Unitary representations of super Lie groups

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Abstract

These lectures present some of the mathematical aspects of the theory of infinite dimensional unitary representations of super Lie groups, with applications to the relativistic classification of super particles and super multiplets.

The lectures are in three parts. In the first part, which is foundational, I shall try to make precise the concept of a super manifold and its automorphisms, the supersymmetries, and explain the functorial method based on the functor of points. This leads naturally to the concept of a super Lie group and the associated concept of a super Lie algebra. I shall then discuss the concept of a unitary representation of a super Lie group. In the second part I shall discuss the super semi direct products and their irreducible unitary representations. In particular I shall set up the super version of the Mackey-Wigner machine of little groups. In the last part I shall apply this theory to describe the super spacetimes and the super Poincaré groups in all dimensions (Minkowski signature), their unitary irreducible representations, and the applications to the classification of super particles and super multiplets.