# ZIKUN LI

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## EDUCATION

**School of Electronic Engineering and Computer Science, Peking University (PKU)** — Beijing, China
Bachelor of Science in Computer Science — Sep 2017 - Jul 2021

**School of Computer Science, Carnegie Mellon University (CMU)** — Pittsburgh, PA, US
Doctoral student in Computer Science — Aug 2022 - Present

- Advised by Prof. Zhihao Jia
- Research interests include: Quantum Computing, Quantum Compiler, Deep Reinforcement Learning

## PUBLICATION

1. **Zikun Li**, Jinjun Peng, Yixuan Mei, Sina Lin, Yi Wu, Oded Padon, and Zhihao Jia, "Oraq: A Learning-Based Quantum Circuit Optimizer" (under review).
2. Mingkuan Xu, **Zikun Li**, Oded Padon, Sina Lin, Jessica Pointing, Auguste Hirth, Henry Ma, Jens Palsberg, Alex Aiken, Umut A.Acar, and Zhihao Jia, 2022, "Quartz: Superoptimization of Quantum Circuits", PLDI '22.
3. Zheng Zhong*, Shen Yan*, **Zikun Li***, Decheng Tan, Tong Yang, Bin Cui, 2021, "BurstSketch: Finding Bursts in Data Streams", SIGMOD '21 (* indicates equal contribution).
4. Jizhou Li*, **Zikun Li***, Yifei Xu*, Shiqi Jiang, Tong Yang, Bin Cui, Yafei Dai, Gong Zhang, 2020, "WavingSketch: An Unbiased and Generic Sketch for Finding Top-k Items in Data Streams", KDD '20 (* indicates equal contribution).

## RESEARCH EXPERIENCES

**A reinforcement learning quantum program optimizer** — PA, USA
*Research assistant, CMU, Advisor: Prof. Zhihao Jia* — Jan 2022 - present

- Designed an reinforcement learning algorithm to optimize quantum circuits which supports multiple metrics and achieves up to **62%** improvement rate, exceeding the SOTA solution up to **20%**.
- Implemented a distributed framework that utilize multiple GPUs for training ($\sim$ **2k LOC in Python**).

**Quartz: A quantum program optimizer** — PA, USA
*Research assistant, CMU, Advisor: Prof. Zhihao Jia* — Sep 2021 - Apr 2022

- Designed a quantum program optimizer that automatically generate verified rules for quantum circuit optimization.
- Implemented a graph pattern matching engine to apply the rules with sub-graph substitution ($\sim$**3k LOC in C++**).
- Developed a cost-based heuristic search to effectively utilize the auto-generated rules which enables our optimizer to outperform the SOTA.

**A Sketch-Based Burst Detection Algorithm in High-Speed Data Streams** — Beijing, China
*Research assistant, PKU, Advisor: Prof. Tong Yang* — Mar 2020 - Nov 2020

- Designed a fast, accurate and memory-efficient algorithm for real-time detection of bursts in high-speed streams.
- Surveyed related works and conducted experiments to compare them with our approach.

**An Unbiased and Generic Data Structure for Finding Top-K Items in Data Streams** — Beijing, China
*Research assistant, PKU, Advisor: Prof. Tong Yang* — Jun 2019 - Feb 2020

- Proposed a data structure which provides unbiased and accurate estimation of frequency of items in a data stream, which achieves on average **2e4** lower error rate and **4.5** $\times$ faster insertion speed compared to prior solution.
- Implemented proposed algorithms in C++, built a benchmark platform ($\sim$**2k LOC in C++**) to efficiently compare our algorithms prior works in various settings.

## TECHNICAL SKILLS

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|---|---|
| **Programming Languages** | C/C++, Java, Python, OpenQASM, Javascript, SQL, Lisp |
| **Tools** | Git, GitHub, Weights & Biases, Docker, MySQL, SQLite, SQL Server |
| **Frameworks** | Pytorch, Tensorflow, CUDA, Pandas, Flask, React |