# Bridges in combinatorics

**Organizador:** Olga Azenhas (SP Convidada), University of Coimbra, CMUC, Department of Mathematics

**Descrição da proposta de sessão paralela:** Bridging with combinatorics seemingly apart areas.

**Orador 1 -** Marko Stošić, CAMGSD, Department of Mathematics, Instituto Superior Técnico, Lisbon; Mathematical Institute SANU, Belgrade

Title: Lattice paths counts, billiard partitions, quivers and knots

Abstract: Lattice paths counts are among the classical problems in enumerative combinatorics. Surprisingly they showed up as a byproduct in problems of representation theory of quivers, as well as in quantum polynomial invariants of knots, through knots-quivers correspondence, thus linking this combinatorial problem with representation theory, topology and mathematical physics. I will give on overview of this relationship, with the emphasis on the combinatorial results, both in rediscovery of previously known formulas and completely novel ones, as well as some recent extensions.

**Orador 2 -** Inês Rodrigues, Center for Mathematics and Applications (NOVA Math), NOVA School of Science and Technology, NOVA University of Lisbon

Title: Structure of quasi-crystal graphs and applications to the combinatorics of quasi-symmetric functions

Abstract: Crystal graphs are powerful combinatorial tools for working with the plactic monoid and symmetric functions. Quasi-crystal graphs are an analogous concept for the hypoplactic monoid and quasi-symmetric functions. We explicitly describe a previously observed isomorphism of components of the quasi-crystal graph, introducing a new combinatorial structure called quasi-array. As an application, we explore the interaction of fundamental quasi-symmetric functions and Schur functions, and the arrangement of quasi-crystal components within crystal components. This is joint work

with Alan Cain, António Malheiro and Fátima Rodrigues.

**Orador 3 -** Diogo Soares, University of Coimbra, CMUC

Title: Distance between two commutation classes in Coxeter groups of classical type

Abstract: A famous result of Tits says that two reduced words for the same element in any Coxeter group differ by a finite sequence of commutations and/or braid relations. In this presentation, we present a formula to compute the minimal number of braid relations needed to transform a reduced word into another for elements in Coxeter groups of classical type, which is equivalent to compute the distance function in the graph of commutation classes.