YUYANG QIU | CV

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EDUCATION

Rutgers University *Sep. 2020 – Spring 2025 (expected)*
Major: Industrial and Systems Engineering
Intended Degree: Ph.D.
Advisor: Prof. Farzad Yousefian

Northeastern University (Boston) *Sep. 2018 – Jun. 2020*
Major: Applied Mathematics
Degree: Master of Science

Jiangsu University *Sep. 2014 – Jun. 2018*
Major: Mathematics and Applied Mathematics
Degree: Bachelor of Science

EMPLOYMENT HISTORY

Givens Associates (Intern) Summer 2024
Mathematics and Computer Science Division, Argonne National Laboratory

- Under supervision of Dr. Charikleia (Hara) Iakovidou. Currently working on memory and communication-efficient asynchronous Federated Learning.

Graduate Research Assistant Fall 2022 - present
Dept. of Industrial and Systems Engineering, Rutgers University

- Under supervision of Prof. Farzad Yousefian. Working on a DOE funded project on "Randomized Federated Learning for Nonsmooth, Nonconvex and Hierarchical Optimization".

RESEARCH

Research Interest

- Designing and mathematically analysing computational algorithms to address optimization problems in federated/distributed learning.
- Applications in machine learning (e.g. training neural networks, hyperparameter tuning, GANs)

Research Area

- Federated Learning
- Distributed/Stochastic Optimization
- Nonsmooth Optimization
- Hierarchical Optimization

PUBLICATIONS

Conference Proceedings

1. **Yuyang Qiu**, Uday V. Shanbhag, Farzad Yousefian. *Zeroth-Order Methods for Nondifferentiable, Nonconvex, and Hierarchical Federated Optimization.* Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS 2023).
   Paper: https://arxiv.org/abs/2309.13024
   Poster: https://nips.cc/media/PosterPDFs/NeurIPS%202023/72874.png?t=1699387657.060764

Journal Articles

0. **Yuyang Qiu**, Uday V. Shanbhag, Farzad Yousefian. *Zeroth-Order Federated Methods for Stochastic MPECs and Nondifferentiable Nonconvex Hierarchical Optimization.* Mathematics of Operations Research (under first revision).
1. Lijuan Qian, Raghda Attia, **Yuyang Qiu**, Dianchen Lu, Mostafa Khater. *The shock peakon wave solutions of the general Degasperis-Procesi equation.* International Journal of Modern Physics B, 33. 1950351. 10.1142/S021797921950351X.
2. Mostafa Khater, Dianchen Lu, Raghda Attia, Li Juan, **Yuyang Qiu**. *On Breather and Cuspon waves solutions for the generalized higher-order nonlinear Schrodinger equation with light-wave promulgation in an optical fiber.* Comp. Meth. Sci. Eng, 1, pp.101-110.
3. Jing Li, **Yuyang Qiu**, Dianchen Lu, Raghda Attia, Mostafa Khater. *Study on the solitary wave solutions of the ionic currents on microtubules equation by using the modified Khater method.* Thermal Science, 23. 370-370. 10.2298/TSCI190722370L.

PUBLIC PRESENTATION/CONFERENCE ATTENDED

ISMP 2024 Jul. 2024
Session: Nonconvexity, stochasticity and hierarchy in optimization problems

- Presentation: Zeroth-order federated methods for stochastic MPECs and nondifferentiable nonconvex hierarchical optimization

NeurIPS 2023 Dec. 2023
Poster Session 1

- Poster presentation: Zeroth-Order Methods for Nondifferentiable, Nonconvex, and Hierarchical Federated Optimization
- Poster link: https://nips.cc/media/PosterPDFs/NeurIPS%202023/72874.png?t=1699387657.060764

INFORMS 2023 Annual Meeting Oct. 2023
Session: On Hierarchical and Federated Optimization

- Presentation title: Randomized Zeroth-Order Federated Methods for Nonsmooth Nonconvex and Hierarchical Optimization

SIAM Conference on Optimization (OP23) Jun. 2023
Session: On Addressing Nonsmoothness, Hierarchy, and Uncertainty in Optimization and Games

- Presentation title: Randomized Methods for Nonsmooth and Nonconvex Federated Optimization
- Abstract: https://meetings.siam.org/sess/dsp_talk.cfm?p=128796

UNDERGRADUATE ADVISING

Anuraag Sarkar (*Freshman, Mathematics & Computer Science Major at Rutgers*) Summer 2023
Project: Numerical Validation of Randomized Zeroth-Order Methods for Nonsmooth Federated Learning

- Taught the student the basics of optimization theory and algorithms, such as convexity and gradient-based methods. Also taught the student how to code algorithms in Python
- Introduced the idea of zeroth-order methods and federated learning to the student, helped student code federated algorithms such as Federated Averaging and zeroth-order Federated method
- Student successfully completed the project and made a poster presentation at the 2023 Summer Research Symposium.
  Poster link: https://drive.google.com/file/d/1CX5jonsM-7VR2j9SVDN2bfzxGv0CWGvd/view

SERVICE

Reviewer
Journal

- Institute of Industrial and Systems Engineers (IISE) Transactions

ACADEMIC EXPERIENCE

Distributed and Stochastic Optimization Apr. 2023 – May 2023
Type: PhD-level Course Project *Advisor: Prof. Farzad Yousefian*

- Studied a paper about proximal algorithm in federated learning
- Learned about the principle of proximal algorithms and its benefits
- Implemented the algorithm in python, compared with other algorithms to study its convergence behavior
- Wrote project report and made presentation to the class

Nonlinear Optimization Apr. 2022 – May 2022
Type: PhD-level Course Project *Advisor: Prof. David Coit*

- Purpose is to find out if FBA service by Amazon is worth for a third-party seller to use
- Used Barrier Function Method to solve the nonlinear problem
- Changed problem parameters and found its effect on the convergency
- Wrote project report and made presentation to the class

Simulation Nov. 2021 – Dec. 2021
Type: PhD-level Course Project *Advisor: Prof. Mariya Naumova*

- Assessment of the impact of sampling errors on mean-variance portfolios
- Used traditional mean-variance analysis then discuss portfolio optimization based on OLS and assessment of the impact of sampling errors on mean-variance portfolios

Optimization in Machine Learning and Data Analysis Apr. 2021 – May 2021
Graduate-level Course Project *Advisor: Prof. Yuqian Zhang*

- Conduct a survey of optimization in data analysis and machine learning
- Studied classic problems such as least squares, support vector machines and logistic regression
- Applied convex optimization methods to solve classic problems, studied the benefit and limit of traditional methods
- Studied the role of modern optimization in deep learning, and the challenge in it (such as nonsmoothness and nonconvexity)

Data Analysis Nov. 2020 – Dec. 2020
Type: Graduate-level Course Project *Advisor: Prof. Grace Guo*

- The objective was to identify which parts, subcomponents and main components are more likely to cause a car accident in each season and the most frequent pattern when mixed with accidents/breakdowns and seasons based on real datasets
- Used the R language to analyze datasets and made illustration graphs
- Made a PowerPoint and a video for presentation

Differential Equations Related May 2019 – Sep. 2019
Type: University Level *Advisor: Prof. Dianchen Lu*

- Served as a research assistant to Prof. Lu

- Wrote and submitted a paper entitled "On Breather and Cuspon waves solutions for the generalized higher-order nonlinear Schrodinger equation with light-wave promulgation in an optical fiber"
- Wrote and submitted a paper entitled "Study on the solitary wave solutions of the ionic currents on microtubules equation by using the modified khater method"
- Wrote and submitted a paper entitled "The Shock Peakon Wave Solutions of the General Degasperis Procesi Equation"

Combinatorial Optimization Mar. 2019- Apr. 2019
Type: Graduate-level Curriculum Design *Advisor: Prof. Oana Veliche*

- Conducted a brief research on Cook's Theorem and explained it in my own words
- Consulted related literature and wrote an essay

Research on sweeping robot algorithm Dec. 2017 – Jun. 2018
Type: Undergraduate Final Year Design *Advisor: Prof. Zhidan Deng*

- Wrote a paper entitled in "Research on sweeping robot algorithm"

INTERNSHIP

Yi Jia He Technology Co., Ltd Jun. 2018 –Aug. 2018
Intern in the department of software development *Nanjing, China*

- Learned how the power transformer substation inspection robot works
- Learned to use robot recognition and image processing skills

NARI Group Corporation/State Grid Electric Power Research Institute Dec. 2017 –Feb. 2018
Intern in the department of software development *Nanjing, China*

- Learned the working principle and working method of substation inspection robot

EXTRACURRICULAR ACTIVITIES

INFORMS Rutgers Student Chapter Sep. 2022- present
Serving as Treasurer of the chapter *Chapter Advisor: Prof. Ahmed Aziz Ezzat*

- Organized and participated in a pizza gathering for the graduate students in the ISE department
- Organized and participated in an online Zoom event aimed to boost LinkedIn page
- Offered course advices for first-year graduate students

College Student Union Public Relations Department Sep. 2014- Jun. 2015

- Participated in planning and negotiated with sponsors

TECHNICAL STRENGTH

Python

- Familiar with Python libraries and tools
- Good at implementing new algorithms that are not built-in, use coding as a way to understand the idea of algorithms

Matlab & R

- Familiar with toolboxes, data analysis