15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: STA141

General decay stability analysis of coupled systems of stochastic neural networks

Biljana Tojtovska

Abstract: In this paper we consider a model of coupled systems of stochastic neural networks, represented by stochastic differential equations. The model generalizes many models in the literature and to the best of our knowledge, there are no results on stability analysis of such a model. Coupled networks consist of parts with individual dynamics which mutually interact based on some coupling structure. The structure can be modeled by a graph, where each node represents a system with nonlinear or stochastic dynamics. However, it is known that dynamical systems may lose the stability property after coupling. There are examples which show that even if all the individual systems are stable, the coupled dynamical system may not be stable. Existence of an equilibrium state for a neural network is important for the process of learning, pattern formation and characterization of different statistical properties of the network. Hence, it is important to give conditions on the network which will imply stability of the coupled system. The goal of our research is to give sufficient conditions on pth moment general decay stability of the equilibrium point of this model. This includes as a special case the exponential, polynomial and logarithmic stability and the methods allow us to discuss the pth moment stability even when results for exponential stability cannot be applied. The discussion in our paper is based on M-matrix theory, on the Lyapunov method and we use known inequality techniques. The results are original and have not been published yet.

[1)] Biljana Tojtovska, Ph.D.: Faculty of Computer Science and Engineering, Rudger Boshkovich 16, 1000 Skopje, Macedonia (MK), btojtovska@gmail.com .