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MADALGO seminars by Ulrich Meyer, Goethe University Frankfurt am Main

I/O-efficient hierarchical diameter approximation

Abstract:

Computing diameters of huge graphs is a key challenge in complex network analysis. As long as the graphs fit into main memory, diameters can be efficiently approximated (and frequently even exactly determined) using heuristics that apply a limited number of BFS traversals.

If the input graphs have to be kept and processed on external storage, however, even a single BFS run may cause an unacceptable amount of time-consuming I/O-operations.

In [SWAT08] we proposed the first parameterized diameter approximation algorithm with fewer I/Os than that required for exact BFS traversal.

In recent ongoing work we derive hierarchical extensions of this randomized approach and experimentally compare their trade-offs between actually achieved running times and approximation ratios. It turns out that the hierarchical approach is frequently capable of producing surprisingly good diameter approximations in shorter time than BFS. We also provide theoretical and practical insights into worst-case input classes.

Joint work with Deepak Ajwani and David Veith