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The  $q$ -analog of Kostant's partition function and the highest root of the simple Lie algebras

Kostant's partition function counts the number of ways to represent a particular vector (weight) as a nonnegative integral sum of positive roots of a Lie algebra. For a given weight the  $q$ -analog of Kostant's partition function is a polynomial where the coefficient of  $q^k$  is the number of ways the weight can be written as a nonnegative integral sum of exactly  $k$  positive roots. In this talk, we present generating functions for the  $q$ -analog of Kostant's partition function when the weight in question is the highest root of the classical Lie algebras of types  $B$ ,  $C$ , and  $D$ , and the exceptional Lie algebras of type  $G_2$ ,  $F_4$ ,  $E_6$ ,  $E_7$ , and  $E_8$ . This is joint work with Erik Insko and Mohamed Omar.