Spectral algorithms for graph mining and analysis

Yiannis Koutis, University of Puerto Rico

Spectral algorithms have long been recognized as a significant tool in the analysis and mining of large graphs. However their adoption remains relatively limited because they are perceived as computationally demanding or non-robust. The talk addresses these two issues. We review recent algorithmic progress that enables the very fast computation of graph eigenvectors in time nearly linear to the size of the graph, making them very appealing from a computational point of view. We also review theoretical results that provide strong arguments in favor of spectral algorithms from a robustness point of view, showing that Cheeger inequalities are rather pessimistic for significant classes of graphs that include real-world networks. We further argue that we have only scratched the surface in understanding the power of spectral methods for graph analysis. We support this claim by discussing non-standard "generalized" graph eigenvectors, and showing that minor modifications of the default spectral partitioning methods have the potential to enhance their efficacy.