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Expectation and Bayes rule with quantum random variables

Common statistical notions, such as expected value and variance, may be defined for quantum random variables in the context of positive operator-valued measures. In this lecture I will review these notions and indicated how Bayes' rule is formulated. I will also describe how, through the use of the operator-theoretic geometric mean, the standard chain rules for Radon-Nikodym derivatives extend to positive operator-valued measures. Based on joint work with Michael Kozdron and Sarah Plosker.