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A Connection Between Graphs and the Quantum Group $U_q(\mathfrak{sl}_2(\mathbb{C}))$

We will explore a connection between certain graphs and the quantum group $U_q(\mathfrak{sl}_2(\mathbb{C}))$, as well as applications of this to representation theory. Given a distance-regular, bipartite, and dual bipartite graph, we construct its Terwilliger algebra. We will see how to map $U_q(\mathfrak{sl}_2(\mathbb{C}))$ onto the Terwilliger algebra, which lets us understand the algebraic structure of the latter. A simple example of this involves the cube graph, which we shall consider in detail.