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The spectral gap of random lifts

Joint work with Simon Griffiths. For a fixed d -regular graph H , a random n -lift is obtained by replacing each vertex v of H by a “fibre” containing n vertices, then placing a random matching between adjacent fibres. We show that with high probability, all eigenvalues of the lift that are not eigenvalues of H (“new” eigenvalues), have order $O(\sqrt{d})$, and that any exceptionally large new eigenvalues are with high probability caused by a dense subgraph of size $O(|E(H)|)$.