Abstract of Presentation

Name	Affiliation
Taro Toyoizumi	RIKEN Brain Science Institute
Research interest: (URL: <u>http://www.brain.riken.jp/labs/mns/toyoizumi/</u>)	
Synaptic plasticity, Information processing in the brain	
Presentation Title: Beyond the edge: Amplification and temporal integration by	
recurrent networks in the chaotic regime	

Abstract :

Randomly connected networks of neurons exhibit a transition from fixed-point to chaotic activity as the variance of their synaptic connection strengths is increased. In this study, we analytically evaluate the performance of reconstructing small external input from activity of neurons under a linear readout setting. At the transition point, known as the edge of chaos, networks display a number of desirable features, including large gains and integration times. Away from this edge, in the non-chaotic regime that has been the focus of most models and studies, gains and integration times fall off dramatically, which implies that parameters must be fine tuned with considerable precision if high performance is required. Here we show that, when neurons have an odd saturating nonlinear response function, the fall-off in gains and integration times is much slower on the chaotic side of the transition. Correspondingly, the decoding performance is characterized, near the edge, by a critical exponent that takes a different value on each side. This means that, under appropriate conditions, good performance can be achieved with less fine tuning beyond the edge, within the chaotic regime.