



Guest Editorial: Trends in Reservoir Computing

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Reservoir Computing (RC) is a leading-edge paradigm for the design and training of recurrent neural network models. The approach has become popular among practitioners due to its simplicity of implementation, effectiveness in applications, and efficiency [1]. Theoretically, RC allows to deepen the study of characterizations and initialization of dynamical neural models, improving our understanding of their dynamical behavior. In recent years, studies on neuromorphic implementations of RC have also opened the way to breakthrough advancements enabling ultra-fast learning in the temporal domain [2].

This special issue contains selected papers that provide an overview of the main streams of current research in the RC field. The papers of this special issue cover topics of neuromorphic computing and non-conventional hardware implementations of RC, optimization of reservoir configurations, theoretical analysis of reservoirs, and emerging developments of RC, including conceptors and deep reservoirs, as well as novel application fields for the RC paradigm. The special issue was preceded by the first international workshop on Reservoir Computing, held at ICANN (September 2019 in Munich, Germany) [3]. The articles have undergone rigorous peer-review according to the journals high standards.

The Special issue contains eight contributions, which can be grouped in the following categories:

Methodology

- *Efficient Implementations of Echo State Network Cross-Validation* by M. Lukoševičius et al.
- *Latent space exploration and functionalization of a gated working memory model using conceptors* by A. Strock et al.
- *Echo State Networks and Long Short-Term Memory for Continuous Gesture Recognition: a Comparative Study* by D. Jirak et al.
- *A Reservoir Computing Approach to Word Sense Disambiguation* by K. Simov et al.

Physical Implementations

- *Limitations of the recall capabilities in delay based reservoir computing systems* by F. Köster et al.
- *Information processing capacity of spin-based quantum reservoir computing systems* by R. Martínez-Peña et al.
- *Bayesian optimisation of large-scale photonic reservoir computers* by P. Antonik et al.
- *Hardware-Optimized Reservoir Computing System for Edge Intelligence Applications* by A. Morán et al.

These contributions encompass a wide range of research topics, thereby appealing to both the experts in the field and those who want a snapshot of the current breadth of reservoir computing research.

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