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Tutorial on Analysis on Symmetric Spaces

(2 Lectures)

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These lectures are a survey of applications of methods of non-commutative harmonic analysis to problems of analysis on symmetric spaces of noncompact type. We begin by describing the basic tools from representation theory including the analogues of the theorems of Plancherel and Paley-Wiener in the non-commutative framework. Among other applications, these results make it possible to extend the Malgrange-Ehrenpreis theorem on solvability of constant coefficient partial differential operators to invariant differential operators on symmetric spaces. We will also introduce the analogue of the wave equation which naturally involves multi-time variables. Finally the extension of these ideas to locally symmetric spaces, open problems and their possible applications to automorphic functions will be discussed.