

# Guorui Xiao

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## RESEARCH INTEREST

I am interested in data management, machine learning, language models, database systems, and machine learning systems, with the ultimate goal of building scalable data-intensive systems.

## EDUCATION

- University of Washington** Seattle, WA, USA
  - Ph.D. Student - Computer Science; GPA: 3.93/4.0* *Expected Graduation:: Sep. 2028*
  - Advisor: [Magdalena Balazinska](#)*
- University of California, Los Angeles** Los Angeles, CA, USA
  - Masters of Science - Computer Science; GPA: 4.0/4.0* *Graduated:: Mar. 2023*
  - Advisor: [Carlo Zaniolo](#)*
- University of California, Los Angeles** Los Angeles, CA, USA
  - Bachelor of Science - Computer Science; GPA: 3.77/4.0; Cum Laude* *Graduated: Dec. 2020*

## PUBLICATIONS & MANUSCRIPTS

- [P1] **Highly Efficient String Similarity Search and Join over Compressed Indexes**  
Guorui Xiao, Jin Wang, Chunbin Lin, Carlo Zaniolo. IEEE International Conference on Data Engineering (ICDE) 2022, pages: 232-244.
- [P2] **Demonstration of LogicLib: An Expressive Multi-Language Interface over Scalable Datalog System**  
Mingda Li, Jin Wang, Guorui Xiao, Youfu Li, Carlo Zaniolo. ACM International Conference on Information and Knowledge Management (CIKM) 2022, pages: 4917-4920. (demo paper)
- [P3] **Revealing Protocol Architecture's Design Patterns in the Volumetric DDoS Defense Design Space**  
Zhiyi Zhang, Guorui Xiao, Sichen Song, Angelos Stavrou, Eric Osterweil, and Lixia Zhang. IEEE Communications Surveys and Tutorials 2024. (survey paper)
- [P4] **RaSQL: A Powerful Language and its System for Big Data Applications**  
Jin Wang, Guorui Xiao, Jiaqi Gu, Jiacheng Wu, Carlo Zaniolo. ACM International Conference on Management of Data (SIGMOD) 2020, pages: 2673-2676. (demo paper)
- [P5] **Scaling state vector sync**  
Varun Patil, Sichen Song, Guorui Xiao, Lixia Zhang. ACM Conference on Information-Centric Networking. (ICN) 2022, pages: 168-170 (poster paper)
- [M1] **RS-SQL: A Query Language for Supporting Recursive Query Processing over Data Streams**  
Guorui Xiao, Jin Wang, Jiacheng Wu, Carlo Zaniolo. To be submitted to The International Journal on Very Large Data Bases (VLDB Journal)
- [M2] **RACoon: An LLM-based Framework for Retrieval-Augmented Column Type Annotation with a Knowledge Graph**  
Linxi Wei, Guorui Xiao, and Magdalena Balazinska. Under review by Conference on Neural Information Processing Systems (NeurIPS) 2024, Table Representation Learning Workshop.
- [M3] **ReLiShare: Reliable Leaker Identification in Sensitive Dataset Sharing**  
Zhiyi Zhang, Guorui Xiao, Xinyu Ma, and Lixia Zhang.

## ONGOING RESEARCH PROJECTS

- UW Database Group (UWDB)** University of Washington
  - Research Assistant* *Dec. 2023 - Present*
    - **Large Language Model for Table Understanding**
      - \* **Unified cost-effective LLM-based framework for Table Understanding**
        - Proposed a unified, cost-effective LLM-based framework for table understanding, optimizing performance while managing token costs within budget constraints.
        - Devised two novel yet general reducer paradigms to reduce table content and task-specific labels, minimizing misleading information and enhancing LLM comprehension.
        - Achieved performance improvements of up to 0.21 micro F1 in column type annotation, 0.12 micro F1 in relation extraction, and 0.29 mean Average Precision in schema augmentation compared to baseline models.
      - \* **Using RAG to improve LLM performance on Column Type Annotation [M2]**
        - Led a research intern to develop a novel system RACoon that augments prompts for LLMs in column type annotation using external non-parametric knowledge from a knowledge graph through RAG, achieving 0.21 improvement in micro F1 against baselines.

## SELECTED RESEARCH PROJECTS

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- **Scalable Analytics Institute (ScAi)** University of California, Los Angeles  
*Research Intern* Dec. 2019 - Mar. 2023
  - **Streaming Data Processing System that Supports Recursive Queries [M1]**
    - \* Proposed a high-level query language by drawing inspirations from Datalog for data streams to support expressing recursive queries.
    - \* Devised a lightweight structure *Queue-Based Index* to avoid redundant computation and further proposed an efficient query evaluation method based on it.
    - \* Designed and implemented a prototype datastream system (~15k lines of codes) to verify the effectiveness of the designs.
    - \* Conducted experiments that showed improvements of ~10X in throughput and ~5X in tail latency.
  - **Unified Compression Framework to Support String Similarity Queries [P1]**
    - \* Proposed the first unified framework for offline and online construction of compressed inverted index to support String Similarity Search/Join applications to avoid expensive disk I/O costs.
    - \* Devised algorithms to achieve near-optimal compression ratio in an online manner with tools like Kernel Density Estimation.
    - \* Conducted experiments that showed we improved ~5X in memory consumption.
  - **Demonstration of RaSQL [P4]**
    - \* Completed a demo to demonstrate that complex queries can be expressed with RaSQL and presented a user-friendly interface to interact with the RaSQL system and monitor the query results.
    - \* Implemented a front end over Flask with HTML/CSS/JS, connected the front end with the RaSQL system with Py4J, prepared example queries and datasets, and contributed to the paper writing.
- **Internet Research Laboratory (IRL)** University of California, Los Angeles  
*Research Intern* Jun. 2020 - Sep. 2020
  - **Systematization of Knowledge: distributed denial-of-service (DDoS) attack [P2]**
    - \* Systematically selected ~250 papers out of ~24,000 works related to volumetric DDoS attack and closely examined ~50 of them.
    - \* Performed detailed analysis over selected to derive systematized repeating design patterns and a set of IP network architecture properties.
    - \* Categorized the above papers into sub-categories based on their deployment locations, approaches, incentives, etc. and contributed to writing a research paper.
  - **Reliable Leaker identification via shared dataset [M3]**
    - \* Built a prototype system focusing on Oblivious-Transfer-based end-to-end sharing that realizes reliable leaker identification and Merkle-Tree-based credential to record the resulting shared dataset.
    - \* Implemented a Generative-Adversarial-Network-based (GAN-based) synthetic tabular data generator to minimize the impact on the authentic shared data.
    - \* Prepared dataset and conducted experiments to show we achieved  $< 1 \times 10^{-8}$  false negative rates by inserting only a few rows of synthetic data.

## SELECTED INDUSTRY EXPERIENCE

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- **Arista Networks, Inc.** Los Angeles, CA, USA  
*Software Engineer Intern* Jun. 2022 - Sep. 2022
  - **IEEE 802.1Q Tunneling CLI**
    - Designed the new module architecture that significantly reduced the code complexity compared to the existing similar tunneling implementation and completed a detailed design document.
    - Implemented software-side reactors and hardware-side bit setter that together can filter packets violating user-defined VLAN rules in 802.1Q tunneling. (~10k lines of codes)
    - Pushed the changes to the next release to be used by all switches over a specific popular platform.
- **Taboola, Inc.** Los Angeles, CA, USA  
*Machine Learning/Data Science Intern* Jun. 2019 - Sep. 2019
  - **Knowledge Base of News Keywords**
    - Built an end-to-end pipeline with Spark SQL and Java to process data crawled by IBM Watson and further capture their embeddings with Word2Vec. (~5k lines of codes)
    - Devised algorithms for de-duplicating keywords based on a combined metric, including similar neighbors, lexical similarity, etc.
    - Proposed a Knowledge Base representation of news keywords over Neo4j to effectively visualize keywords relationships and implemented an auto-renewal process that runs daily.
- **Qihoo 360 Technology Co.** Beijing, China  
*Machine Learning/Data Science Intern* Jun. 2018 - Sep. 2018
  - **Internet Traffic Classification and Anomaly Detection**

- Conducted surveys, implementations, and experiments on state-of-the-art machine learning algorithms for traffic anomaly detection and manually examined benign and malicious internet traffic samples.
- Selected features and devised an n-grams algorithm to form pseudo images from traffic.
- Designed a Random Forest model and a Neural Network model to achieve a 4% false positive rate and a 94% true positive rate.

## TEACHING EXPERIENCE

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- **COM SCI 35L: Software Construction Laboratory** Los Angeles, CA, USA  
*Teaching Assistant* *Fall 2021*
  - Lectured 20 hours of material focusing on Git, Shell, Vim, Java, etc., to 52 students and held 20 hours of office hours for ~250 students.
  - Mentored ~10 groups of undergraduate students completing Node.js/React projects.
  - Graded ~250 students' coding assignments and 2 exams.

## MISC

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- **Selected Courses:** Database System, Introduction to Machine Learning, Operating Systems, Compiler Construction, Internet Architecture and Protocols, Current Topics in Computer System Modeling Analysis.
- **Selected Languages:** Python, C/C++, Java, SQL, Bash, Datalog.
- **Selected Platforms:** Amazon EC2, Sklearn, Github, Neo4j, Apache Spark, Apache Flink, Spark Streaming, L<sup>A</sup>T<sub>E</sub>X.