

LIVIO FLAMINIO  
INTRODUCTION TO THE THEORY OF UNITARY GROUP  
REPRESENTATIONS AND ITS APPLICATIONS TO DYNAMICS

Weeks 2-3: 4-16 July, 5 double lectures (each lecture is 45-50 minutes).

**Abstract:** We shall review the main concepts in representation theory of real Lie groups, focusing on main classes of groups, compact, nilpotent and some semi-simple groups. The goal is to show how representation theory can be used to study some cohomological problems in algebraic dynamics which are fundamental for the problem of conjugacy, of equidistribution etc.

1. Basic concepts in representation theory. Unitary representations, reducibility. Representations of Lie groups and Lie algebras, smooth vectors.
2. Compact Lie groups, Peter-Weyl theorem and Borel-Weil theorem
3. Induced representations, Mackey's theory. Nilpotent groups, Kirillov's theory
4.  $SL(2, \mathbb{R})$ ,  $SL(2, \mathbb{C})$  and beyond.
5. Applications to dynamical systems. Invariant distributions. Cohomology of groups actions.