$\mathbf{U}_q(\mathfrak{gl}_N)$ DIAGRAM CATEGORIES VIA SUPER q-HOWE DUALITY

DANIEL TUBBENHAUER

ABSTRACT. The Temperley-Lieb algebra has its origin in the study of $\mathfrak{sl}_2$-modules: Rumer, Teller and Weyl showed (more or less) already in the 30ties that the Temperley-Lieb algebra can be seen as a diagrammatic realization of the representation category of $\mathfrak{sl}_2$-modules - providing a topological (and fun!) tool to study the latter.

In this talk I try to explain how one can proof such a realization. Our main tool is "a machine that takes dualities and produces diagrammatic categories". In particular, we show explicitly how this "machine" works if one feeds it with q-Howe duality – which produces diagrammatic presentations of categories of $\mathfrak{gl}_n$-modules akin to the Temperley-Lieb calculus.

As an application, I give a diagrammatic version of a symmetry of HOMFLY-PT polynomials.

In principal, everything in this talk is amenable to categorification, but we have to stay in the uncategorified world for the moment.