Jiaheng Cui

+1 (781) 399-1043 | Jiaheng.Cui@uga.edu | University of Georgia, Athens, GA, 30602
LinkedIn Page | Personal Website | GitHub Page | Google Scholar Page

EDUCATION

University of Georgia **Athens, GA, USA**
PhD in Electrical and Computer Engineering, College of Engineering Jun. 2023 – Present

- **PhD Advisor:** Dr. Yiping Zhao, Dr. Xianyan Chen
- **GPA:** 4.0/4.0
- **Coursework:** *Trustworthy Machine Learning (A); Design of Experiments for Research Workers (A); Machine Learning (A); Bayesian Statistical Methodology with Applications (A); Optimization Algorithms in AI (A)*

Northeastern University **Boston, MA, USA**
Master in Artificial Intelligence, Khoury College of Computer Sciences Sept. 2021 – May. 2023

- **GPA:** 3.96/4.0
- **Coursework:** *Programming Design Paradigm (A); Pattern Recognition and Computer Vision (A); Algorithms (A); Advanced Reinforcement Learning (A); Foundations of AI (A); Machine Learning (A-); Human-Computer Interaction (A); Statistical Inference (A)*

Nankai University **Tianjin, China**
Bachelor of Science in Statistics, College of Mathematical Sciences Sept. 2017 - Jun. 2021

- **GPA:**85.73/100
- **Major Coursework:** *Mathematical Analysis (83); Advanced Algebra and Analytic Geometry (92); Probability Theory (98); Fundamentals of Computer for Science and Engineering (92); Data Structures and Algorithms (92); Database (85); Introduction to Machine Learning (92)*
- Awarded "Graduate with Honor" and "Outstanding Undergraduate Thesis Award"

University of California, Berkeley **Berkeley, CA, USA**
Berkeley International Study Program Aug. 2019 - Dec. 2019

- **GPA:** 3.57/4.0
- **Coursework:** *Numerical Analysis (A); Concepts of Statistics (A-); Introduction to Partial Differential Equations (B)*
- Awarded "Global Nankai" Abroad Study Scholarship

TECHNICAL SKILLS

- Programming Languages: Python, JAVA, C++, JavaScript
- Others: Git, R, MATLAB, Latex, Markdown, OpenCV, Android Development, Spark, MySQL, Azure

PUBLICATIONS

1. **Functional Regression for SERS Spectrum Transformation Across Diverse Instruments**

Tao Wang, Yanjun Yang, Haoran Lu, **Jiaheng Cui**, Xianyan Chen, Ping Ma, Wenxuan Zhong, Yiping Zhao*
Analyst, 2025, 150 460-469. DOI: 10.1039/D4AN01177E **(Selected as journal cover)**

2. **Ultra-sensitive detection of PFASs using surface enhanced Raman scattering and machine learning: a promising approach for environmental analysis**

Joshua C. Rothstein, **Jiaheng Cui***, Yanjun Yang, Xianyan Chen, and Yiping Zhao*
Sensors & Diagnostics 2024 3(8): 1272-1284.

3. **Detection of SARS-CoV-2 in patient specimens by surface enhanced Raman spectroscopy and deep learning**

Yanjun Yang, Hao Li, Dan Luo, **Jiaheng Cui**, Amit Kumar, Leslie Jones, Jackelyn Crabtree, Hemant Naikare, Yung-Yi C. Mosley, Teddy Spikes, Sebastian Hülck, Xianyan Chen, Ralph A. Tripp, Bin Ai, and Yiping Zhao*
Proc. SPIE 12999, Optical Sensing and Detection VIII, 129991I (20 June 2024).

4. **Rapid Detection of SARS-CoV-2 Variants Using ACE2-Based SERS Sensor Enhanced by CoVari Deep Learning Algorithms**

Yanjun Yang, **Jiaheng Cui**, Dan Luo, Jackelyn Murray, Xianyan Chen, Sebastian Hülck, Ralph Tripp, and Yiping Zhao*
ACS Sensors 2024 9 (6), 3158-3169.

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5. **Decoding PFAS contamination via Raman spectroscopy: A combined DFT and machine learning investigation**

Yangxiu Chen, Yanjun Yang, **Jiaheng Cui**, Hong Zhang*, and Yiping Zhao*

Journal of Hazardous Materials, Volume 465, 2024, 133260, ISSN 0304-3894.

RESEARCH & ACADEMIC EXPERIENCE

Research Program in Dr Gang Luo's Lab **Harvard University, Boston, USA**

Summer Research Intern May. 2022 – Oct. 2022

Project: **Eyeturn Measurement based on Computer Vision and Cloud Computing**

- Used OpenCV to perform traditional Computer Vision processing such as binarization and edge detection on the gazeNet results in order to locate the corneal reflection points for eyes with different colors and sizes.
- Used matrix optimization techniques to do ellipse fitting on the iris, and found the center of the iris based on the binarization results.
- Determined whether the patient had strabismus based on the detection results and ophthalmic knowledge; if so, we were able to quantify the severity of the strabismus.

Course Project: Advanced Reinforcement Learning **Northeastern University, Boston, USA**

Mar. 2022 - May. 2022

Project: **An Improved Approach to Hierarchical Object Detection with Deep Reinforcement Learning**

- Refined the detection strategy by refining the sub-sections that needed to be processed by the agent; updated the state, action, and reward space design of the RL part. Results showed an overall AP increase with simply refining the action-selection strategy.
- Performed experiments with DQN, DDQN, and D3QN; although DDQN achieved the highest observed accuracy, D3QN had the largest mAP.
- The final model using D3QN reduces the average number of steps to process an image from 7 to 4 and the maximum number of steps from more than 10 to 7.

Bachelor Thesis **Nankai University, Tianjin, China**

Jan. 2021 - Jun. 2021

Project: **An Exploration of Transformer-Based Object Detection Technology**

- Proposed modifications to the DETR model, results showed better performance on large object detection tasks and the potential to do vehicle, pedestrian, and sign detection for autonomous driving cars.
- Analyzed the built-in defects of DETR and proposed further theoretical improvement methods
- Won the Best Paper Award for undergraduate students

Research Program in Dr. Hong Zhao's Lab **Nankai University, Tianjin, China**

Research Assistant Jun. 2020 - Mar. 2021

Project: **Copper Wire Melting Mark Classification Algorithm (Jul. 2020 – Mar. 2021)**

- Classified four typical melting mark pictures using C++ and OpenCV.
- Completed the algorithm design to improve the identification accuracy of picture classification by combining our algorithm with classification models.

Project: **Motor Vehicle Fire Scene Information Reporting System (Jun. 2020 - Jul. 2020)**

- Developed a vehicle fire scene information reporting system (an Android APP implemented by JAVA) for Tianjin Fire Research Institute of MEM, which has been put into practical use.

National College Students Innovation Training Program **Nankai University, Tianjin, China**

Group Leader Mar. 2019 - Mar. 2021

Project: **Geometric View and Algorithm Optimization of Generative Adversarial Network (GAN)**

- This project was selected as one of the two national-level projects in the College of Mathematics, Nankai University.
- Explained the principle of GAN with differential geometry and optimal transportation theory.
- Proposed a generative model - OTVAE based on optimal transport and VAE, which could train 10 epochs to obtain the image quality produced by WGAN training 200 epochs with 60% less time.

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Course Project: Introduction to Machine Learning **Nankai University, Tianjin, China**
Group Leader Nov. 2020 - Jan. 2021
Project: **Machine Learning Financial Aid Rater**

- Optimized the existing algorithm for aiding economically disadvantaged students at Nankai University.
- Structurized the original unstructured data using tokenization in NLP, realized dimensionality reduction using the t-SNE algorithm, and achieved label refinement using a t-SVM model in semi-supervised learning.
- Nankai University Student Financial Aid Center has adopted the model to rate economically disadvantaged students to provide suggestions to the experts for helping students.

INTERNSHIP EXPERIENCE

OpenBayes **Beijing, China**
AI Engineer Intern Jan. 2020 - Feb. 2020

- Explored the basic algorithm of machine learning and created a 5-chapter tutorial for new interns.

Wuhan Shuosi Software Co., Ltd **Tianjin, China**
Data Scientist Intern Jun. 2019 - Aug. 2019

- Used Numpy, Pandas, and basic analysis methods of Python in processing and interpreting stock data
- Tracked several stocks, collected and cleaned the financial data, performed specific transformations (such as log transformation), and conducted a market analysis with Python.

EXTRACURRICULAR ACTIVITIES

New Media Center of College of Mathematics **Nankai University, Tianjin, China**
Department Officer Jun. 2018 - May. 2019

- Received and processed activity information from other college student organizations in the college and arranged daily news reports on the media platforms
- Led a team of 10 people, organized more than 30 online activities, and released more than 1,000 messages and articles on media platforms within one school year