

## Stirling numbers and Koszul algebras with symmetry

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(joint work with Ayah Almousa and Sheila Sundaram)

Stirling numbers  $c(n, k)$ ,  $S(n, k)$  of the first and second kind are the answers to two counting problems: how many permutations of  $1, 2, \dots, n$  have  $k$  cycles, and how many set partitions of  $1, 2, \dots, n$  have  $k$  blocks?

The  $c(n, k)$  also give the Hilbert function for certain well-studied Koszul algebras with symmetry: the cohomology of configurations of  $n$  distinct labeled points in  $d$ -space, also known as the Orlik-Solomon algebras and graded Varchenko-Gelfand algebras for type A reflection hyperplane arrangements.

We discuss how the  $S(n, k)$  give the Hilbert series for their less-studied Koszul dual algebras. This includes relating the symmetric group action on the original algebras and on their Koszul duals, representation stability in the sense of Church and Farb, and branching rules that lift Stirling number recursions.