COMBINATORICS AND REPRESENTATIONS IN LIE THEORY

TUTOR: FABRIZIO CASELLI

Research program

The present post-doc position (assegno di ricerca) is part of a national project entitled "Moduli and Lie theory" financed by the Italian Gouvernement as a PRIN project. The research activity of the candidate will be framed within the research activity of the team of Bologna which concerns the Lie theory aspects of the national project.

Combinatorics and representation theory find a natural scenario in Lie theory and their interplay is evident to all researcher in this area since at least the first half of the 20th century. The recent studies of Prof. Nicoletta Cantarini and Prof. Fabrizio Caselli on the representation theory of generalized Verma modules of linearly compact Lie superalgebras are a typical example of such interplay. In this context a possible line of research of the candidate is to face the classification of degenerate induced modules of exceptional linearly compact Lie superalgebras. In this study it could be useful to try to extend the duality of such modules recently established to the general context, and possibly avoiding the use uf superconformal structure.

On another line of research, Prof. Fabrizio Caselli in collaboration with Prof. Mario Marietti recently studied a purely combinatorial object called pircon which extends the algebraic concept of parabolic Bruhat interval. The study of pircons applied to the algebraic setting provided new results of classical parabolic Kazhdan-Lusztig polynomials introduced by Deodhar. A natural problem in this context is now to study the possible relationship between the updown symmetry of pircons and Stanley's P-kernels, a relationship which is only partly understood at the moment.

The candidate is expected to work on one of these or other problems in Lie theory which are of interest to the unit of Bologna of the PRIN project. He/she could find the Department of Mathematics in Bologna a natural place where to study combinatorics and representation theory in Lie theory because of the many researchers working in the area from different perspectives.

ACTIVITY PROGRAM

The research activity of the candidate is expected to last for 12 months. In the first 3 months the candidate will choose a specific topic among those described above and study the necessary prerequisites to face the corresponding research problem. In the remaining 9 months the candidate is expected to actively participate to the research activity of the unit.

During the whole year the candidate will also participate to the weekly seminar organized by the team, will contribute to the formation of graduate and undergraduate students of members of the team, and will have the opportunity to attend international conferences where he/she can present the results that have been obtained.