Fast Algorithms for Geometric Intersection Graphs

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Geometric intersection graphs are graphs whose n vertices correspond to geometric objects and whose m edges correspond to pairs of intersecting objects. Several classes of geometric intersection graphs are defined by restricting the shape of the objects: disks, unit disks, squares, rectangles, etc. *Graph-based* algorithms receive as input solely the adjacency representation of the graph while *geometric* algorithms receive the geometric representation of the graph. In this talk, we consider approximation algorithms to two classic hard optimization problems: maximum independent set and minimum dominating set. We are particularly interested in algorithms whose running times are close to linear in the input size, i.e. $\widetilde{O}(n+m)$ for graph-based algorithms and $\widetilde{O}(n)$ for geometric algorithms (the $\widetilde{O}(\cdot)$ notation conceals logarithmic factors). We will discuss four different approaches to obtain such algorithms: greedy, local search, strip decomposition, and shifting coresets, comparing their performance for different problems and graph classes.

This work is based on multiple papers co-written by the author with Celina M. H. de Figueiredo, Vinicius G. Pereira de Sá, Raphael Machado, Gautam K. Das, and Ramesh K. Jallu.