

SAMPLING UNITARY ENSEMBLES

Sheehan Olver

The University of Sydney, Australia

Sheehan.Olver@sydney.edu.au

We develop a computationally efficient algorithm for sampling from a broad class of unitary random matrix ensembles that includes but goes well beyond the straightforward to sample Gaussian Unitary Ensemble (GUE). The algorithm exploits the fact that the eigenvalues of unitary ensembles (UEs) can be represented as a determinantal point process whose kernel is given in terms of orthogonal polynomials. Consequently, our algorithm can be used to sample from UEs for which the associated orthogonal polynomials can be numerically computed efficiently. By facilitating high accuracy sampling of non-classical UEs, the algorithm can aid in the experimentation-based formulation (or refutation) of universality conjectures involving eigenvalue statistics that might presently be unamenable to analysis. Examples of such experiments are included.

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