

**Title of the Special Session:**

**Spiking Neural Networks for Spatio- and Spectro-Temporal Data Modelling and Pattern Recognition: Methods, Systems, Applications**

**Organizer:**

Prof. Nik Kasabov

**One Paragraph Short Bio:**

**Professor Nikola K. Kasabov**, Fellow IEEE, Fellow RSNZ, is the Director of the Knowledge Engineering and Discovery Research Institute (KEDRI, [www.kedri.info](http://www.kedri.info)) at the Auckland University of Technology and Marie Curie Visiting Professor at the Institute for Neuroinformatics, ETH and University of Zurich. He has published more than 450 papers, books and patents in the areas of information science, computational intelligence, neural networks, bioinformatics, neuroinformatics. Prof. Kasabov is a Past President of the Intern. Neural Network Society (INNS) and the Asia Pacific Neural Network Assembly (APNNA). He is a Distinguished IEEE CIS Lecturer (2011-2013) and a Guest Professor at the Shanghai Jiao Tong University (2010-2013).

**Introduction to the special session:**

Spatio- and spectro-temporal data (SSTD) are the most common type of data collected in many domain areas, including engineering, bioinformatics, neuroinformatics, ecology, environment, medicine, economics, etc. However, there is lack of efficient methods for the analysis of such data, for the discovery of complex spatio-temporal patterns in it and for spatio-temporal pattern recognition (STPR), especially for on-line and real time applications. The brain functions as a spatio-temporal information processing machine and deals extremely well with spatio-temporal data. Its organisation and functions have been the inspiration for the development of new methods for SSTD analysis and STPR called spiking neural networks (SNN). They are considered the third generation of neural networks and a promising paradigm for the creation of new intelligent ICT for SSTD. This new generation of computational models and systems are potentially capable of modelling complex information processes due to their ability to represent and integrate different information dimensions, such as time, space, frequency, phase, and to deal with large volumes of data in an adaptive and self-organising manner. The proposed special session is aiming at presenting the state-of-the art in this new area of science and technology, including methods, software and hardware realisations and applications across domain areas.

**Topics include (but are not limited to):**

- Methods of SNN design for STPR
- Evolving, probabilistic SNN for STPR
- On-line, evolving learning in SNN
- Spike pattern association neurons and neural networks
- Neuro-genetic systems based on SNN and gene regulatory networks
- Neuromorphic systems for STPR
- Applications for video and sound data analysis
- Applications for cognitive robotic systems
- Applications for environmental data modelling and prediction
- Applications for brain data modelling
- Applications for brain-computer interfaces
- Applications for personalised modelling

**Keywords:**

Spatio-temporal pattern recognition, Spiking neural networks, On-line machine learning, Cognitive robotics, Brain data modelling, Brain computer interfaces, Neuromorphic computation, Neuro-genetic systems, Personalised modelling.

**Program Committee:**

Prof. N.Kasabov; Prof. Giacomo Indiveri – INI, ETH and University of Zurich; Prof. Martin McGinnity – University of Ulster; Prof. Elisabetta Chicca – University of Bielefeld; Dr Ammar Mohemmed, Dr Stefan Schliebs, Dr Raphael Hu, Kshitij Dhoble, Nuttapod Nuntalid, Linda Liang, Gary Chen, Haza Nuzlu - KEDRI, Auckland University of Technology; Fabio Stefanini, Sadique Sheik - INI, ETH and Uni Zurich; Prof. Siti Miriam – Uni Tech, Malaysia.

**Paper submission:**

Papers should be submitted following the instructions of WCCI and indicating this special session.