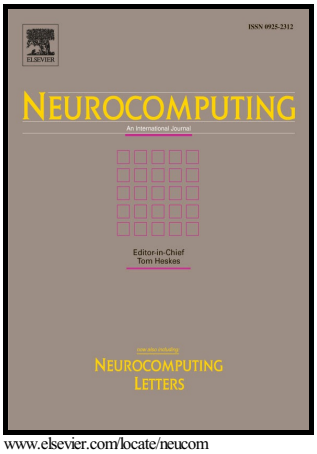


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# Mean-square exponential input-to-state stability of stochastic recurrent neural networks with multi-proportional delays ⋆

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**Abstract**

This paper investigates mean-square exponential input-to-state stability of stochastic recurrent neural networks with multi-proportional delays. Here, we study the proportional delay, which is a kind of unbounded time-varying delay in stochastic recurrent neural networks, by employing Lyapunov-Krasovskii functional, stochastic analysis theory and Itô′s formula. A new stability criterion about the mean-square exponential input-to-state stability, which is different from the traditional stability criteria, is presented. In addition, the new proposed criterion easy to verify and less conservation than earlier publications about mean-square exponential input-to-state stability of stochastic recurrent neural networks. Finally, several examples and their simulations are given to illustrate the correctness and effectiveness of the theoretical results.

*Key words:* Stochastic neural networks; Proportional delay; Mean-square exponential input-to-state stability; Lyapunov-Krasovskii functional



## 1 Introduction

As a class of fixed weights, external input and internal state neural networks, recurrent neural networks were diffusely known. Recurrent neural networks mainly contain Hopfield neural networks, cellular neural networks and Cohen-Grossberg neural networks. In view of their characteristics with fixed

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