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**Brain-Inspired Computation for Advanced Image Processing and Computer Vision Systems**

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**ABSTRACT.**

The talk demonstrates that spiking neural networks (SNN), named as the third generation of artificial neural networks, can be used to build brain-inspired SNN systems (BI-SNN) that are capable of deep, incremental learning of temporal or spatio/spectro -temporal data and for various applications. Similarly, to how the brain learns, these BI-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. This is different from the traditional deep learning neural networks that usually have fixed structures and are difficult to adapt to new data.

The talk explains some basic notions and methods of SNN and BI-SNN, illustrated on an exemplar BI-SNN architecture NeuCube that is built according to a 3D brain spatial template (free software and open source along with a cloud-based version available from www.kedri.aut.ac.nz/neucube). NeuCube can learn both audio and visual information simultaneously, similar to how the brain does it. Through learning, a BI-SNN model creates associations between audio and visual information presented, that can be used for scene understanding.

BI-SNN systems result not only in better classification and prediction accuracy, when used on spatio-temporal audio-visual data, but they also allow to extract meaningful knowledge, thus opening a way of building open and transparent AI in the future.

Reference: N.Kasabov, Time-Space, Spiking Neural Networks and Brain-Inspired Artificial Intelligence, Springer, 2019, https://www.springer.com/gp/book/9783662577134.