

Kasra Jamshidi

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Research Interests

Large-Scale Graph Mining Systems, Parallel Graph Algorithms.
Application-Aware Systems, Query Optimization, Graph Query Languages.
Distributed Systems, Byzantine Fault Tolerance.

Education

Simon Fraser University, BC, Canada
2019-Present PhD Computer Science
2014-2019 BSc. Computer Science

Publications

- 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

APR 2019 - PRESENT

Research Assistant - *Parallel & Distributed Computing Lab*

- Built a distributed, fault tolerant stream processing system for an RDMA-enabled cluster using C++23. Serves big data analytics queries on mutating graph datasets, sustaining an average output throughput of **200M (3.5GB) records per second**.
 - Deployed using Docker on a 32-node cluster
 - 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 Subgraph Morphing, a system-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.
 - Proven correct with arbitrary commutative/associative aggregations
 - Integrated and evaluated the technique in 4 existing pattern-based systems
 - Scales to large patterns and large data graphs
- 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**.
<https://github.com/pdclab/peregrine>
 - Performance scales nearly ideally with physical CPU cores (e.g., 48 cores lead to 41x speedup)
 - Handles datasets approaching memory limits using commodity machines (e.g., 32GB)
 - Custom lockfree aggregator

SEP 2018 - AUG 2019

Undergraduate Research Assistant – *Parallel & Distributed Computing Lab*

- 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++.

JAN 2018 - MAY 2018

Object Clustering Robot Swarm Research – *Autonomy Lab*

- 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**.

JAN 2017 - MAR 2018

Founding Developer – *Polly Language Exchange/Lingvu*

- Developed web chat app using OpenResty that pairs users seeking to learn each other's native languages, leveraging Redis queues to fairly match users. Implemented a microservice for finding nearby conversation partners using Phoenix web framework for Elixir and PostgreSQL geospatial.
 - Backend: OpenResty (NGINX), Lua, Redis, Phoenix/Elixir, PostgreSQL.
 - Frontend: WebRTC with vanilla JS, Angular 2.
 - Deployment: Vagrant and DigitalOcean.

JUN 2016 - DEC 2016

Software Intern – *Nexedi France*

- Developed a React web-app to compare open-source enterprise solutions. Implemented offline-capable indexing and fuzzy search using Levenshtein distance.
- Wrote documentation and tutorials implementing sample Python data science analyses using scikit-learn and other common libraries on the Wendelin Exanalytics system.
- Prepared tech demo for Wendelin to assist a sales presentation by the CEO to industry leaders

Service & Other Activities

Reviewing for Journals & Conferences

EuroSys '20, ATC '20, OSDI '20, PACT '20, ASPLOS '21, ICS '21, ATC '21, OSDI '21, ASPLOS '22, ATC '22, SOSP '23.

Student Mentoring

- 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 trips to Silicon Valley for tours and networking events at Google, Apple, Stripe, and various startups in the area.
- Organized tour and networking night for students and alumni at Electronic Arts Canada
- Taught student workshops on foundational technologies for undergraduates: Linux and git
- Organized a research hackathon where teams experiment with purposefully over-engineered software
- Directed executive team in event-planning, financial management, and engagement testing

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. <i>SFU Computing Science Research Day</i>	2022
SFU Computing Science Graduate Fellowship	2022
Clark Wilson LLP Graduate Scholarship	2022
SFU Computing Science Graduate Fellowship	2021
Best Poster Award - Peregrine: A Pattern-Aware Graph Mining System <i>SFU Computing Science Research Day</i>	2020
SFU Computing Science Graduate Fellowship	2019
SFU Vice President-Research Undergraduate Student Research Award	2018
Gordon M. Shrum Major Entrance Scholarship	2014