# Kasra Jamshidi

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## Research Interests

Scalable Graph Systems, Graph Query Languages.
Application-Aware Systems, Query Optimization.
Distributed Systems, Byzantine Fault Tolerance.

## Education

Simon Fraser University
**PhD Computer Science** - *Advised by Prof. Keval Vora*    2019-2024
**BSc Hon Computer Science**                2014-2019

## Publications

**Contigra: Graph Mining with Containment Constraints**                EuroSys '24
Joanna Che, **Kasra Jamshidi**, Keval Vora.
European Conference on Computer Systems, April 2024.

**OsirisBFT: Say No to Task Replication for Scalable Byzantine Fault Tolerant Analytics**   PPoPP '24
**Kasra Jamshidi**, Keval Vora.
Symposium on Principles and Practice of Parallel Programming, March 2024.

**Accelerating Graph Mining Systems with Subgraph Morphing**                EuroSys '23
**Kasra Jamshidi**, Guoqing Harry Xu, Keval Vora.
European Conference on Computer Systems, May 2023.

**Anti-Vertex For Neighborhood Constraints In Subgraph Queries**         GRADES-NDA '22
**Kasra Jamshidi**, Mugilan Mariappan, Keval Vora.
ACM Workshop on Graph Data Management Experiences & Systems and Network Data Analytics, June 2022.

**A Deeper Dive Into Pattern-Aware Subgraph Exploration With Peregrine**         OSR '21
**Kasra Jamshidi**, Keval Vora.
SIGOPS Operating Systems Review 55, 1, June 2021.

**Peregrine: A Pattern-Aware Graph Mining System**                EuroSys '20
**Kasra Jamshidi**, Rakesh Mahadasa, Keval Vora.
European Conference on Computer Systems, April 2020.

## Experience

**Graduate Research Assistant** @ SFU PDCL                April 2019 - Present

- Designed and implemented Peregrine, a programmable parallel graph mining system that is **700x faster** than the previous state-of-the-art with **8x fewer CPUs**, while using **100x less memory.**
  - Maintain open-source project: [https://github.com/pdclab/peregrine](https://github.com/pdclab/peregrine).
  - Performance scales nearly ideally with physical CPU cores (e.g., 48 cores lead to 41x speedup).
  - Custom lockfree aggregator.

- Built a distributed, fault tolerant stream processing system for an RDMA-enabled cluster using C++23. Solves analytics queries on massive, rapidly updating data, sustaining an average output throughput of **200M (3.5GB) records per second**.
  - Custom lockfree arena allocator to reduce context switches in critical path.
  - Custom Paxos implementation to take advantage of RDMA and provide Byzantine fault tolerance.
  - Asynchronous RDMA network layer implementation.

- Developed a runtime-agnostic query optimization framework that automatically improves graph mining execution speed by **10-34x** (saving **24 hours+** on some queries) with overhead in the milliseconds.
  - Accounts for low-level runtime traits to fix multiple different bottlenecks, uncovered via extensive profiling.
  - Formally proven correct with arbitrary aggregations and practically scales to large patterns and data graphs.
  - Integrated and evaluated the framework in 4 existing graph mining systems.

### Undergraduate Research Assistant @ SFU PDCL                September 2018 - August 2019

- Developed a distributed graph mining model without the synchronization requirements of Arabesque (SOSP '15) and implemented a proof-of-concept using Java, Scala, and the Akka actor framework.
- Implemented the DualSIM (SIGMOD '16) disk-based pattern-matching algorithm in C++.

### Object Clustering Robot Swarms @ SFU Autonomy Lab        January 2018 - May 2019

- Simplified existing compute-free, communications-free robot design to be deterministic, resulting in cheaper robot swarms that finish object clustering tasks **2-3x faster.**
- Observed novel environmental manipulation method to further improve clustering speed by **5x.**

### Founding Developer @ Polly Language Exchange/Lingvu        January 2017 - March 2018

- Developed web chat app that pairs users seeking to learn each other's native languages
- Technologies: WebRTC, Angular2, NGINX, Lua, Redis, Phoenix/Elixir, PostgreSQL Geospatial, Vagrant.

### Software Intern @ Nexedi Inc.                June 2016 - January 2017

- Developed various React web applications, including implementing reverse-indexing and fuzzy full-text search.
- Wrote technical documentation and tutorials for new products, and assisted in demonstrations by the CEO.

## Service & Other Activities

**Reviewing for Journals & Conferences:**
EuroSys 20, 23, 24; ATC 20, 21, 22; OSDI 20, 21; PACT 20; ASPLOS 21, 22; ICS 21; SOSP 23; ICDCS 23; VLDB 24.

### Student Mentoring

- Joanna Che (MSc), *Graph Mining with Containment Constraints.*
- Rakesh Mahadasa (MSc), *Incremental Graph Mining.*
- Jeremy Schwartz (undergraduate), *Graph Pattern Generation.*
- Hao Henry Fang (undergraduate), *Pattern-Aware Graph Mining on Weighted Graphs.*
- Daniel Gomes Maia Filho (undergraduate), *Workload-Balancing in Incremental Graph Mining.*
- Richard Dong (undergraduate), *Parallel Frequent Subgraph Mining.*

### President of the Computing Science Student Society

- Organized week-long student trip to Silicon Valley for tours and networking events.
- Taught undergraduate workshops on git and Linux software development.

### Technical Writer at BC Children's Society

- Drafted and edited program and funding proposals to the Ministry of Children and Families for new initiatives to assist children and youth with support needs.
- Revised internal training and reference manuals.

## Honours & Awards

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| Best Poster Award - Anti-Vertex For Neighborhood Constraints | 2022 |
| SFU Computing Science Graduate Fellowship | 2019, 2021, 2022, 2023 |
| Clark Wilson LLP Graduate Scholarship | 2022 |
| Best Poster Award - Peregrine: A Pattern-Aware Graph Mining System | 2020 |
| SFU Vice President-Research Undergraduate Student Research Award | 2018 |
| Gordon M. Shrum Major Entrance Scholarship | 2014 |