

Preface

The subject of matrix field theory involves matrix models, noncommutative geometry, fuzzy physics and noncommutative field theory, and their interplay.

These lecture notes contain a systematic construction of matrix models of quantum field theories with noncommutative and fuzzy geometries. Emphasis is placed on the matrix formulation of noncommutative and fuzzy spaces and on the nonperturbative treatment of the corresponding field theories. In particular, the phase structure of noncommutative phi-four theory is treated in great detail, and an introduction to noncommutative gauge theory is given. The text has evolved partly from my own personal notes on the subject and partly from lectures given, intermittently, to my doctoral students during the past few years. Thus, the list of topics, while not necessarily representing the exact state of the art, reflects the research interests of the author and the educational goals of Annaba University.

The references included are not meant to be comprehensive or exhaustive, but they will provide a solid bibliography and a reliable guide to background reading.

Small parts of these lectures have already appeared in various preprints on the arXiv. Reference to this Springer publication is made there.

The book is primarily written as a self-study guide for postgraduate students—with the aim of pedagogically introducing them to key analytical and numerical tools as well as useful physical models in applications. Last but not least, I dedicate this work to my father Saad Ydri, 1943–2015, for his continuous support.

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