

# Séminaire d'algèbre, topologie et géométrie

Jeudi 22 juin à 14h00

Salle I

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*Shuffling cumulants*

Gian-Carlo Rota observed that the poset of set partitions and the related Möbius calculus plays (implicitly or explicitly) a central role in various areas of mathematics. In particular in the combinatorics of cumulants in classical probability. Cumulants behave linearly with respect to the sum of two or more independent random variables, i.e., the  $n$ th-order cumulant of their sum equals the sum of their  $n$ th-order cumulants. Voiculescu's theory of free probability is, from an algebraic point of view, which we'll adopt in this talk, the study of linear forms on associative algebras. Here, the classical concept of independence is replaced by the algebraic notion of freeness, i.e., the absence of relations. Speicher introduced the notion of free cumulants as the proper analog in the theory of free probability of classical cumulants. He showed that their combinatorics can be described in terms of Möbius calculus on non-crossing set partitions.

In this talk we will summarise recent work that emphasises a more abstract and algebraic point of view by showing that general, i.e., non-commutative shuffle algebra provides an algebraic description of cumulant-moment relations in non-commutative probability. The classical case is covered by commutative shuffle algebra.

(Based on joint work with F. Patras)