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

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This short course introduces spiking neural networks (SNN) as the third generation of the artificial neural network techniques, their implementation and their applications. The course has three parts:

**Part 1. Introduction to SNN**
Classical models of SNN are presented [1,2] along with new ones, such as the probabilistic neuronal model [3], the dynamic evolving SNN (deSNN) [4], SPAN [5], reservoir SNN [3]; quantum inspired SNN [6] and others.

**Part 2. SNN system implementation**
Software systems for building SNN are introduced including: Python; Brian; the KEDRI EvoSpike simulator; MATLAB toolbox.

**Part 3. SNN applications for spatio- and spectro-temporal data modeling and pattern recognition**
**S**patio- and spectro-temporal data (SSTD) are the most common data in many domain areas, including: signal processing; bioinformatics, neuroinformatics, ecology, environment, medicine, economics, etc., and still there are no sufficient methods to model such data and to discover complex spatio-temporal patterns from it. The talk introduces new methods for modeling and pattern recognition of SSTD based on SNN. Applications of SNGN across domain areas are demonstrated, including: integrated audio-visual pattern recognition [7]; moving object recognition [4]; EEG data modeling [8]; design of artificial cognitive and emotional systems [9]. Challenging open problems and future directions are presented [10,11] .

**References**
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**Biodata:**

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