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**

Understanding the Impact of Graph Reduction on Adversarial Robustness in GNNs
Kerui Wu*, Ka-Ho Chow, Wenqi Wei, Lei Yu*

- Under review in **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

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

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

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

Certified in CyberSecurity (CC) **May 2023**
ISC^2 (International Information System Security Certification Consortium)

Professional Skills

- **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)