

Holonomy groups of Lorentzian manifolds

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Abstract

This lecture gives an overview about recent developments in holonomy theory for Lorentzian manifolds. We will start by introducing holonomy groups, describe the problem of their classification and glance at its solution for Riemannian manifolds. Then we will focus on the classification of Lorentzian holonomy groups. We will present the possible groups and show how they can be realised as holonomy groups of Lorentzian metrics. As an application the classification of holonomy groups of Lorentzian manifolds with a parallel spinor is given. Finally, we will describe some holonomy related structures such as pp-waves and their generalisations.