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# Lyapunov and Riccati Diagonal Stability

**Abstract:**

Barker, Berman and Plemmons (1978) described necessary and sufficient conditions for the existence of diagonal solutions to the Lyapunov matrix inequality. These solutions define diagonal Lyapunov functions for the associated linear time-invariant (LTI) systems and play a role in applications such as neural networks, population dynamics, and the control of large scale systems.  Furthermore, they can be used to establish stronger forms of stability such as D-stability.  In this talk, I will discuss some motivating applications and classical results on diagonal stability for LTI systems before describing recent work on diagonal stability for systems subject to switching and time-delay.  In particular, I will discuss results characterising the existence of diagonal solutions to the algebraic Riccati equation and the relevance of these to the stability of time-delay systems.