

# YAO XIAO

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This is the verbose version. You may want to check out the [short version](#) with a selected subset of information instead.

## EDUCATION

**Harvard University** | Master of Science | Computational Science and Engineering 2024.09 – present

- GPA: NA/4.00, including: Computer Networks, Data Systems, Distributed Systems, Parallel Computing, Software Security, etc.

**New York University Shanghai** | Bachelor of Science | Honors Mathematics | Computer Science 2020.09 – 2024.05

- Honors Mathematics GPA: 4.00/4.00, including: Linear Algebra, Math Modeling, Probability Theory, Numerical Analysis, etc.
- Computer Science GPA: 3.97/4.00, including: Data Structures, Algorithms, Operating Systems, Software Engineering, etc.

## PUBLICATIONS

AUTHORS WITH <sup>†</sup> ARE SORTED BY  $\alpha$ - $\beta$  ORDER, OTHERS ARE SORTED BY CONTRIBUTION

- [1] Yuejie Wang, Qitong Men, **Yao Xiao**, Yongting Chen, and Guyue Liu. 2024. ConfMask: Enabling Privacy-Preserving Configuration Sharing via Anonymization. In *Proceedings of the ACM SIGCOMM 2024 Conference (ACM SIGCOMM'24)*. Association for Computing Machinery, New York, NY, USA, 465–483. [doi:10.1145/3651890.3672217](https://doi.org/10.1145/3651890.3672217)
- [2] Shengbin Yue, Shujun Liu, Yuxuan Zhou, Chenchen Shen, Siyuan Wang, **Yao Xiao**, Bingxuan Li, Yun Song, Xiaoyu Shen, Wei Chen, Xuanjing Huang, and Zhongyu Wei. 2024. LawLLM: Intelligent Legal System with Legal Reasoning and Verifiable Retrieval. In *29th International Conference on Database Systems for Advanced Applications (DASFAA'24)*. [doi:10.48550/arXiv.2309.11325](https://doi.org/10.48550/arXiv.2309.11325)
- [3] Xinyu Li<sup>†</sup>, **Yao Xiao**<sup>†</sup>, and Yuchen Zhou<sup>†</sup>. 2023. Efficiently Visualizing Large Graphs. [doi:10.48550/arXiv.2310.11186](https://doi.org/10.48550/arXiv.2310.11186)

## RESEARCH EXPERIENCE

**Privacy-Preserving Network Configuration Sharing via Anonymization** | [SIGCOMM'24](#) | [GitHub](#) 2022.10 – 2024.08

ADVISOR: Professor Guyue Liu, [guyue.liu@gmail.com](mailto:guyue.liu@gmail.com)

- Proposed the ConfMask framework to systematically anonymize topology and routing information in network configurations.
- Designed the anonymization algorithm for different protocols that mitigated deanonymization risks yet preserved important utilities.
- Managed to rigorously prove the route equivalence and routing utility preservation properties of the anonymization framework.
- Led the implementation of the end-to-end network configuration anonymization system and the artifact evaluation.

**Analyzing the Critical Behavior of Bernoulli Percolation in  $\mathbb{Z}^3$  via Invasion Percolation** | Capstone 2023.09 – 2024.01

ADVISOR: Professor Wei Wu, [ww44@nyu.edu](mailto:ww44@nyu.edu)

- Proved that in  $\mathbb{Z}^d$ , infinite cluster density at critical point  $\mathbf{P}_\infty(p_c) = 0$  if and only if invasion probability  $G_{\mathbb{Z}^d}(0, x) \rightarrow 0$  as  $|x| \rightarrow \infty$ .
- Verified via simulation that  $G_{\mathbb{Z}^3}(0, x) \leq G_{\mathbb{Z}^2}(0, x)$  for each  $|x|$ , thus proving that  $\mathbf{P}_\infty(p_c) = 0$  in  $\mathbb{Z}^3$  given the fact that it holds in  $\mathbb{Z}^2$ .
- Estimated the fractal dimension of the invasion percolation cluster in  $\mathbb{Z}^3$  numerically which was approximately 2.627.

**Efficient Distributed Serving System for Large Language Model Inference** | Capstone 2023.09 – 2024.01

ADVISOR: Professor Guyue Liu, [guyue.liu@gmail.com](mailto:guyue.liu@gmail.com)

- Enabled larger batch sizes beyond KV cache limit for layers except self-attention, observing that only self-attention relies on KV cache.
- Batched prefills and decodes dynamically in self-attention to mitigate pipeline bubbles caused by varying transformer input lengths.
- Packed multiple short attention computations with the longest one, while concurrently swapping KV cache to minimize overhead.

**Efficiently Visualizing Large Graphs** | Dean's Undergraduate Research Fund | [ArXiv](#) 2022.05 – 2022.08

ADVISOR: Professor Jie Xue, [jiexue@nyu.edu](mailto:jiexue@nyu.edu)

- Designed t-SGNE specialized for graphs, leveraging the neighboring relations between nodes and achieving 6.7x computation efficiency.
- Proposed SPLEE, a graph embedding method based on Laplacian eigenmaps and shortest paths, intended to suit t-SGNE.
- Combined SPLEE and t-SGNE for visualization of graphs with 300K nodes and 1M edges, achieving 10% improvement in visual effect.

## WORKING EXPERIENCE

**Scikit-learn** | Open Source | Core Developer | [125 Merged Pull Requests](#) 2023.04 – present

SKILLS: Python, Cython, JavaScript, Sphinx, scikit-learn, numpy, scipy, pandas, polars, CI/CD

- Managed maintenance tasks e.g., test suite coverage, code refactoring, developer API improvement, automated GitHub workflows, etc.
- Enhanced sparse array and polars dataframe support, estimator representation, metrics visualization, multilabel data cross-validator, etc.
- Optimized IncrementalPCA on sparse data (>10x faster, >30x less memory), SPD matrix generator (>10x less memory), etc.
- Led the redesign the entire scikit-learn main website and coordinated efforts in documentation improvements and UI/UX enhancements.

**DISC Lab, Fudan University** | Lab Assistant | [DASFAA'24](#) | [GitHub](#) 2023.05 – 2023.08

SKILLS: Python, PyTorch, HuggingFace, LLM, instruction tuning

- Led the construction of 403K legal knowledge instruction data, curated with legal syllogism prompting for higher expertise.
- Fine-tuned DISC-LawLLM, an LLM specialized for legal services based on Baichuan 13B Chat, outperforming GPT-3.5 Turbo.
- Participated in designing a verifiable knowledge retrieval module to inject external knowledge and enhance output actuality.
- Drove the implementation of a comprehensive benchmark for legal systems evaluation in both objective and subjective dimensions.

## TEACHING EXPERIENCE

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- **Linear Algebra**, MATH-SHU.0140, NYU Shanghai, Learning Assistant, Spring 2024
- **Calculus II**, MATH-SHU.0131, NYU Shanghai, Learning Assistant, Fall 2021, Fall 2023
- **Operating Systems**, CSCI-UA.0202, New York University, Teaching Assistant, Spring 2023

## PROJECTS

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**Optimized Column Store Database System** | Course Project 2024.09 – present

SKILLS: C, SIMD/AVX, multi-threading, query optimizations

- Built a cache-conscious column store that supports CRUD and schema operations, indexing, and joins, optimized for select queries.
- Supported clustered / unclustered sorted / B+ tree indexes, achieving 5x select speedup with <5% bulk loading overhead on 100M data.
- Implemented cache-conscious sort-merge and hash joins parallelized across all cores, outperforming nested-loop joins by up to 10x.
- Optimized with cache-conscious batching, multi-threading, and vectorized processing (AVX), speeding up 4x loading and 6x select.

**Deskulpt: A Cross-Platform Desktop Customization Tool** | [GitHub](#) 2024.03 – present

SKILLS: Rust, TypeScript, Tauri, React, Vite, SWC | **Full-stack**

- Led the development of a cross-platform system for highly customizable desktop widgets that can be written in React / TypeScript.
- Integrated rich development tools in Deskulpt, enabling streamlined widget creation and debugging, editor and type hints, etc.
- Built Deskulpt using Tauri to ensure system security and compatibility across Windows, macOS, and Linux environments.
- Utilized Rust's async capabilities in the backend to ensure responsive interactions between the UI and system resources.
- Implemented security measures, e.g., CSP protection, constraints on file system access, limiting frontend capabilities, etc.

**CampusHelper: WeChat / Alipay Miniprogram** 2023.12 – present

SKILLS: TypeScript, MongoDB, WeChat / Alipay cloud, miniprogram frameworks | **Full-stack**

- Utilized miniprogram cloud, including cloud functions, database, and storage to enhance data management and service reliability.
- Optimized miniprogram performance through cloud-based technologies, lazy loading, list virtualization, etc.
- Built a clean, consistent, accessible, and user-friendly interface, enhancing the overall user experience.
- Won the 2nd Prize (4th Place) in the [2023 Alipay Miniprogram Developers' Competition](#).

**YouTube Interface Customizer** | Course Project | [GitHub](#) 2023.02

- Built a Firefox extension that supports changing color themes, rearranging, and customizing elements of the YouTube interface.
- Created the documentations of features and contribution guides, and released (self-distributed) v1.0 at Mozilla Add-ons.

**Inequality Process Simulation** | Course Project | [Paper](#) | [GitHub](#) 2022.12

- Simulated inequality process in economic systems via nuanced random transactions functions, reflecting on real-world economy.
- Discovered that the final distribution of wealth in a real-world economic system fits the shape of a gamma or beta prime distribution.

**Gyro-Tower Simulation** | Course Project | [Paper](#) | [GitHub](#) 2022.10

- Modeled gyroscopes as networks of springs, formulated the system with differential equations, and solved it via Euler's method.
- Simulated vertical stacks of gyroscopes, and found that they obeyed gyroscopic precession assuming a flexible middle axle.

## HONORS AND AWARDS

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- [1] **Magna cum laude**, NYU Shanghai, 2024
- [2] **Level I Certification**, [CRLA's International Tutor Training Program](#), 2024
- [3] **2nd Prize, 4th Place**, [Alipay Miniprogram Developers' Competition](#), 2023
- [4] **Meritorious Winner**, [Mathematical Contest in Modeling](#), 2023
- [5] **Dean's List of Academic Year**, NYU Shanghai, 2020 – 2021, 2021 – 2022, 2022 – 2023

## SKILLS

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- [1] **Programming**: Proficient in Python, Rust, TypeScript; Intermediate in C/C++, Java, Julia, MATLAB
- [2] **Frameworks and packages**: CUDA; SIMD/AVX; OpenMP; Tauri, React; Numpy, Pandas, Polars, Scikit-learn, PyTorch
- [3] **DevOps**: Docker; Git; AWS, GCP; Ansible; Kubernetes; CircleCI, GitHub Actions; Computer networks; Distributed systems; Linux