KALEIDOSCOPE: Graph Analytics on Evolving Graphs

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About me

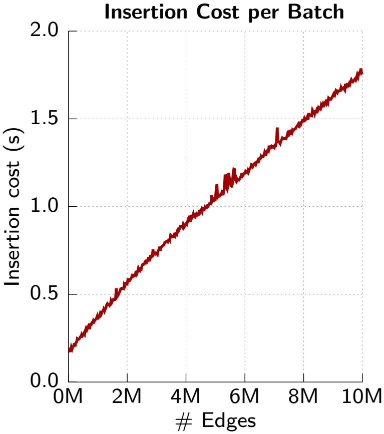
- 4th year PhD Student at Georgia Tech
- Advisor: Taesoo Kim
- Research Area: Systems
  - Operating Systems, Heterogeneous Systems, and Graph Processing
- Thesis work: Processing of Evolving Graphs

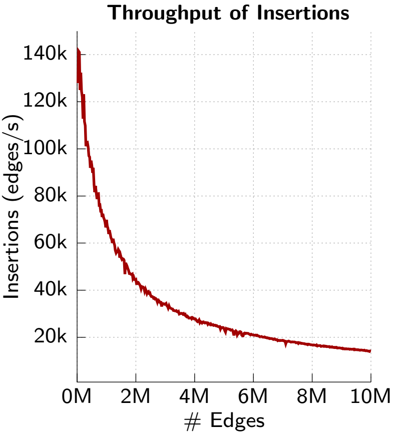
Kaleidoscope- Overview

- Problem: Low locality and high memory overhead for processing evolving graphs
- These problems hinder adoption of systems for evolving graphs, fallback: batch processing (large latency)
- We use a *tiled* representation of the evolving graph that mitigates memory overheads while allowing for higher processing performance
- Kaleidoscope can help with the execution of more complicated algorithms on larger graphs in less time.

Specific problem: Insertion performance

- Inserting edges into Stinger in batches
- Observe performance of insertions over edges present in graph

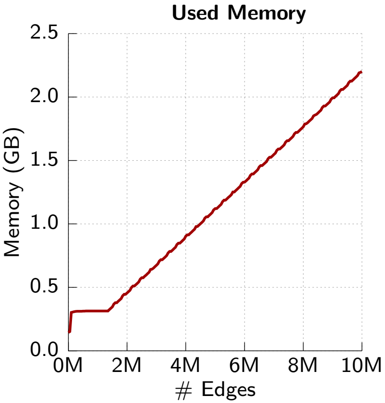


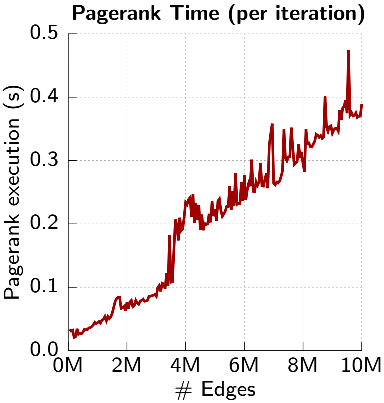


⇒ Insertion performance collapses with > 1M edges

Specific problem: Memory overhead

- Inserting edges into Stinger in batches
- Observe impact on execution time of evolving PageRank





⇒ Execution time grows super-linearly due to insertion overhead

Goals for KALEIDOSCOPE

- Core design idea: Use *tiled* graph representation
- Allows for:
  - Lower memory overhead by using localized identifiers
  - Asynchronous graph compaction
  - Improvements in locality with space-filling curves
- Also enables a straight-forward multi-core strategy by load-balancing tiles across processors

Conclusion

- KALEIDOSCOPE aims at addressing **three** problems when processing evolving graphs:
    - Large memory footprint
    - Synchronous compaction
    - Low locality
- KALEIDOSCOPE proposes a tiled data structure to address these problems:
    - Provides localized graphs
    - Enables asynchronous compaction
    - Exploits locality-optimizing space-filling curves

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Thanks!