

Two-resolvent local laws with decorrelation in energy space

Abstract:

Let $G_1(w_1)$, $G_2(w_2)$ be resolvents of two large random matrices. For a broad class of mean field models it is known that $G_1(w_1)G_2(w_2)$ concentrates around a deterministic matrix, with fluctuations controlled from above by $\eta := \min\{|\operatorname{Im} w_1|, |\operatorname{Im} w_2|\}$. Such estimates are known as two-resolvent local laws. In this talk, I will discuss both Hermitian and non-Hermitian random matrix ensembles. For each setting, I will present an improved two-resolvent local law whose control parameter captures the dependence on $w_1 - w_2$ and other model parameters in an optimal way. I will then discuss several applications of these results, focusing on the recent proof of hyperuniformity for the eigenvalue process of a non-Hermitian matrix with independent identically distributed entries. The talk is based on several recent joint works with G. Cipolloni, L. Erdős, J. Henheik and Z. Bao.