Correlated volumes at the Anderson transitions in a random graph

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We study the Anderson Transition in disordered models with random connectivities. Specifically, we focus on the degree of ergodicity of the high-energy wavefunctions. We use the multifractal formalism to analyze numerical data for unprecedented large system sizes, obtaining a set of correlated volumes which control finite-size effects. Those volumes grow very fast with disorder strength but show no tendency to diverge, at least in an intermediate metallic regime. Close to the Anderson transitions, we characterize the crossover to system sizes much smaller than the first correlated volume. Once this crossover has taken place, we obtain evidence of a scaling in which the derivative of the first fractal dimension behaves critically with an exponent $\nu = 1$.

M Pino, JE Roman Phys. Rev. B 109, 184204 (2024)
M Pino. Physical Review Research 2 (4), 042031 (2020)