Kai Sun

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EDUCATION

University of Waterloo	Waterloo, ON
B. Math., Double Major in Computer Science (Co-op) and Statistics	Sep 2018 - Apr 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 ATG	Toronto, ON
Research Intern	*Python, PyTorch*	Sep 2020 – Dec 2020

- (NDA) Deep learning research on intelligent vehicle-to-vehicle communication in cooperative self-driving to improve perception and prediction in vehicle fleets

MemSQL	Seattle, WA
Software Engineering Intern	*C++, Python, SQL*	May 2020 - Aug 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

BlackBerry	Ottawa, ON
Android Software Development Student	*Java, Android Studio, SQLite*	May 2019 - Aug 2019

- Implemented syncing of email drafts between mobile devices and the Microsoft Exchange Server in Java to expand support for Exchange Web Services (EWS) in the BlackBerry Hub+ Inbox app
- Improved user experience by enhancing the search functionality for emails

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**	*C++, ARM64 Assembly*	Jan 2021 – Present

- Implemented a high-performance blocking lock in Libfibre, a user-level threading runtime written in C++, for multi-threaded programs by incorporating pthreads mutex and futex mechanisms
- Ported Libfibre from x86 to ARM64 by implementing the context switch between user-level threads in ARM64 assembly language

Research Assistant with **Professor Jimmy Lin**	*Python*	Jan 2021 – Apr 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