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The tracial Hahn-Banach theorem and matrix convex sets

Abstract

This talk will discuss matrix convex sets and their tracial analogs which we call contractively tracial convex sets. In both contexts completely positive (cp) maps play a central role: unital cp maps in the case of matrix convex sets and trace preserving cp (CPTP) maps in the case of contractively tracial convex sets. CPTP maps, also known as quantum channels, are fundamental objects in quantum information theory. Free convexity is intimately connected with Linear Matrix Inequalities (LMIs) $L(x) = A_0 + A_1x_1 + \cdots + A_gx_g \succeq 0$ and their matrix convex solution sets $\{X : L(X) \text{ is positive semidefinite}\}$, called free spectrahedra. The Effros-Winkler Hahn-Banach Separation Theorem for matrix convex sets states that matrix convex sets are solution sets of LMIs with operator coefficients. Motivated in part by cp interpolation problems, we will develop the foundations of convex analysis and duality in the tracial setting, including tracial analogs of the Effros-Winkler Theorem. This is joint work with Bill Helton and Scott McCullough.

Talk time: 07/19/2016 3:00PM— 07/19/2016 3:20PM
Talk location: Cupples I Room 113

Special Session: State space methods in operator and function theory. Organized by J. Ball and S. ter Horst.