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SlashBurn: Graph Compression and Mining beyond Caveman Communities

Abstract:

Given a real world graph, how should we lay-out its edges? How can we compress it? These questions are closely related, and the typical approach so far is to find clique-like communities, like the 'cavemen graph', and compress them. We show that the block-diagonal mental image of the 'cavemen graph' is the wrong paradigm, in full agreement with earlier results that real world graphs have no good cuts. Instead, we propose to envision graphs as a collection of hubs connecting spokes, with super-hubs connecting the hubs, and so on, recursively. Based on the idea, we propose the SLASHBURN method to recursively split a graph into hubs and spokes connected only by the hubs. We also propose techniques to select the hubs and give an ordering to the spokes, in addition to the basic SLASHBURN. We give theoretical analysis of the proposed hub selection methods. Our view point has several advantages: (a) it avoids the 'no good cuts' problem, (b) it gives better compression, and (c) it leads to faster execution times for matrix-vector operations, which are the back-bone of most graph processing tools. Through experiments, we show that SLASHBURN consistently outperforms other methods for all datasets, resulting in better compression and faster running time. Moreover, we show that SLASHBURN with the appropriate spokes ordering can further improve compression while hardly sacrificing the running time.