Learning Random Matrix Approximations of String Theory: Kähler Metrics

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Abstract

We do lots of interesting things.

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2.1 Optimization of Bergman Metrics

2.1.1 A brief review of Bergman metrics

In the same way that many functions can be well-approximated by a Taylor series, one might hope to find a universal class of metrics that converge to the metrics of interest. For Kähler metrics, the class of Bergman metrics serve this purpose. It was shown by (Tian-Yau-Zelditch) that a Bergman metric can provide an arbitrarily good approximation to a given Kähler metric, in a fixed Kähler class. To review, let us consider a compact Kähler manifold M with an effective line bundle L, such that L^k is ample for some $k > 0$. We consider a basis of sections of L^k of the form $s^\alpha(z^i)$, where the z^i are projective coordinates on M. The Kähler potential for the Bergman metric takes the form

$$k = \log(s_\alpha P_{\alpha\bar{\beta}} \bar{s}_{\bar{\beta}}) \,, \tag{1}$$

where the matrix P is positive-definite, and therefore can be written as $P = A^\dagger A$.

2.2 New Ensembles from Generative Adversarial Networks

3 Kähler metrics at fixed Picard Number

3.1 $h^{11} = 10$

3.2 $h^{11} = 16$

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