

Postdoctoral Fellow in the Department of Computer Science at Hong Kong Baptist University with experience in designing and implementing various high-performance, secure database and distribution-aware data structures.

EDUCATION **Hong Kong Baptist University** Hong Kong, China
Ph.D. in Computer Science Sep 2021 – Jun 2026
Supervisor: Prof. Xu Jianliang

Huazhong University of Science and Technology Wuhan, China
Bachelor of Engineering in Electronics & Information Engineering Sep 2017 – Jun 2021
GPA: 3.7/4.0 (Rank: 15%)

PROFESSIONAL EXPERIENCE **Hong Kong Baptist University** Hong Kong, China
Postdoctoral Fellow Aug 2026 – Present
Ph.D. Candidate Sep 2021 – Jul 2026

- Supervisor: Prof. Xu Jianliang
- Designed novel algorithms and indexes for relational and vector databases to support efficient and secure query processing in a wide range of systems.
- Designed novel distribution-aware data structures to handle complex database workloads while ensuring robust performance.
- Research resulted in publications at top-tier conferences.

Nanyang Technological University Singapore
Visiting Scholar March 2026 – June 2026

- Supervisor: Prof. Wang Qichen
- Focus on "Learned Indexes for Query Optimization," specifically aiming to integrate learned index structures into structure-guided execution plans for acyclic queries.

Huazhong University of Science and Technology Wuhan, China
Researcher May 2019 – Feb 2020

- Design a fast consensus algorithm of blockchain combining SOTA consensus algorithm.
- Build a blockchain system for ASTRI as a integrity-assured record for distributed database.

RESEARCH INTERESTS

- Oblivious query processing for data federation and outsourcing cloud computing.
- Scalable secure query processing for vector database based on Trusted Execution Environments.
- Robust updatable learned index under real-world workload.
- Distributed vector database design

PUBLICATIONS

1. Y. Zhou[†], **X. Zhang**[†], C. Xu, and J. Xu, "Authenticated Approximate Nearest Neighbor Search in Outsourced Vector Databases," *Under SIGMOD Revision*, Jul. 2026, *Full Paper*.
2. Y. Peng[†], **X. Zhang**[†], J. Yang, S. Wang, T. N. Chan, B. Du, C. Dong, and J. Xu, "Privacy-Preserving Approximate Nearest Neighbor Search in Trusted Execution Environments," *Under Review*, Jun. 2026, *Full Paper*.
3. **X. Zhang**, L. Liang, A. Anastasia, and J. Xu, "HIRE: A Hybrid Learned Index for Robust and Efficient Performance under Mixed Workloads," *Proceedings of the ACM on Management of Data (SIGMOD '26)*, vol. 4, no. 1, Feb. 2026, *Full Paper*.
4. R. Tang, X. Zhu, **X. Zhang**, L. Chen, X. Li, M. Yuan, and J. Xu, "EDGE: DBMS-Empowered Boolean Decomposition for GIG Synthesis," in *ACM/IEEE Design Automation Conference (DAC '25)*, IEEE, 2025, pp. 1–7, *Full Paper*.
5. **X. Zhang**, Q. Wang, C. Xu, Y. Peng, and J. Xu, "FedKNN: Secure Federated k-Nearest Neighbor Search," *Proceedings of the ACM on Management of Data (SIGMOD '24)*, vol. 2, no. 1, Mar. 2024, *Full Paper*.

†These authors contributed equally.

RESEARCH PROJECTS

FedKNN: Secure Federated k-Nearest Neighbor Search

SIGMOD '24

- Proposed FedKNN, a system for secure and privacy-preserving federated kNN search, achieving up to 4.8× efficiency improvement over SOTA by optimizing local computations with a Distribution-Aware algorithm.

HIRE: A Hybrid Learned Index for Robust and Efficient Performance

SIGMOD '26

- Designed HIRE, a hybrid in-memory index combining learned predictions with traditional robustness, which reduces tail latency by 98% and improves throughput by 41.7× compared to SOTA approaches.

Privacy-Preserving Approximate Nearest Neighbor Search

Under Review

- Proposed a secure ANN index structure within trusted execution environments, mitigating side-channel attacks by enforcing oblivious memory access patterns on proximity graph indexes. In this paper, we achieve plaintext-level throughput with provable privacy guarantees by devising a distribution-aware oblivious access algorithm, significantly outperforming SOTA solutions.

Authenticated Approximate Nearest Neighbor Search

Under Revision

- Designed VIDA, a novel scheme for authenticated graph-based ANN search. VIDA leverages vector commitments and Inner Product Arguments to verify distance computations, thereby drastically reducing the overall data transmission size. To further optimize performance, we introduce MeST, a proof aggregation mechanism that compresses the verification of multiple vectors into a single cryptographic proof. In extensive experiment, our solution achieves up to a 5.2x speedup in end-to-end latency and reduces data transfer time by 99.3%.

TALKS

1. FedKNN: Secure Federated k-Nearest Neighbor Search, *2024 ACM SIGMOD International Conference on Management of Data*, Santiago, Chile, Jun. 2024.
2. Secure Federated kNN Search, *Huawei*, Online, Nov. 2024.
3. HIRE: A Hybrid Learned Index for Robust and Efficient Performance under Mixed Workloads, *2026 ACM SIGMOD International Conference on Management of Data*, Bengaluru, India, Jun. 2026.

SERVICES

- Reviewer, IEEE Transactions on Parallel and Distributed Systems (TPDS) 2025
- Reviewer, IEEE Transactions on Knowledge and Data Engineering (TKDE) 2024–2026
- Reviewer, Springer Data Science and Engineering (DSE) 2024
- External Reviewer, ACM International Conference on Management of Data (SIGMOD) 2025
- External Reviewer, International Conference on Very Large Data Bases (VLDB) 2023–2025
- External Reviewer, IEEE International Conference on Data Engineering (ICDE) 2022–2025

SKILLS

Programming Rust, C/C++, Golang, Python, $\LaTeX$, Bash

Tools Docker, Vim, Git, Linux

Languages English, Chinese

AWARDS

- Academic Excellence Scholarship, Huazhong University of Science and Technology 2018, 2021
- Excellent Teaching Assistant Performance Award, Hong Kong Baptist University 2022, 2023
- RPg Research Performance Award, Hong Kong Baptist University 2024, 2025
- ACM SIGMOD Student Travel Award, ACM 2024, 2026
- VLDB Student Travel Award, VLDB Endowment 2024

REFEREES

- Prof. Xu Jianliang, Head & Chair Professor, Hong Kong Baptist University
- Dr. Wang Qichen, Assistant Professor, Nanyang Technological University
- Prof. Byron Choi, Associate Head & Professor, Hong Kong Baptist University