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The Large-N Limit Of Matrix Models And AdS/CFT

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Abstract content
   (Max 300 words)
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Random matrix models have found numerous applications in both Theoretical Physics and Mathematics. In the AdS/CFT correspondence, for example, the dynamics of the half-BPS states can be fully described in terms of the holormorphic sector of a single complex matrix model which is related to (1+1)-dimensional free fermions in a harmonic potential.

In this work, we consider the strong-coupling limit of multi-matrix models coupled via Yang-Mills interactions. In particular, we consider the significance of rescaling the matrix fields. In order to investigate the role played by such a rescaling, we consider the matrix quantum mechanics of a simple Hermitian system. The system is compactified on a circle, and using the Das-Jevicki-Sakita Collective Field Theory approach we obtain the exact ground-state energy of the system.

We then fully compactify N=4 SYM on the four-sphere. A radial sub-sector is readily identified and the eigenvalue spectrum obtained for an arbitrary number of matrices. For two matrices we parametrize the system using matrix valued polar coordinates. A closed form (using the Harish-Chandra-Itzykson-Zuber formula) for the saddle point equations at strong-coupling is derived. A complementary approach to the saddle point equations technique - based on the Dyson-Schwinger equations - is given. The system is then regulated with a Penner-type potential and the density of eigenvalues is obtained.

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Level for award
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MSc.

Main supervisor (name and email)
and his / her institution

Prof. JP Rodrigues.
University of the Witwatersrand, Johannesburg.
joao.rodrigues@wits.ac.za

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No

Primary author: Mr MULOKWE, Mbavhalelo (University of the Witwatersrand)

Presenter: Mr MULOKWE, Mbavhalelo (University of the Witwatersrand)

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