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Universality for general Wigner-type matrices. (English) Zbl 1403.60010

The definition of Wigner matrices goes back to the revolutionary 1958 paper of E. P. Wigner [Ann. Math. (2) 67, 325–327 (1958; Zbl 0085.13203)]. Ever since random matrices have attracted considerable attention and the last decade has seen several groundbreaking results. Let $H = H^* \in \mathbb{C}^{N \times N}$ be a random $N \times N$ Hermitian matrix with independent and centered entries. The matrix of variances $v_{ij} = \mathbb{E}[|h_{ij}|^2]$ is not assumed to be stochastic, and so the density of states is not Wigner’s semicircle law. The authors demonstrate that as the matrix dimension $N$ tends to infinity, the resolvent $z \mapsto (H - z)^{-1}$ converges to a diagonal matrix with entries $m_1(z), \ldots, m_N(z)$ satisfying for each $i$ the equation

$$-m_i(z)^{-1} = z + \sum_j v_{ij}m_j(z).$$

The latter equation has been analyzed in [“Quadratic vector equations on complex upper half-plane”, Preprint, arXiv:1506.05095] by the first author et al. In this manuscript, the authors prove a local law down to the smallest spectral resolution scale as well as bulk universality for both real symmetric and complex Hermitian symmetry classes.

Reviewer: Joscha Prochno (Graz)

MSC:
60B20 Random matrices (probabilistic aspects)
15B52 Random matrices (algebraic aspects)

Keywords:
eigenvector delocalization; rigidity; anisotropic local law; local spectral statistics

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References:

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