PDSW-DISCS 2018: 3RD JOINT INTERNATIONAL WORKSHOP ON PARALLEL DATA STORAGE & DATA INTENSIVE SCALABLE COMPUTING SYSTEMS

PARALLEL ALGORITHMS FOR MINING LARGE-SCALE TIME-VARYING (DYNAMIC) GRAPHS

Big Data and Scalable Computing Research Lab

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TEMPORAL GRAPH

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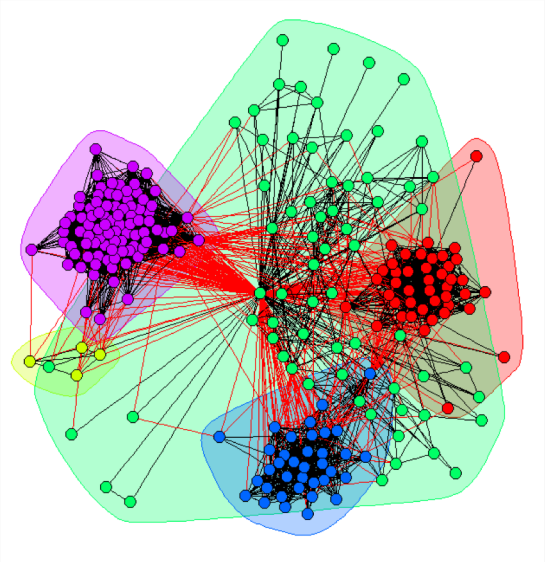
- powerful representation of various social, biological and technological dynamic systems
  - Social interactions and human activities,
  - appearance and disappearance of links in the Web,
  - patterns of interactions among genes
  - patterns of interactions in functional brain networks
- Complex system



APPLICATIONS

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- Diffusion and propagation in complex and social networks
  - spread of viruses through a community
- Understanding communication networks
  - false news propagation
- Improving transportation systems
  - route-planning algorithms depending on the traffic with varied time
- Neuron (brain) network analysis
  - Locating key neurons in cortical networks

MOTIVATION & CHALLENGES

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- defining and computing various temporal network metrics
  - classic studies' analysis of the topological properties of static graphs
- emergence of network big data
  - massive networks often do not fit in the main memory of a single machine
  - prohibitively large runtime for existing sequential methods

OUR APPROACH

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- Designing scalable algorithms
- Metrics
  - Computing path
  - Centrality
  - Communities

OUR SCALABLE ALGORITHMS FOR STATIC GRAPH

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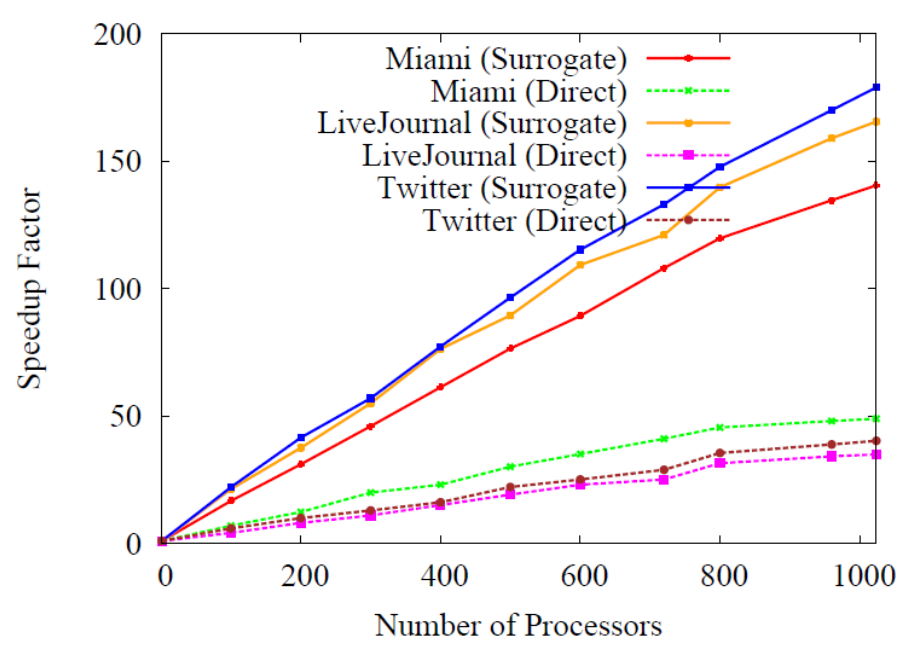
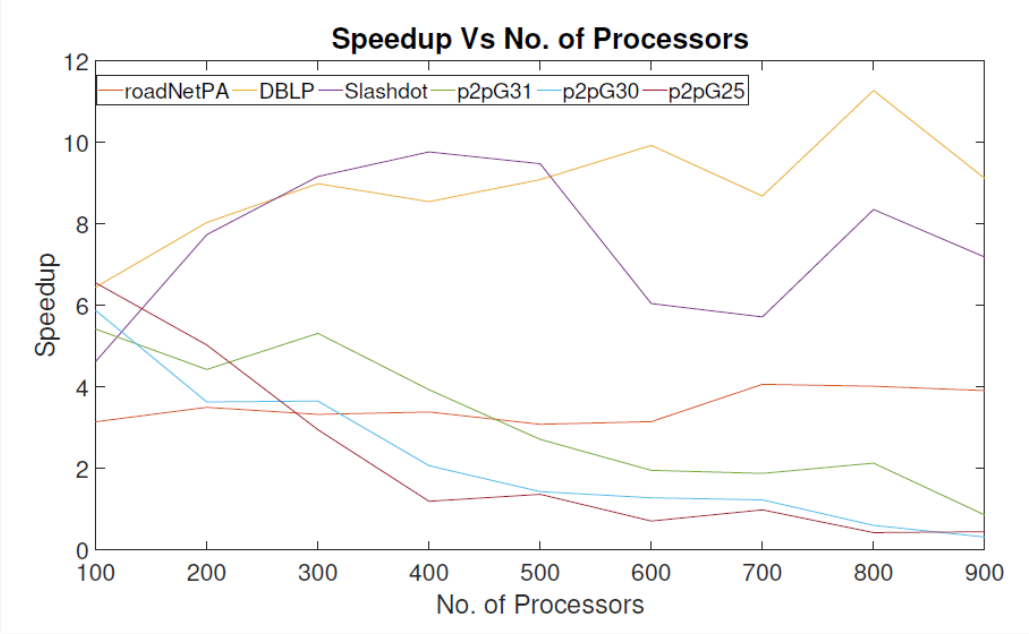
DISTRIBUTED-MEMORY PARALLEL ALGORITHMS FOR COUNTING AND LISTING TRIANGLES IN BIG GRAPHS



DPLAL (DISTRIBUTED PARALLEL LOUVAIN ALGORITHM WITH LOAD-BALANCING) TO DETECT COMMUNITIES



OUR MULTI-THREADED ALGORITHM FOR DYNAMIC GRAPH

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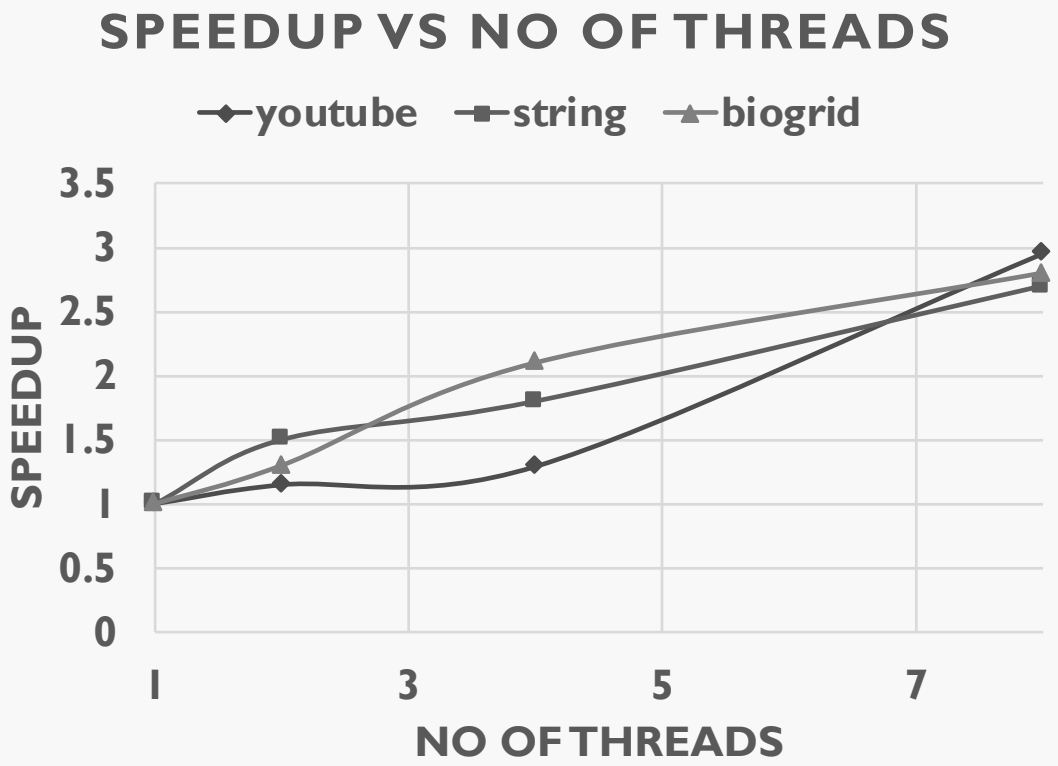
Speedup factors of our multithreaded shortest path algorithm



FUTURE WORKS

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Parallelize existing sequential temporal networks mining and computation of network metrics

- Efficient load balancing
- Communication schemes
- Data reduction (e.g., graph sparsification and approximation)
- Efficient formalization of temporal metrics

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THANK
YOU