Kerui Wu

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Education

Rensselaer Polytechnic Institute (RPI) **Sept. 2021 – Expected May 2025**

Bachelor of Science *in Computer Science; GPA: 3.74/4.0* *New York, USA*

- **Dean's Honor List** 2021, 2022, 2023
- **Membership** in IT & Web Science Honor Society
- **Relevant Courses:** Machine Learning and Optimization; Deep Learning on Graph; Data Science
- **Undergraduate Thesis:** Simulating Mathematical Femtosecond Laser Micro with Partial Differential Equation; Advised by Professor Yuri Lvov
- **Undergraduate Thesis:** Identifying Vulnerable Child Care Centers Due to Effects of Temperature and Precipitation; Advised by Professor Thilanka Munasinghe

Certificate

Neural Network and Deep Learning **Mar. 2024**

DeepLearning.AI

Certified in CyberSecurity (CC) **May 2023**

ISC^2 (International Information System Security Certification Consortium)

Work Experience

Full-Stack Developer, Submitty Open Source **Jan. 2023 – May 2023**

Advisors: Barb Cutler (Associate Professor) *New York, USA*

- Submitty is an open-source course management, assignment submission, exam, and grading system, which is widely used by multiple colleges like RPI.
- Led the design and development of comprehensive full-stack features, including integrating customizable pronoun settings. This involved front-end development using HTML and JavaScript, backend API creation with PHP, and database schema design using SQL.
- Engineered and executed unit tests to ensure feature reliability, leveraging Cypress for testing automation and implementing continuous integration via GitHub workflows.
- Proactively identified, documented, and resolved software bugs, significantly improving system stability and user experience.

Computer Science Mentor, Rensselaer Polytechnic Institute **Sept. 2022 – Present**

Advisors: Shianne Hulbert (Instructional Support Coordinator) *New York, USA*

- Conducted regular office hours, providing one-on-one and group mentoring to assist students in overcoming challenges in their assignments and lab work.
- Facilitated lab sessions, guiding students through problem-solving processes, verifying solutions, and ensuring they grasped key concepts necessary for academic success.

Research Experience

Robustness of Graph Reduction Against GNN Poisoning

Advisors: Lei Yu (Assistant Professor), Yuxuan Zhu (PhD candidate)

- Empirically studied the impact of graph reduction algorithms like coarsening and sparsification on the robustness of GNN against state-of-the-art poisoning and backdoor attacks.
- Implemented six coarsening and six sparsification methods across three widely used GNN architectures and two certified robust GNN models to assess their influence in various poisoning and backdoor attacks.
- Visualized clean accuracy and attack success rates under varying hyperparameters and comprehensively analyzed experimental results to interpret the interplay between graph reduction techniques and GNN security.

Time Series Analysis on Multivariate Seismic Data

Advisor: Bulent Yener (Professor), Steve Roecker(Research Scientist)

- Explored the performance of cutting-edge deep learning models for unsupervised anomaly detection in multivariate seismic time series data collected from an array of sensors for earthquake identification and onset time picking.
- Reconstructed benchmark models using the latest versions of PyTorch, incorporating insights from a comprehensive literature review.

- Performed a thorough empirical evaluation, populating leaderboards based on F1-score, ROC curve, AUC, and computational efficiency, thereby advancing the state-of-the-art in seismic data analysis.

Efficient Steady-State Solver for Dynamical Complex Networks

Advisor: Jianxi Gao (Associate Professor), Yanna Ding (Candidate PhD)

- Combined Mean-Filed Approach with a perturbation-based method to efficiently compute steady states in large-scale dynamical systems with precision guaranteed.
- Implemented experiment in large dynamic networks with billions of nodes with four dynamic ODEs.
- Systematically evaluated solver's performance on different typologies like Erdős–Rényi and Scale-Free networks with different degree density and heterogeneity settings.

Publication

On the Robustness of Graph Reduction Against GNN Backdoor **Jul. 2024**

Yuxuan Zhu, Michael Mandulak, ***Kerui Wu****, George Slota, Yuseok Jeon, Ka-Ho Chow, Lei Yu*

- Accepted by **ACM AISec 2024**

Graph Data Poisoning Benchmark Against Graph Reduction

Kerui Wu*, Lei Yu*

- In preparation for **IEEE Big Data 2024**; Manuscript available

Solving Networked Dynamical Systems via Decoupling and Operator Splitting

Yanna Ding, ***Kerui Wu****, Yadi Cao, Malik Magdon-Ismail, Jianxi Gao*

- In preparation for **Physics Review X**; Manuscript available

Technical Implementations

China Construction Bank Achievement System | *React.JS, Go, MySQL, Azure* **Jan. 2024**

- Developed a web application for China Construction Bank (CCB) employees to submit their daily achievements, utilizing UI frameworks like MUI. The app is currently in use across 11 bank branches.
- Created a combined web app for administrators to check each employee's daily score, where a table with comprehensive query functional backend APIs, like filter and sort by job positions and bank locations, was provided.
- Create secure signup and login Restful API functions with the use of SHA256 encryption and JWT.
- Deploy the website, including the backend framework and database management system to Microsoft Azure and use workflow scripts in Github to automate such process.

NASA Data Visualization | *React.JS, Express.JS, MongoDB* **May 2023**

- Developed a visualization app for NASA's research on the impact of wind energy on energy production as part of a Web Science System term project.
- Designed and implemented a user-friendly web application using the React framework, enabling intuitive data visualization for complex datasets related to wind energy.
- Engineered and deployed RESTful APIs using Express.js, allowing third-party developers to seamlessly integrate with the system and access the visualization data.

Professional Skills

- Machine Learning & Numerical Computing: Pytorch, Torch-Geometric, Numpy, Scipy, SKLearn
- Programming: Python, C/C++, Javascript, PHP, Go, React.JS, Express.JS, jQuery
- Database: MySQL, PostgreSQL, MicrosoftSQL, MongoDB
- Tool: Ubuntu, KaliLinux, Azure, Git(Hub), NeoVIM