A Functional Approach to External Graph Algorithms

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Abstract

We present a new approach for designing external graph algorithms and use it to design simple external algorithms for computing connected components, minimum spanning trees, bottleneck minimum spanning trees, and maximal matchings in undirected graphs and multi-graphs. Our I/O bounds compete with those of previous approaches. Unlike previous approaches, ours is purely functional—without side effects—and thus is amenable to standard checkpointing and programming language optimization techniques. This is an important practical consideration for applications that may take hours to run.