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*Matrix Majorization in Non-Commutative Contexts*

The notion of majorization of one self-adjoint  $n \times n$  matrix by another is a very useful concept in matrix theory. For example, a classical theorem of Schur and Horn states that a diagonal matrix  $D$  is majorized by a self-adjoint matrix  $B$  if and only if a unitary conjugate of  $B$  has the same diagonal as  $D$ . Some equivalent characterizations of  $A$  being majorized by  $B$  include there existing a doubly stochastic matrix that maps the vector of eigenvalues of  $B$  to the vector of eigenvalues of  $A$ , tracial inequalities involving convex functions of  $A$  and  $B$ , and there exists a mixed unitary quantum channel that maps  $B$  to  $A$ .

In this talk, we will examine the notion of majorization in other non-commutative contexts. In particular, we will discuss a generalization of matrix majorization that works in any  $C^*$ -algebra, and a new non-commutative notion of majorization that characterizes the potential outputs under all unital quantum channels of any non-commutative tuple of matrices.

This talk is based on joint works with Ng and Robert, and with Kennedy and Marcoux.