Kai Sun

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EDUCATION

University of Waterloo Waterloo, ON

B. Math., Double Major in Computer Science (Co-op) and Statistics September 2018 - April 2023

- 97.3% Cumulative GPA
- **Michael and Ophelia Lazaridis Olympiad Scholarship**: Full-ride scholarship (over $100,000 value) to the University of Waterloo

WORK EXPERIENCE

Uber Advanced Technologies Group (ATG) Toronto, ON

Research Intern September 2020 – December 2020

- (NDA) Deep learning research on intelligent vehicle-to-vehicle communication in cooperative self-driving to improve perception and prediction in vehicle fleets
- **Technologies used**: Python, PyTorch

SingleStore (formerly **MemSQL**) Seattle, WA

Software Engineering Intern, Query Optimization May 2020 - August 2020

- Implemented pruning methods on the join plan search space, achieving 16-40x speedups in the distributed optimizer for large customer joins of 18+ tables while still finding the same optimal plan
- Designed a data structure for the distributed optimizer cache to efficiently store and access sparse data, reducing its memory usage by over 80% for large customer joins
- Developed a heuristic search algorithm with a fast join cost estimator for 25-40 table joins that finds a backup join plan in 2-5 seconds with up to 90% lower estimated cost than previous backup plans
- **Technologies used**: C++, Python, SQL

BlackBerry Ottawa, ON

Android Software Development Student May 2019 - August 2019

- Implemented the syncing of email drafts between mobile devices and the Microsoft Exchange Server to expand support for Exchange Web Services (EWS) in the BlackBerry Hub+ Inbox app
- **Technologies used**: Java, Android Studio, SQLite

AWARDS

International Mathematical Olympiad, Silver Medal 2016

ACM-ICPC East Central North America Regional Contest, 4th Place (out of 135 teams) 2018

Putnam Mathematical Competition, Honorable Mention 2018, 2019

Canadian Mathematical Olympiad, 1st Place in Canada 2016

Canadian Computing Olympiad, Silver Medal 2018

RESEARCH EXPERIENCE

Research Assistant with **Professor Florian Kerschbaum** May 2021 – Present

- Machine learning research in security and privacy

Research Assistant with **Professor Martin Karsten** January 2021 – Present

- Ported Libfibre, a user-level threading runtime system, from x86 to ARM64 by implementing the context switch between user-level threads in ARM64 assembly language
- Implemented a fast lock for Libfibre in C++ by incorporating PThreads mutex and futex mechanisms

Research Assistant with **Professor Jimmy Lin** January 2021 – April 2021

- **Preprint**: Xueguang Ma, **Kai Sun**, Ronak Pradeep, and Jimmy Lin. *A Replication Study of Dense Passage Retriever*. arXiv:2104.05740, April 2021.
- Added question answering (QA) functionality to PyGaggle by integrating the DPR and GAR readers in Python
- Developed retriever and reader score fusion, improving the end-to-end QA accuracy from 41.9% to 44.0% on the Natural Questions (NQ) dataset