

# 学术报告会

时 间: 10月21日 (周一) 下午15: 00-16: 00

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## Deep Learning, Knowledge Representation and Transfer with Brain-Inspired Spiking Neural Network Architectures for Brain-Inspired AI

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### Abstract:

The talk argues and demonstrates that the third generation of artificial neural networks, the spiking neural networks (SNN), can be used to design brain-inspired architectures that are not only capable of deep learning of temporal or spatio-temporal data, but also enabling the extraction of deep knowledge representation from the learned data. Similarly to how the brain learns, these SNN models do not need to be restricted in number of layers, neurons in each layer, etc. as they adopt self-organising learning principles of the brain. The presented approach is illustrated on an exemplar SNN architecture NeuCube (free software and open source available from [www.kedri.aut.ac.nz/neucube](http://www.kedri.aut.ac.nz/neucube)). Case studies are presented of brain and environmental data modelling and knowledge representation using incremental and transfer learning algorithms. These include predictive modelling of EEG and fMRI data measuring cognitive processes and response to treatment, AD prediction, understanding depression, predicting environmental hazards and extreme events. And something more, if a SNN model is designed to follow a brain template, knowledge transfer between humans and machines becomes possible through the creation of brain-inspired Brain-Computer Interfaces (BI-BCI) used here to understand the human-to-human knowledge transfer through hyper-scanning and also to create brain-like neuro-rehabilitation robots. This opens the way to build a new type of AI systems – the open and transparent AI. More details can be found in: N.Kasabov, *Time-Space, Spiking Neural Networks and Brain-Inspired Artificial Intelligence*, Springer, 2019, <https://www.springer.com/gp/book/9783662577134>.

### Biography:

**Professor Nikola Kasabov** is Fellow of IEEE, Fellow of the Royal Society of New Zealand, Fellow of the INNS College of Fellows, DVF of the Royal Academy of Engineering UK. He is the Founding Director of the Knowledge Engineering and Discovery Research Institute (KEDRI), Auckland and Professor at the School of Engineering, Computing and Mathematical Sciences at Auckland University of Technology. Kasabov is the current President of the Asia Pacific Neural Network Society (APNNS) and Past President of the International Neural Network Society (INNS). He is member of several technical committees and a Distinguished Lecturer of IEEE (2012-2014). He is an Advisory Professor at SJTU, Visiting Professor at ETH/University of Zurich and Robert Gordon University UK. He is an Editor of several Springer Handbook and Associate Editor of Neural Networks, IEEE TrNN, Tr CDS, Information Sciences, Applied Soft Computing. His main research interests are in the areas of neural networks, intelligent information systems, bio/neuroinformatics. He has published more than 620 publications. Prof. Kasabov has received a number of awards, among them: *Doctor Honoris Causa* from Obuda University, Budapest; INNS Ada Lovelace Meritorious Service Award; NN Best Paper Award for 2016; APNNA ‘Outstanding Achievements Award’; INNS Gabor Award for ‘Outstanding contributions to engineering applications of neural networks’; EU Marie Curie Fellowship; Bayer Science Innovation Award; APNNA Excellent Service Award; RSNZ Science and Technology Medal; 2015 AUT Medal; Honorable Member of the Bulgarian, the Greek and the Scottish Societies for Computer Science. More information of Prof. Kasabov can be found on the KEDRI web site: <http://www.kedri.aut.ac.nz/staff>.