

Graph Coloring, Palette Sparsification, and Beyond

Sepehr Assadi  

Dept. of Computer Science, Rutgers University, New Jersey, USA

Abstract

Graph coloring is a central problem in graph theory and has numerous applications in diverse areas of computer science. An important and well-studied case of graph coloring problems is the $(\Delta + 1)$ (vertex) coloring problem where Δ is the maximum degree of the graph. Not only does every graph admit a $(\Delta + 1)$ coloring, but in fact we can find one quite easily in linear time and space via a greedy algorithm. But are there more efficient algorithms for $(\Delta + 1)$ coloring that can process massive graphs that even this algorithm cannot handle?

This talk overviews recent results that answer this question in affirmative across a variety of models dedicated to processing massive graphs – streaming, sublinear-time, massively parallel computation, distributed communication, etc. – via a single unified approach: *Palette Sparsification*. We survey the ideas behind these results and techniques, their generalizations to various other coloring problems and even beyond (e.g., to clustering problems), as well as their natural limitations.

The talk is based on a series of joint works with Noga Alon, Andrew Chen, Yu Chen, Sanjeev Khanna, Pankaj Kumar, Parth Mittal, Glenn Sun, and Chen Wang.

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