Statistical Field Theory

Claude Itzykson,Jean-Michel Drouffe

Statistical Field Theory:

Statistical Field Theory Giorgio Parisi,1988-01-21 A comprehensive text book covering the field of statistical physics
Statistical Field Theory: Volume 1, From Brownian Motion to Renormalization and Lattice Gauge Theory Claude Itzykson,Jean-Michel Drouffe,1991-03-29 Volume 1 From Brownian Motion to Renormalization and Lattice Gauge Theory Volume 2 Strong Coupling Monte Carlo Methods Conformal Field Theory and Random Systems This two volume work provides a comprehensive and timely survey of the application of the methods of quantum field theory to statistical physics a very active and fruitful area of modern research The first volume provides a pedagogical introduction to the subject discussing Brownian motion its anticommutative counterpart in the guise of Onsager s solution to the two dimensional Ising model the mean field or Landau approximation scaling ideas exemplified by the Kosterlitz Thouless theory for the XY transition the continuous renormalization group applied to the standard phi to the fourth theory the simplest typical case and lattice gauge theory as a pathway to the understanding of quark confinement in quantum chromodynamics The second volume covers more diverse topics including strong coupling expansions and their analysis Monte Carlo simulations two dimensional conformal field theory and simple disordered systems The book concludes with a chapter on random geometry and the Polyakov model of random surfaces which illustrates the relations between string theory and statistical physics The two volumes that make up this work will be useful to theoretical physicists and applied mathematicians who are interested in the exciting developments which have resulted from the synthesis of field theory and statistical physics *Statistical Field Theory* Giuseppe Mussardo,2020-03-26 Fundamental concepts of phase transitions such as order parameters spontaneous symmetry breaking scaling transformations conformal symmetry and anomalous dimensions have deeply changed the modern vision of many areas of physics leading to remarkable developments in statistical mechanics elementary particle theory condensed matter physics and string theory This self contained book provides a thorough introduction to the fascinating world of phase transitions and frontier topics of exactly solved models in statistical mechanics and quantum field theory such as renormalization groups conformal models quantum integrable systems duality elastic S matrices thermodynamic Bethe ansatz and form factor theory The clear discussion of physical principles is accompanied by a detailed analysis of several branches of mathematics distinguished for their elegance and beauty including infinite dimensional algebras conformal mappings integral equations and modular functions Besides advanced research themes the book also covers many basic topics in statistical mechanics quantum field theory and theoretical physics Each argument is discussed in great detail while providing overall coherent understanding of physical phenomena Mathematical background is made available in supplements at the end of each chapter when appropriate The chapters include problems of different levels of difficulty Advanced undergraduate and graduate students will find this book a rich and challenging source for improving their skills and for attaining a comprehensive understanding of the many facets of the subject **Statistical Field Theory:**

Volume 2, Strong Coupling, Monte Carlo Methods, Conformal Field Theory and Random Systems Claude Itzykson,Jean-Michel Drouffe,1991-03-29 Volume 1 From Brownian Motion to Renormalization and Lattice Gauge Theory Volume 2 Strong Coupling Monte Carlo Methods Conformal Field Theory and Random Systems This two volume work provides a comprehensive and timely survey of the application of the methods of quantum field theory to statistical physics a very active and fruitful area of modern research The first volume provides a pedagogical introduction to the subject discussing Brownian motion its anticommutative counterpart in the guise of Onsager s solution to the two dimensional Ising model the mean field or Landau approximation scaling ideas exemplified by the Kosterlitz Thouless theory for the XY transition the continuous renormalization group applied to the standard phi to the fourth theory the simplest typical case and lattice gauge theory as a pathway to the understanding of quark confinement in quantum chromodynamics The second volume covers more diverse topics including strong coupling expansions and their analysis Monte Carlo simulations two dimensional conformal field theory and simple disordered systems The book concludes with a chapter on random geometry and the Polyakov model of random surfaces which illustrates the relations between string theory and statistical physics The two volumes that make up this work will be useful to theoretical physicists and applied mathematicians who are interested in the exciting developments which have resulted from the synthesis of field theory and statistical physics   Quantum and Statistical Field Theory Michel Le Bellac,1991 As a fundamental branch of theoretical physics quantum field theory has led in the last 20 years to spectacular progress in our understanding of phase transitions and elementary particles This textbook emphasizes the underlying unity of the concepts and methods used in both domains and presents in clear language topics such as the perturbative expansion Feynman diagrams renormalization and the renormalization group It contains detailed applications of critical phenomena to condensed matter physics such as the calculation of critical exponents and a discussion of the XY model Applications to particle physics include quantum electrodynamics and chromodynamics electroweak interactions and lattice gauge theories The book is based on courses given over several years on statistical mechanics and field theory and is written at graduate level It attempts to guide the reader through a somewhat difficult and sometimes intricate subject in as clear a manner as possible leading to a level of understanding where more advanced textbooks and research articles will be accessible The only textbook covering the subject at this level the work is thus an ideal guide for graduate and postgraduate students in physics researchers in quantum and statistical field theory and those from other fields of physics seeking an introduction to quantum field theory A large number of problems are given to test the reader s grasp of the ideas   **Introduction to Statistical Field Theory** Edouard Brézin,2010-07-22 Knowledge of the renormalization group and field theory is a key part of physics and is essential in condensed matter and particle physics Written for advanced undergraduate and beginning graduate students this textbook provides a concise introduction to this subject The textbook deals directly with the loop expansion of the free energy also known as the background field method This is a powerful

method especially when dealing with symmetries and statistical mechanics In focussing on free energy the author avoids long developments on field theory techniques The necessity of renormalization then follows   Statistical Field Theory Giorgio Parisi,1987   Statistical Field Theory G. Mussardo,2010 A thorough and pedagogical introduction to phase transitions and exactly solved models in statistical physics and quantum field theory   *Statistical Field Theory* ,2016   Methods of Quantum Field Theory in Statistical Physics A. A. Abrikosov,L. P. Gorkov,I. E. Dzyaloshinski,2012-05-04 This comprehensive introduction to the many body theory was written by three renowned physicists and acclaimed by American Scientist as a classic text on field theoretic methods in statistical physics   **Quantum Field Theory and Statistical Mechanics** James Glimm,Arthur Jaffe,1985-01-01 This volume contains a selection of expository articles on quantum field theory and statistical mechanics by James Glimm and Arthur Jaffe They include a solution of the original interacting quantum field equations and a description of the physics which these equations contain Quantum fields were proposed in the late 1920s as the natural framework which combines quantum theory with relativ ity They have survived ever since The mathematical description for quantum theory starts with a Hilbert space H of state vectors Quantum fields are linear operators on this space which satisfy nonlinear wave equations of fundamental physics including coupled Dirac Max well and Yang Mills equations The field operators are restricted to satisfy a locality requirement that they commute or anti commute in the case of fer mions at space like separated points This condition is compatible with finite propagation speed and hence with special relativity Asymptotically these fields converge for large time to linear fields describing free particles Using these ideas a scattering theory had been developed based on the existence of local quantum fields   Introduction to Statistical Field Theory E. Brézin,2010 Knowledge of the renormalization group and field theory is a key part of physics and is essential in condensed matter and particle physics Written for advanced undergraduate and beginning graduate students this textbook provides a concise introduction to this subject The textbook deals directly with the loop expansion of the free energy also known as the background field method This is a powerful method especially when dealing with symmetries and statistical mechanics In focussing on free energy the author avoids long developments on field theory techniques The necessity of renormalization then follows   ☐☐☐ Claude Itzykson,Jean-Michel Drouffe,2004   Statistical Approach to Quantum Field Theory Andreas Wipf,2012-10-28 Over the past few decades the powerful methods of statistical physics and Euclidean quantum field theory have moved closer together with common tools based on the use of path integrals The interpretation of Euclidean field theories as particular systems of statistical physics has opened up new avenues for understanding strongly coupled quantum systems or quantum field theories at zero or finite temperatures Accordingly the first chapters of this book contain a self contained introduction to path integrals in Euclidean quantum mechanics and statistical mechanics The resulting high dimensional integrals can be estimated with the help of Monte Carlo simulations based on Markov processes The most commonly used algorithms are presented in detail so as to prepare the reader for the use of high performance computers as

an experimental tool for this burgeoning field of theoretical physics Several chapters are then devoted to an introduction to simple lattice field theories and a variety of spin systems with discrete and continuous spins where the ubiquitous Ising model serves as an ideal guide for introducing the fascinating area of phase transitions As an alternative to the lattice formulation of quantum field theories variants of the flexible renormalization group methods are discussed in detail Since according to our present day knowledge all fundamental interactions in nature are described by gauge theories the remaining chapters of the book deal with gauge theories without and with matter This text is based on course tested notes for graduate students and as such its style is essentially pedagogical requiring only some basics of mathematics statistical physics and quantum field theory Yet it also contains some more sophisticated concepts which may be useful to researchers in the field Each chapter ends with a number of problems guiding the reader to a deeper understanding of some of the material presented in the main text and in most cases also features some listings of short useful computer programs

Statistical Field Theory Giorgio Parisi,Robert H. Pantell,1988-01 A comprehensive text book covering the field of statistical physics *Statistical Field Theory: Volume 1, From Brownian Motion to Renormalization and Lattice Gauge Theory* Claude Itzykson,Jean-Michel Drouffe,1989-09-29 A comprehensive and timely survey of the application of the methods of quantum field theory to statistical physics a very active and fruitful area of modern research is provided in two volumes The first volume provides a pedagogical introduction to the subject discussing Brownian motion its anticommutative counterpart in the guise of Onsager s solution to the two dimensional Ising model the mean field or Landau approximation scaling ideas exemplified by the Kosterlitz Thouless theory for the XY transition the continuous renormalization group applied to the standard phi to the fourth theory the simplest typical case and lattice gauge theory as a pathway to the understanding of quark confinement in quantum chromodynamics Statistical Field Theory: Volume 1, From Brownian Motion to Renormalization and Lattice Gauge Theory Claude Itzykson,Jean-Michel Drouffe,1991-03-29 A comprehensive and timely survey of the application of the methods of quantum field theory to statistical physics a very active and fruitful area of modern research is provided in two volumes The first volume provides a pedagogical introduction to the subject discussing Brownian motion its anticommutative counterpart in the guise of Onsager s solution to the two dimensional Ising model the mean field or Landau approximation scaling ideas exemplified by the Kosterlitz Thouless theory for the XY transition the continuous renormalization group applied to the standard phi to the fourth theory the simplest typical case and lattice gauge theory as a pathway to the understanding of quark confinement in quantum chromodynamics Statistical Field Theories Andrea Cappelli,Giuseppe Mussardo,2012-12-06 Recent developments in theoretical physics include new instances of the unification of quite different phenomena The theoretical community is challenged by the growing interactions between high energy physics statistical physics and condensed matter physics The common language though is exact solutions of two dimensional and conformable field theories This volume is a faithful representation of this interdisciplinary domain

Conformable and integrable field theories have been active research topics for several decades The main recent developments concern the boundary effects and applications to disordered systems The number of applications of the exact methods to condensed matter problems has been growing over the years Nowadays it is widely recognized that strongly interacting systems in low dimensions can be successfully described by integrable and conformable theories This volume is an indispensable aid to those seeking to find their way in this domain   *Statistical Field Theory for Neural Networks* Moritz Helias,David Dahmen,2020-08-20 This book presents a self contained introduction to techniques from field theory applied to stochastic and collective dynamics in neuronal networks These powerful analytical techniques which are well established in other fields of physics are the basis of current developments and offer solutions to pressing open problems in theoretical neuroscience and also machine learning They enable a systematic and quantitative understanding of the dynamics in recurrent and stochastic neuronal networks This book is intended for physicists mathematicians and computer scientists and it is designed for self study by researchers who want to enter the field or as the main text for a one semester course at advanced undergraduate or graduate level The theoretical concepts presented in this book are systematically developed from the very beginning which only requires basic knowledge of analysis and linear algebra   **Statistical Field Theory. 0-521-37012-40-521- 40806-7** ,1991

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