

## IJCNN-2020 Special session proposal

**Title:** Recurrent Neural Information Processing: Models and Applications

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### **Aims and motivation**

In the last few years, recurrent neural networks have attracted much attentions in a variety of areas such as machine learning, optimization, and systems and control. The paradigm of recurrent neural information process explicitly takes the past information into consideration, capturing the dynamics of sequences via cycles in neurons. A compelling advantage of recurrent neural networks lies in their abilities to capture spatial-temporal dependent patterns. As a result, recurrent neural information processing is the state of the art architecture for learning representations of sequential data such as speech recognition, machine translation, text comprehension, and visual attention. Another appealing feature of recurrent neural networks is that they can be designed as parallel and goal seeking computational models, which enable recurrent neural information processing to be investigated from the perspective of nonlinear dynamics. This leads to powerful models for solving optimization problems ranging from linear programming to nonlinear programming, convex optimization to nonconvex optimization, and smooth optimization to non-smooth optimization.

Despite of the recent success, many issues related to recurrent neural information process await further investigations. From the perspective of representation learning, it is desirable to enable recurrent neural networks to efficiently capture long sequences so that they are scalable to complex scenarios. It is expected that novel recurrent neural network models, their applications in natural language processing and computer vision, and theoretic guarantees for their computational power will be obtained. From the perspective of nonlinear dynamics, it is desirable to analyse their complexity in the nonlinear systems theory. It is expected that novel neurodynamic models, their applications in real-time optimization and intelligent control, and theoretic analysis for their dynamic behaviours will be established. This special session is expected to present novel recurrent neural information processing techniques, which concentrates on new models and novel applications.

### **Scope and Topics**

The main topics of this special session include, but are not limited to, the following:

- Deep learning with recurrent networks
- Sequence-to-sequence learning with recurrent networks
- Attention and memory with recurrent networks
- Generative modelling with recurrent networks
- Novel applications with recurrent networks
- Neurodynamic systems for real-time optimization and related applications
- Neurodynamic systems for signal processing and control
- Neurodynamic systems for brain-inspired computing

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## Organizers



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