A renormalisation group approach to the universality of Wigner's semi-circle law for random matrices with dependent entries

Thomas Krajewski[*1]

[1]Aix-Marseille Université – Aix-Marseille Université - AMU – France

Abstract

Spectral properties of random matrices have many applications in physics, ranging from nuclear physics to disordered systems. This ubiquity can be traced back to the universality of spectral properties: whatever the distribution of the entries are, the spectral observables obey some universal laws when the size of the matrices become large. A simple example is Wigner's semi-circle law that describes the density of eigenvalues for a hermitian matrix whose entries are independent and identically distributed (iid). We extend it beyond the iid case, provided the cumulants obey a simple power law bound in the size of the matrix. To derive this result, we use the replica technique and a renormalisation group equation for the replica effective action. This is joint work with Vu Dinh Long (student at Ecole Polytechnique) and Adrian Tanasa (LABRI, Bordeaux).

[*]Speaker