Spectral gap in bipartite biregular graphs and applications
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The almost sure asymptotical value of the second-largest eigenvalue in random regular graphs has been computed by Friedman [Fr2004], and a new and simpler proof of this has been recently given by Bordenave [Bo2015]. The proof established random regular graphs as almost Ramanujan (or asymptotically Ramanujan), with consequences and applications that reach far and wide. Starting from Bordenave's clever use of the non-backtracking operator, we have been able to calculate the almost sure asymptotical value of the third-largest eigenvalue in random bipartite biregular graphs and obtained a similar spectral gap result. Applications include community detection in equitable graphs or frames, matrix completion, and the construction of channels for efficient and tractable error-correcting codes (Tanner codes). This work is joint with Gerandy Brito and Kameron Harris.