IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS
Special Issue on
New Frontiers in Extremely Efficient Reservoir Computing

Reservoir computing (RC) is a machine learning framework for temporal (sequential) pattern recognition, which originates from specific types of recurrent neural network models including echo state networks and liquid state machines. An RC system consists of a dynamical reservoir for mapping inputs into a high-dimensional temporal representation space and a readout for pattern analysis from the high-dimensional signal. Since only the readout part is trained typically with a simple linear algorithm, the learning cost of RC is extremely low compared with that of other recurrent neural networks. Such machine learning methods capable of high-speed learning are particularly demanded for online and real-time information processing systems. Further potential capabilities arise while addressing problems characterized by limited amount of supervised data. Due to these advantages, application fields of RC have been rapidly expanding. Theoretical aspects of RC have also been intensively studied in this decade. In addition, physical RC which exploits physical phenomena to realize the function of a reservoir has attracted much attention toward development of energy efficient machine learning hardware.

This special issue focuses on new challenges for fully exploiting the potential of RC in practical applications and realizing extremely efficient information processing hardware. We would like to solicit high-quality works which pursue extremely efficient RC systems and devices, as well as breakthrough approaches to the model design and analysis. The topics include, but are not limited to:

- Non-autonomous dynamical systems theory and RC
- Analysis of RC training for small sets of annotated data
- Online and real-time computation with RC
- RC methods for structured and graph data
- Breakthrough developments for extremely efficient RC models
- Novel deep RC models and analysis
- Fundamental theoretical results framing RC in the machine learning scenario
- New paradigms for drastic improvement in RC performance
- Extension of the frontiers of RC applicative fields
- Novel physical and hardware implementations of RC
- Cutting edge extremely efficient neuromorphic RC

IMPORTANT DATES

- 15 September 2020: Deadline for manuscript submission
- 1 December 2020: Reviewer's comments to authors
- 15 May 2021: Submission deadline of revisions
- 15 June 2021: Final decisions to authors
- 15 August 2021: Publication date

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SUBMISSION INSTRUCTIONS

- Read the information for Authors at http://cis.ieee.org/tnnls.
- Submit the manuscript at the IEEE-TNNLS webpage (http://mc.manuscriptcentral.com/tnnls) and follow the submission procedure. Please, clearly indicate on the first page of the manuscript and in the cover letter that the manuscript is submitted to this Special Issue. Send also an email to the leading guest editor Dr. Gouhei Tanaka (gouhei@sat.t.u-tokyo.ac.jp) with subject "TNNLS special issue submission" to notify about your submission.