

# A polynomial-time algorithm for determining quadratic Lyapunov functions for nonlinear systems

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We consider nonlinear systems  $dx/dt = f(x(t))$  where  $Df(x(t))$  is known to lie in the convex hull of  $L$   $n \times n$  matrices  $A_1, \dots, A_L$ . For such systems, quadratic Lyapunov functions can be determined using convex programming techniques. This paper describes an algorithm that either finds a quadratic Lyapunov function or terminates with a proof that no quadratic Lyapunov function exists. The algorithm is an interior-point method based on the theory developed by Nesterov and Nemirovsky.