Faloutsos focusing on sophisticated software solutions.