Research Internship

Real-world Graph Algorithmics I: Node Ordering for Efficiency and Compression

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The Web graph (webpages connected by hyperlinks), Facebook (profiles connected by friendships), Internet (computers connected by Internet connections) and a human brain (neurones connected by synapses) are only a few examples of graphs extracted from the real-world. Designing practical algorithms to solve graph problems in these real-world graphs has applications ranking from web search to drug design. However, designing such algorithms is an extremely challenging task, indeed these graphs are huge making any quadratic time algorithm not practical.

Ordering nodes of an input graph in a relevant way has proved to be a key subroutine for solving many problems such as finding a dense subgraph [3, 7], listing triangles [11], listing k-cliques [4, 6], listing maximal cliques [9, 10], finding a maximum clique [14], counting k-motifs [13] and compressing graphs [2, 5, 1, 12, 8].

The internship aims at (i) finding better orderings to use in existing ordering dependent graph algorithms and (ii) suggesting new efficient ordering dependent graph algorithms.

Required skills: C programming, analysis of algorithms, computational complexity theory, (convex) optimization, intuition and modelization, English. Any skill is optional except having the eye of the tiger.

References

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