

# Kai Sun

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🌐 github.com/KaiSun314

🌐 kaisun.me

## 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 using 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