



## Probability Seminar

**Title:** The quantum Heisenberg XXZ model, and the Brauer algebra

**Speaker:** Kieran Ryan (QMUL)

**Date:** Wed 10th February 2021 at 3:00PM

**Location:** Online

**Abstract:** Several quantum spin systems have probabilistic representations as interchange processes. Some of these processes can be thought of as continuous time random walks on the symmetric group, which in turn has led to study using representation theory.

We will see how this algebraic approach can be employed in studying the spin- $\frac{1}{2}$  quantum Heisenberg XXX model, and how the symmetric group naturally appears. In particular, when the underlying graph is the complete graph, we can obtain the free energy of the model, and thereby determine points of phase transitions.

In a similar way, the Heisenberg XXZ model can be studied using the Brauer algebra. We will introduce this algebra, and note how the method can be extended to the XXZ case, giving the free energy on the complete graph, and phase diagrams.