

Entrywise Bounds for Eigenvectors of Random Graphs

Pradipta Mitra

Reykjavik University

Abstract

Let G be a graph randomly selected from $\mathbf{G}_{n,p}$, the space of Erdős-Rényi Random graphs with parameters n and p , where $p \geq \frac{\log^6 n}{n}$. Also, let A be the adjacency matrix of G , and v_1 be the first eigenvector of A . We provide two short proofs of the following statement: For all $i \in [n]$, for some constant $c > 0$

$$\left| v_1(i) - \frac{1}{\sqrt{n}} \right| \leq c \frac{1}{\sqrt{n}} \frac{\log n}{\log(np)} \sqrt{\frac{\log n}{np}}$$

with probability $1 - o(1)$. This gives nearly optimal bounds on the entrywise stability of the first eigenvector of (Erdős-Rényi) Random graphs. This question about entrywise bounds was motivated by a problem in unsupervised spectral clustering. We make some progress towards solving that problem.