Non-Orthogonality in Quantum Theory

Shengyang Zhong

In this talk I will focus on the non-orthogonality relations between pure states in quantum theory. They will be modelled by the mathematical structures called quantum Kripke frames. A quantum Kripke frame consists of a set and a binary relation on it with five properties, which are possessed by the non-orthogonality relations. I will show that many structures and results of Hilbert spaces, crucial to the formalism of quantum theory, have counterparts in quantum Kripke frames. These structures and results include closed linear subspaces, linear maps having adjoints, unitary operators, self-adjoint operators, projectors and the correspondence between the closed linear subspaces and the projectors of a Hilbert space. This shows that the non-orthogonality relations are important in quantum theory. Moreover, simple as they are, quantum Kripke frames can be useful in modelling quantum systems and their behaviour.