Mugilan Mariappan

PhD Candidate in Computer Science
Systems & Parallel Computing | SFU

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Research Interests

High-performance Graph Processing, Streaming Graph Systems, Graph Neural Network (GNN) Infrastructure, and Graph Database Systems.

Education

Ph.D. in Computing Science — Burnaby, Canada
Simon Fraser University — 2018 – Present
Dissertation: Incremental Processing of Streaming Graphs
Advisor: Dr. Keval Vora

B.E. in Computer Science — Coimbatore, India
Coimbatore Institute of Technology (GPA: 8.5/10) — 2010 – 2014

Publications

1. **GraphBolt: Dependency-Driven Synchronous Processing of Streaming Graphs**
Mugilan Mariappan and Keval Vora.
European Conference on Computer Systems (EuroSys), 2019.
2. **DZiG: Sparsity-Aware Incremental Processing of Streaming Graphs**
Mugilan Mariappan, Joanna Che, and Keval Vora.
European Conference on Computer Systems (EuroSys), 2021.
3. **Anti-Vertex for Neighborhood Constraints in Subgraph Queries**
Kasra Jamshidi, **Mugilan Mariappan**, and Keval Vora.
ACM SIGMOD Workshop on GRADES-NDA, 2022.
4. **Threshold Strategy for Leaking Corner-Free Hamilton-Jacobi Reachability with Decomposed Computations**
Chong He, **Mugilan Mariappan**, Keval Vora, and Mo Chen.
IEEE Conference on Decision and Control (CDC), 2025.

Research Experience

Simon Fraser University — Burnaby, Canada
Graduate Research Assistant, PDC Lab (PDCL) — 2018 – Present

- Engineered **DZiG**, a sparsity-aware incremental processing system that exploits computational sparsity to handle over **10M simultaneous graph mutations** with extreme efficiency compared to traditional re-computation.
- Developed **GraphBolt**, a dependency-driven streaming engine that **guarantees synchronous correctness** while delivering sub-millisecond update latencies for large-scale **streaming graphs**.
- Architected formal matching semantics and prototype grammar extensions for graph query languages (Cypher) to express and enforce complex structural neighborhood constraints.
- Designing high-performance system infrastructures to optimize the execution of large-scale Graph Neural Network (GNN) workloads and GraphRAG instances.

LinkedIn Graph Systems Lab Sunnyvale, USA
Graduate Research Intern Sep 2022 – Dec 2022

- Analyzed scalability and performance limiters for LinkedIn's proprietary **Liquid Graph Database** using LDBC Social Network Benchmark's complex workloads.
- Collaborated with **Microsoft Research (Gray Systems Lab)** to identify architectural bottlenecks and design optimization, establishing a technical roadmap for system-level enhancements.

Industry Experience

athenaHealth Chennai, India
Software Engineer May 2014 – July 2017

- Rearchitected the **athenaText** secure messaging module, improving stability and reducing application crashes by **50%**.
- Contributed to the ongoing engineering and maintenance of search functionality for **Epocrates**, supporting the stability of a core module used by over 50% of US physicians.

Teaching

Teaching Assistant (SFU): Distributed Systems (CMPT 431), Operating Systems (CMPT 300).
Mentorship:

- **Graduate Mentor:** Guided 7+ students in systems research and performance engineering at PDCL.
- **Key Collaborations:** Mentored Joanna Che (M.Sc.) for the **DZiG** project and supervised undergraduate researchers including M. Morrison, A. Scridon, and N. Kuwayama on graph infrastructure.

Honors, Awards & Service

Scholarships: Helmut & Hugo Eppich Family Grad Scholarship (2022); Special Graduate Entrance Scholarship (2018).

Fellowships: Graduate Fellowship (2018, '20, '22, '23); CMPT Graduate Fellowship (2019, '21, '22).

Awards: Best Poster Award (with Joanna Che), SFU CS Research Day 2019.

Leadership & Service:

- **SFU:** CS Councillor (Graduate Student Society); Secretary (CS Graduate Student Association).
- **CIT:** Secretary (Computer Science Association).