



# 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

## Research Experience

### Time Series Analysis on Multivariate Seismic Data

May 2024 - Present

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

*Project Lead*

- 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.
- 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.
- Enhanced the accuracy of picking results by applying Change Point Detection algorithms for post-processing.

### Robustness of Graph Reduction Against GNN Poisoning

Jan. 2024 - Present

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

*Collaborator, Project Lead*

- 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.

### Efficient Steady-State Solver for Dynamical Complex Networks

Jan. 2024 - Present

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

*Collaborator*

- 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**

### Evaluating the Impact of Graph Reduction on GNN Adversarial Robustness

*Kerui Wu, Lei Yu*

- In preparation for **CVPR 2025**; Manuscript available

### Efficient Steady-State Computation for Large Complex Systems

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

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

## Work Experience

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### 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.

## Technical Contribution

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### 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.

## Certificate

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### Neural Network and Deep Learning

Mar. 2024

DeepLearning.AI

### Certified in CyberSecurity (CC)

May 2023

ISC<sup>2</sup> (International Information System Security Certification Consortium)

## Professional Skills

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- **Machine Learning & Numerical Computing:** Pytorch, Torch-Geometric, Numpy, Scipy, SKLearn
- **Programming:** Python, C/C++, Javascript, PHP, Go, React.JS, Express.JS, jQuery, R
- **Database:** MySQL, PostgreSQL, MicrosoftSQL, MongoDB
- **Tool:** Ubuntu, KaliLinux, Azure, Git(Hub), NeoVIM
- **Personal Interest:** Running, Badminton, Video Editing, Music Production, Go(chess game)