Jiale Lao

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Education

Sichuan University **Sep. 2020 – May 2024**

Bachelor of Science in Software Engineering *Sichuan, China*

- GPA: 3.89/4.00 (Rank: 6/213)
- Advisor: Prof. Mingjie Tang from Sichuan University (Purdue Ph.D)
- I am a highly motivated and passionate undergraduate eager to **pursue admission into a Ph.D. program.** I possess a keen interest in **Database, Machine Learning, Large Language Models, and Graph Neural Networks.** My aim is to make significant contributions to the field through advanced research and collaborative efforts.

Research

Automatic Optimization of Database with Large Language Model **May 2023 – Present**

Research Intern *- https://github.com/SolidLao/GPTuner*

- Advisors: Prof. Jianguo Wang from Purdue University and Prof. Mingjie Tang from Sichuan University
- We design and implement GPTuner, a database tuning system that leverages domain knowledge to enhance knob tuning procedure
- We employ a LLM-based pipeline to handle multi-source knowledge, and design a prompt ensemble algorithm to transfer the unstructured knowledge into a structured view
- We leverage LLM-based techniques to prune the search space from two aspects, and propose a two-stage Bayesian Optimization framework to explore the optimized search space
- We conduct extensive experiments to demonstrate the effectiveness of GPTuner. We consider different benchmarks (TPC-C and TPC-H), metrics (throughput and latency) and DBMS (PostgreSQL and MySQL). Compared with the state-of-the-art methods, GPTuner finds the best-performing knob configuration with significantly less tuning rounds
- Project outcome: a paper in submission of VLDB 2024

Accelerating Shortest-Path Querying with Graph Neural Network **Octobor 2022 – Present**

Research Intern *- https://github.com/SolidLao/PathBee*

- Advisors: Prof. Jianguo Wang from Purdue University and Prof. Mingjie Tang from Sichuan University
- We design and implement PathBee, a novel framework based on Graph Neural Networks that offers significant improvements to the existing 2-hop labeling-based approaches
- We prove it is NP-hard to find an optimal vertex traverse order to enhance index construction procedure
- We model the index construction procedure and find Betweenness Centrality-based order performs best
- We propose leveraging GNN to calculate Betweenness Centrality to reduce its expensive computation costs, we develop a sampling strategy to improve accuracy as well as adapt to the characteristic of 2-hop labeling approaches
- We conduct experiments on 26 real-world datasets, and PathBee achieves substantial reductions in index construction time (up to 21.49 times), index size (up to 5.78 times), as well as query time (up to 2.18 times).
- Project outcome: a paper in submission of VLDB 2024

Resource-aware Optimization of Distributed Stream Processing System **September 2023 – Present**

Research Intern *Ant Group*

- Advisors: Prof. Mingjie Tang from Sichuan University
- We are developing a runtime multi-objective optimization framework for streaming jobs (e.g., Flink)
- We develop a throughput estimator and resource (e.g., CPU and MEM) estimators to bootstrap Genetic Algorithm
- We are testing our approach in the production environment of ANTGROUP to verify its effectiveness

Publication

GPTuner: A Manual-Reading Database Tuning System via GPT-Guided Bayesian Optimization

- **Jiale Lao**, Yibo Wang, Yufei Li, Zhiyuan Chen, Yunjia Zhang, Mingjie Tang, Jianguo Wang
- In submission, VLDB 2024

PathBee: Accelerating Shortest Path Querying via Graph Neural Networks

- **Jiale Lao**, Yinghao Tang, Tingfeng Lan, Mingjie Tang, Yuanchuan Zhou, Jianguo Wang
- In submission, VLDB 2024