

# Tata Institute of Fundamental Research

## School of Mathematics

Lecture Series on:

On harmonic analysis on classical  $p$ -adic groups and  $L$ -packets.

by

Professor Marko Tadić

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*About the Speaker:* Professor Marko Tadić is a leading mathematician in the fields of representation theory and harmonic analysis on reductive groups, in particular over  $p$ -adic fields, and application of this theory to the modern theory of automorphic forms (through Langlands program).

He is a Professor in the University of Zagreb Croatia. He is a full member of the Croatian Academy of Sciences and Arts and member of Academia Europaea. He was awarded the Rudjer Bošković prize in 1989 and was also the Editor-in-chief of “Glasknik Matematički” during 1998–2001.



**Abstract:** Local Langlands correspondences for reductive groups generalise the Artin reciprocity law from the local class field theory. These correspondences are expected to give natural partitions of irreducible representations into finite sets, called  $L$ -packets. There were recently big breakthroughs regarding them in the case of classical  $p$ -adic groups (other than  $GL$ -groups which were settled earlier).

From the other side, the square integrable packets emerge naturally considering some very basic problems of (pure) harmonic analysis of these groups.

In our lecture we shall discuss this connection, and how crucial data of one theory correspond to the crucial data of the other theory (this is nice instance of unity which we sometimes meet in mathematics). We shall discuss how one can describe elements of packets and related questions, like for example, given an irreducible square integrable representation, what are the other elements of the packet etc.. All this is directly related to the classification of tempered representations and non-unitary dual in terms of cuspidal representations. Such classification in the case of  $GL$ -groups is given by Bernstein-Zelevinsky theory.

The other topic that we shall discuss in the lectures is the unitarizability problem for classical groups. We recall that soon after completion of Bernstein-Zelevinsky theory, the unitary duals in the  $GL$ -case were classified (giving the same answer in the archimedean case). We expect pretty explicit picture of the unitary duals of classical groups, although much more complicated than in the  $GL$ -case (recall that similarly the classification of the irreducible square integrable representations is substantially more complicated for these groups than for  $GL$ -groups). For getting the answer, several difficult questions remain to be settled. We shall discuss what shape of classification we can expect and possible strategy for solving the problem.

All Are Welcome