Special Issue on

Recurrent and Differential Neural Networks Applications in Modelling and Characterization of Neuroelectrophysiological Systems

CALL FOR PAPERS

Artificial neural networks (ANNs) have played a relevant role in the development of approximate solutions for input-output relationships of uncertain systems. For a long time, ANNs were used to construct approximate solutions of static nonlinear maps between input and output variables. These approximations yielded nonparametric models of uncertain systems.

Some decades ago, this concept of approximation was extended to consider recurrent and differential associations of inputs and outputs which are connected by causal relations. These ANNs were named recurrent ANNs (RNNs) and differential ANNs (DiNNs), respectively. The introduction of time dependence on ANN dynamics increased the number of scientific and technological fields that can be analyzed by implementing the approximation of the uncertain systems.

The new abilities of ANNs gained by the inclusion of time dependence motivated the application of such class of nonparametric models to represent these highly complicated dynamics in neurosciences. The possible applications of RNNs and DiNNs may include the approximation of cognitive process, effects of external stimuli on somatic-sensitive neural circuits, and mathematical approximation of neural circuits developed ex vivo, as well as modelling the evoked potential electroneurophysiological stimulus.

The aim of this special issue is to highlight the ability of RNNs and DiNNs to solve nonparametric modelling, pattern classification, and state estimation, as well as additional applications in other neuroscience disciplines. In particular, the application of RNNs and DiNNs to approximate the functional relationship between the external stimulus and brain responses (measured as electrophysiological signals or medical images) is encouraged. For this purpose, this special issue gathers recent progress and new interpretations of classical approaches of ANNs which could potentially be applied in different areas of neuroscience.

Significantly, this special issue aims to offer an opportunity to students, researchers, and other professionals who develop ANNs that may have a relevant impact on real-life applications of neurosciences and their related disciplines.

Potential topics include but are not limited to the following:

- ▶ New ANN structures inspired by neuroelectrophysiological systems
- ▶ Modelling complex neuroelectrophysiological circuits
- ▶ Cognitive processes modelled by ANNs with recurrent and continuous dynamics
- ▶ Dynamic neural fields
- ▶ Pattern classifier based on ANNs for neuroelectrophysiological processes
- ▶ Dynamic clustering of neuroelectrophysiological signals
- ▶ Computation aspects of developing ANNs with applications to neuroelectrophysiological systems
- ▶ Spatiotemporal ANNs with recurrent and continuous dynamics

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/cin/rdnnn/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

Lead Guest Editor
Jorge I. Oria, Instituto Politécnico Nacional, Mexico City, Mexico
ichairezo@gmail.com

Guest Editors
Iván Ramos, Instituto Politécnico Nacional, Mexico City, Mexico
isalgador@ipn.mx

Ralph Etienne-Cummings, John Hopkins University, Maryland, USA
retienne@jhu.edu

Hafiz Ahmed, Coventry University, Coventry, UK
ac7126@coventry.ac.uk