

Central limit theorem for partial linear eigenvalue statistics of Wigner matrices

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In this paper, we study the complex Wigner matrices $M_n = \frac{1}{\sqrt{n}}W_n$ whose eigenvalues are typically in the interval $[-2, 2]$. Let $\lambda_1 \leq \lambda_2 \leq \dots \leq \lambda_n$ be the ordered eigenvalues of M_n . Under the assumption of four matching moments with the Gaussian Unitary Ensemble (GUE), for test function f 4-times continuously differentiable on an open interval including $[-2, 2]$, we establish central limit theorems for two types of partial linear statistics of the eigenvalues. The first type is defined with a threshold u in the bulk of the Wigner semicircle law as $A_n[f; u] = \sum_{l=1}^n f(\lambda_l) \mathbf{1}_{\{\lambda_l \leq u\}}$. And the second one is $B_n[f; k] = \sum_{l=1}^k f(\lambda_l)$ with positive integer $k = k_n$ such that $k/n \rightarrow y$ in $(0, 1)$ as n tends to infinity. Moreover, we derive a weak convergence result for a partial sum process constructed from $B_n[f; \lfloor nt \rfloor]$.

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