

Education

2019.9 - Now *Peking University, Computer Science, Ph.D Student*

Advisor: Bin Cui Professor

◆ GPA: 3.59/4.0

2015.9 - 2019.7 *Renmin University of China, Computer Science, Bachelor*

Advisor: Wei Lu Associate Professor

◆ GPA: 3.78/4.0 ◆ Major Ranking: 2/56

Project

2021.9 - Now *A Comprehensive Experimental Evaluation for Database Tuning*

- ◆ I decompose existing tuning systems into three modules and comprehensively evaluate the intra-algorithms. In addition, I propose an efficient DB tuning benchmark that reduces the evaluation overhead to a minimum ($150 \sim 311 \times$ speedups), facilitating the analysis of new algorithms with fewer costs [Accepted by **VLDB 2022**].
- ◆ Based on the research, I developed an open-sourced database tuning system which has received industrial attention. It currently serves as a knob tuning toolkit for Database Autonomy Service (DAS) at Alibaba Cloud, Achieving 13%-50% improvement on throughput for various workloads.

2020.11 - 2021.9 *Dynamic and Safe Configuration Tuning for Cloud Database*

- ◆ To enhance the dynamicity and safety of existing configuration tuners, I define the online tuning problem and solve it as a contextual bandit problem with safety constraints.
- ◆ For safety, I combine the black-box and the white-box knowledge to evaluate the safety of configurations and propose a safe exploration strategy via subspace adaptation, largely reducing the risks of applying harmful configurations. Compared with the SOTA methods, it achieves 14.4%~165.3% improvement on cumulative improvement while decreasing 91.0%~99.5% unsafe recommendations. [Published in **VLDB 2022**].

2019.9 - 2020.9 *Resource-Oriented Configuration Tuning Boosted by Meta-learning*

- ◆ To mitigate the over-provision in clouds, I define the resource-oriented tuning problem and solve it via constrained Bayesian Optimization. Compared with the DBA tuned configurations, our method reduces 65%, 87%, 39% of CPU utilization, I/O and memory on average, respectively.
- ◆ To speed up the tuning process, I propose an ensemble model that represents prior knowledge from historical tuning tasks via ranking similarity. Compared with the SOTA methods, it finds better configurations with up to $\sim 18 \times$ speedups. [Published in **SIGMOD 2022**].

2018.11 - 2019.9 *Reinforcement Learning-Based Method for Join Optimization*

- ◆ I model the join optimization problem as a Markov decision process and propose deep Q-learning-based method to estimate the possible reward of a possible operation.
- ◆ I propose a tree-based embedding method to represent the "state" and use a beam search to avoid missing the optimal plans. Compared with the native Postgres implementation, RLO can be 14X faster in finding the execution plan and 12.9% faster in an end-to-end comparison. [Published in **SCIENTIA SINICA Informationis**].

2017.02 - 2018.8 *Similarity Search under Metric Spaces*

- ◆ I developed a plugin toolkit built on B+- tree that enables users to answer similarity queries in metric spaces simply using standard SQL statements.
- ◆ I propose a filtering strategy and a heuristics data partition algorithm, achieving up to two orders of magnitude faster than the existing domain-specific SQL-based solution. [Published in **VLDB 2018**]

Honors

- ◆ Best Student Paper Award at The 36th CCF National Database Conference. [NDBC 2019]
- ◆ 2021 Alibaba Academic Cooperation Outstanding Intern Award.
- ◆ 2021 National Scholarship.
- ◆ 2021 PKU Academic Innovation Award.
- ◆ 2019 PKU Learning Excellence Scholarship.
- ◆ 2018 National Scholarship.
- ◆ CCF Collegiate Computer Systems & Programming Contest 2018 - Bronze Medal.

Publications

1. **Xinyi Zhang**, Hong Wu, Yang Li, Jian Tan, Feifei Li, and Bin Cui. 2022. Towards Dynamic and Safe Configuration Tuning for Cloud Databases. In Proceedings of the 2022 International Conference on Management of Data, SIGMOD '22, June 12–17, 2022,

Philadelphia, PA, USA. ACM, New York, NY, USA, 15 pages. <https://doi.org/10.1145/3514221.3526176>. (**CCF A Conference, 1-th author**)

2. **Xinyi Zhang**, Zhuo Chang, Yang Li, Hong Wu, Jian Tan, Feifei Li, Bin Cui. Facilitating Database Tuning with Hyper-Parameter Optimization: A Comprehensive Experimental Evaluation. International Conference on Very Large Data Bases, PVLDB, 15(9): 1808 - 1821, 2022. doi:10.14778/3538598.3538604. (**CCF A Conference, 1-th author**)
3. **Xinyi Zhang**, Hong Wu, Zhuo Chang, Shuowei Jin, Jian Tan, Feifei Li, Tieying Zhang, and Bin Cui. 2021. ResTune: Resource Oriented Tuning Boosted by Meta-Learning for Cloud Databases. In Proceedings of the 2021 International Conference on Management of Data, SIGMOD '21, June 20–25, 2021, Virtual Event, China. ACM, New York, NY, USA, 13 pages. <https://doi.org/10.1145/3448016.3457291>. (**CCF A Conference, 1-th author**)
4. Xinyi Zhang, Zhipeng Zhang, Tieying Zhang, Bin Cui, Ju Fan. RLO: a reinforcement learning-based method for join optimization. SCIENTIA SINICA Informationis. (**CCF-A Chinese journal, 1-th author**).
5. Wei Lu, **Xinyi Zhang**, Zhiyu Shui, Zhe Peng, Xiao Zhang, Xiaoyong Du, Hao Huang, Xiaoyu Wang, Anqun Pan, Haixiang Li. MSQl+: A Plugin Toolkit for Similarity Search under Metric Spaces in Distributed Relational Database Systems. International Conference on Very Large Data Bases, PVLDB, 11 (12): 1970-1973, 2018. DOI: <https://doi.org/10.14778/3229863.3236237>. (**CCF A Conference, 1-th student author**)