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their applications based on contributions to the workshop "Lie Theory and Its Applications in Physics" held in Sofia (Bulgaria) in June 2023. Traditionally, Lie theory is a tool to build mathematical models for physical systems. Recently, the trend is towards geometrization of the mathematical description of physical systems and objects. A geometric approach to a system yields in general some notion of symmetry, which is very helpful in understanding its structure. Geometrization and symmetries are meant in their widest sense, i.e., representation theory, algebraic geometry, number theory, infinite-dimensional Lie algebras and groups, superalgebras and supergroups, groups and quantum groups, noncommutative geometry, symmetries of linear and nonlinear partial differential operators, special functions, and others. Furthermore, the necessary tools from functional analysis are included. This is a large interdisciplinary and interrelated field. The topics covered in this volume from the workshop represent the most modern trends in the field: Representation Theory, Symmetries in String Theories, Symmetries in Gravity Theories, Supergravity, Conformal Field Theory, Integrable Systems, Polylogarithms, and Supersymmetry. They also include Supersymmetric Calogero-type models, Quantum Groups, Deformations, Quantum Computing and Deep Learning, Entanglement, Applications to Quantum Theory, and Exceptional Quantum Algebra for the standard model of particle physics. This book is suitable for a broad audience of mathematicians, mathematical physicists, and theoretical physicists, including researchers and graduate students interested in Lie Theory.
