

Nonlinear joint spectral radius of cone order preserving functions

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Different recent studies show that nonlinear functions outperform linear functions in many Machine Learning applications. Here we are interested in the stability of switched systems that alternate maps from a class of nonlinear functions without an a-priori switching rule. This is for example the case of Neural Networks and Neural ODEs. In particular, our study is focused on families of homogeneous nonlinear functions that preserve the ordering induced by a cone. Such maps, admitting a spectral radius definition, allow us to generalize, to the nonlinear case, the notion of joint spectral radius (JSR) of a family of functions. As in the linear case, the value of the nonlinear JSR yields information about the stability of the system. Hence, we investigate properties of the nonlinear JSR and provide some insights on its computation. Joint work with: Nicola Guglielmi, Francesco Tudisco.

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