School of Mathematics and Physics Women in Mathematics Day

The Ghost Algebra by Madeline Nurcombe

Abstract:

The Temperley-Lieb algebra has many diverse applications in mathematics, from physical models of polymers and percolation in statistical mechanics, to knot theory. It is also a diagram algebra; its basis elements can be expressed as string diagrams, which are multiplied by concatenation. The one-boundary Temperley-Lieb algebra is similar, but its basis diagrams have an additional boundary line that the strings may be connected to. There is also a two-boundary Temperley-Lieb algebra, with a second boundary, but its diagrams require an even number of strings connected to each boundary, and it is infinite-dimensional, unlike the zero- and one-boundary algebras. In this talk, I will introduce the ghost algebra, a finite-dimensional two-boundary version of the Temperley-Lieb algebra that allows diagrams with odd numbers of connections to each boundary. Its diagrams contain ghosts: dots on the boundaries that act as bookkeeping devices to ensure associativity of multiplication. I will discuss the construction of this algebra, as well as its dilute generalisation, and the relationships between these algebras.