Kasra Jamshidi

Vancouver BC, Canada · contact@kjamsh.com · https://kjamsh.com

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

Designing Application-Aware Systems for Mining Large Graph Data Thesis
Kasra Jamshidi.
September 2024.

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

Scalable Byzantine Fault Tolerant Analytics without Replication 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

Software Engineer @ Safe Software November 2023 - Present

- Refined, debugged, and tested integrations with 10+ RDBMS for the flagship product FME, a data automation engine written in C++ and deployed to 200K active users in 25K organizations including Google, Amazon, and Oracle
- Implemented batching optimization for DuckDB integration, allowing FME to leverage DuckDB's columnar data layout for **100x improvement in processing throughput** over standard row-based processing
- Planned and led Neo4j graph database integration using Python, designing efficient interfaces between graph data and FME's internal C++ data representation, fulfilling multiple user-submitted feature requests for graph support
- Planned and led Delta Lake integration, enabling efficient access to delta tables in cloud storage
- Acted as domain expert on Python development within team and on graph databases throughout the organization
- Proactively improved code clarity by building C++23 library polyfills and a compile-time enum handling library during company hackathon, eliminating ad-hoc, redundant, and untested utility methods throughout the codebase
- In the year since joining, the team achieved **2x higher task** throughput than projected by management and the team's maintenance backlog became empty for the first time in 17 years

Graduate Research Assistant @ SFU PDCL April 2019 - September 2024

- 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.
  - 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

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