Pseudo-hermitian random matrix theory: phase structure in metric parameter space

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Pseudo-hermitian random matrix theory: phase structure in metric parameter space

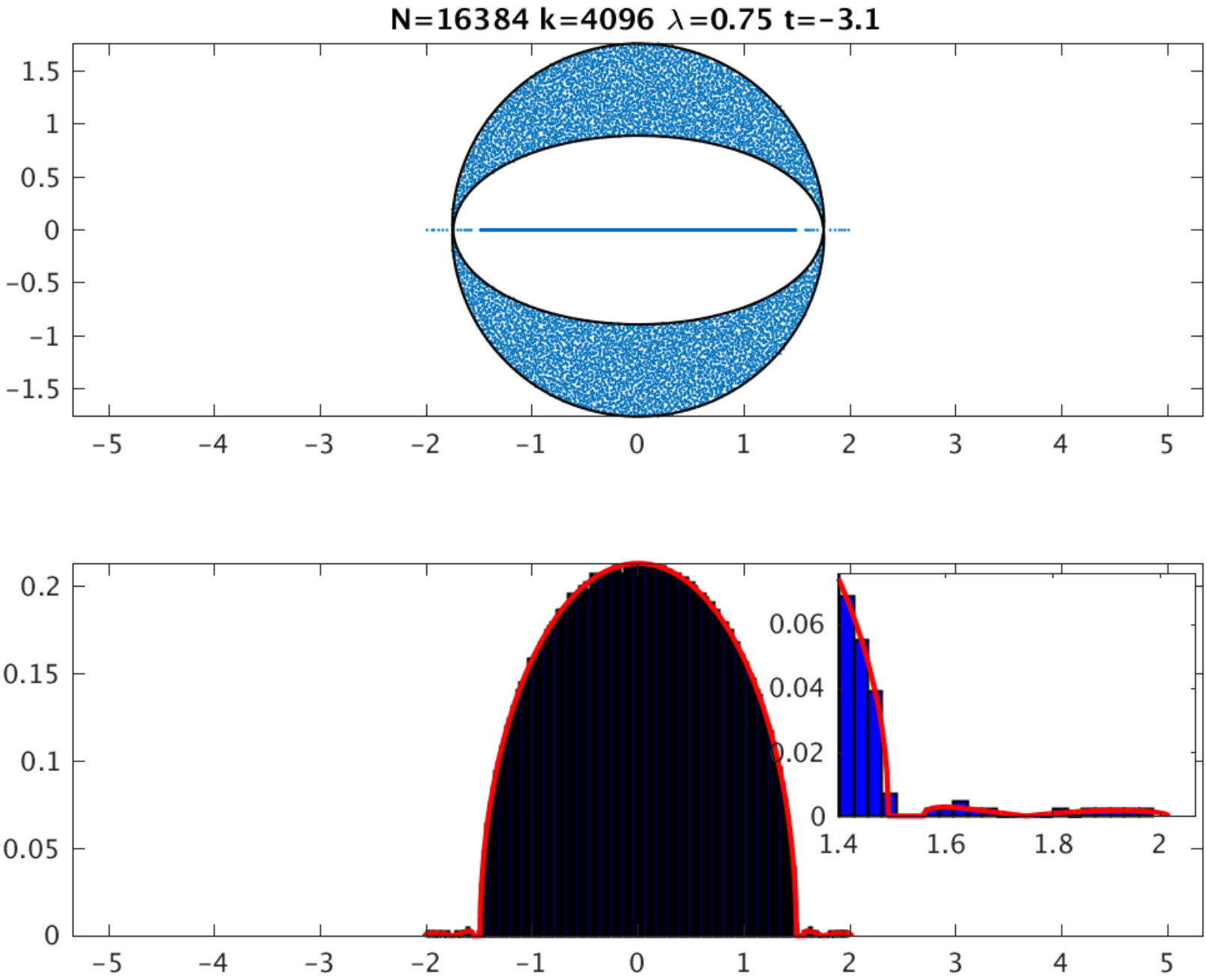
- Pseudo-hermitian random matrix φ: $\mathbf{B}$ is a fixed metric, φ is a $N \times N$ random matrix that fulfills the intertwining relation $\varphi^\dagger \mathbf{B} = \mathbf{B}\varphi$.
- Indefinite metric $\mathbf{B}$ is of the form

$$\mathbf{B} = \mathrm{diag}\,(\underbrace{1,\ldots,1}_{k},\underbrace{t,\ldots,t}_{N-k}), \qquad \lambda = k/N, t < 0.$$

- Probability distribution on φ

$$P(\varphi) = \tilde{Z}_N^{-1} \mathrm{e}^{-\frac{Nm^2}{2}\mathrm{Tr}\,(\mathbf{B}^{-2}\varphi^\dagger\varphi)}.$$

- Calculation of eigenvalue distribution using diagrammatic approach in the planar limit where matrix size $N \to \infty$.
- Contains real eigenvalue density as well as domains in the complex plane which are filled with constant density.
- Rich phase structure with critical phases in the complex domain and/or in the real density.
- Video where λ is fixed and t changes with time.


N=16384 k=4096 λ=0.75 t=-3.1
1.5
1
0.5
0
-0.5
-1
-1.5
-5
-4
-3
-2
-1
0
1
2
3
4
5
0.2
0.15
0.1
0.05
0
0.06
0.04
0.02
0
1.4
1.6
1.8
2