

# Abstract

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**Abstract:** The presented thesis discusses the analytical solutions to the Hermitian matrix models that arise as a description of scalar field theory on the fuzzy sphere. We introduce the reader to the basic concepts regarding noncommutative spaces, fuzzy spaces and fuzzy field theory. We highlight the interplay between a scalar field theory defined on a fuzzy space and a random matrix model. We review the techniques used to solve Hermitian matrix models in the limit corresponding to the commutative limit of related fuzzy field theories. We discuss the essential obstacles preventing us from solving the matrix model of a scalar field theory on the fuzzy sphere exactly and assess the approximations we can use. We then develop an analytical, perturbative method to obtain the solution of these approximations. We compare our results with the numerically obtained data for the exact model and evaluate the successes and the shortcomings of the approximations we used. We then examine the possible improvements upon these approximations. Finally, we investigate the matrix model suggested to be free of the UV/IR-mixing phenomenon and observe the expected consequences

of the UV/IR-mixing removal.

**Key words:** fuzzy sphere, scalar field theory on the fuzzy sphere, Hermitian matrix models