

An Introduction to Anti de Sitter Geometry

Francesco Bonsante (Università di Pavia)

Anti de Sitter geometry is the analogue of hyperbolic geometry in Lorentzian setting. After the seminal work of G. Mess, several interesting relations between Anti de Sitter geometry and hyperbolic geometry in dimension 2 and 3 have been pointed out. The general purpose of the course is to give an introduction to this topic, especially highlighting the relation with the Teichmüller theory and focusing on some recent developments. In the first part we will describe the “classical” theory developed by Mess to study the class of globally hyperbolic spacetimes, which can be considered the analogue of quasi-Fuchsian structures in this setting. In the second part we will point out a correspondence between space-like surfaces in Anti de Sitter spacetimes and deformations of hyperbolic metrics on a surface. This correspondence is at the heart of the relations between Anti de Sitter geometry and Teichmüller theory. We will give some applications arising by applying this machinery to some particular class of surfaces like pleated surfaces, minimal surfaces, and constant curvature surfaces. If time permits, generalizations to the case of Anti de Sitter structures with conical time-like singularities will be given.

Prerequisites Basic differential geometry and topology, some elementary hyperbolic geometry (especially in dimension 2), elements of Lie groups.