Title : Modularity in random regular graphs and lattices.

Abstract :

Modularity is a score given to partitions of graphs which is highly used in clustering algorithms to group highly connected nodes, and also in statistical physics where it gives the energy state of a particular Gibbs model of a system.

We use probabilistic methods to show that the edge expansion parameter can be used to derive almost sure upper bounds on the modularity of a graph. This extends to results in random regular graphs. We show that aas the modularity of a random cubic graph lies in the interval (0.66,0.88), when the components are restricted to sub-linear size.

A result published by R. Guimerà et. al. gave a lower bound for the modularity of complete sections of the square lattice. We extend this result to any subgraph of the square lattice and can achieve a lower bound of the same order of magnitude. Indeed this result extends to any graph which has an embedding into the plane with bounded edge length and edge density.

Ref: Guimerà, M.Sales-Pardo, L.A.Amaral, Modularity from fluctuations in random graphs and complex networks, Phys Rev E Stat Nonlin Soft Matter Phys. 70 (2) 2004.