Götze, F.; Naumov, A. A.; Tikhomirov, A. N.

The authors consider a random symmetric matrix $X = (X_{ij})_{i,j=1}^n$ whose upper triangular entries are independent identically distributed random variables with zero mean, unit variance and finite $(4 + \delta)$-th moment. They prove that the typical distance between the Stieltjes transform of the empirical spectral measure of the matrix $n^{-1/2}X$ and the Stieltjes transform of the Wigner semicircle distribution is of order $(nv)^{-1}$, where $v$ is the distance in the complex plane to the real line. The estimate is stated in terms of the $p$-th moment of the difference between the two Stieltjes transforms. The authors deduce several corollaries of this result. More precisely, they provide an estimate on the rate of convergence of the empirical distribution function of $n^{-1/2}X$, and an estimate on the rigidity of the eigenvalues stating that these are, in some sense, close to the corresponding quantiles of the Wigner law. They also obtain a delocalization result for the eigenvectors of $n^{-1/2}X$.

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

Keywords:
random matrix; symmetric matrix; Wigner law; local semicircle law; empirical distribution function; Stieltjes transform; rigidity of eigenvalues; speed of convergence; delocalization of eigenvectors

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