

**Topic:**

Self-organizing incremental neural network and its application

**Organizers:**

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**Abstract:**

Self-organizing incremental neural network (SOINN) is an online incremental learning method that can be used to achieve the following targets that are very important for cognitive modeling:

- 1) Represent the topological structure of the input data with any probability distribution, neurons are self-organized with no predefined network structure and size
- 2) Realize online incremental learning for unsupervised learning without any priori condition such as suitable number of nodes, a good initial codebook, or how many classes there are.
- 3) Automatically report a suitable number of classes from unlabeled data.
- 4) Separate the classes with some low-density overlaps.
- 5) Detect the main structure of clusters polluted by noises.

As a new type neural network, SOINN is used to do some tasks including unsupervised learning, supervised learning, semi-supervised learning, and semi-supervised active learning. The adoption of SOINN makes the above learning tasks much more efficient than some traditional methods. Also, SOINN is adopted to design some systems applied for classification of temporal data, associative memory, humanoid robot, pattern-based reasoning, and online robot navigation in real-world.

This topic will be introduced with two parts. The first part is “self-organizing incremental neural network for online incremental learning”, the contents of this part include: Self-organizing incremental neural network (SOINN), Enhanced SOINN for online incremental unsupervised learning, Adjusted SOINN classifier: a fast nearest neighbor classifier, Semi-supervised SOINN and Semi-supervised active SOINN, SOINN associative memory with real value pattern.

The second part is “Application with self-organizing incremental neural network”, the contents of this part include: Dynamic programming SOINN for temporal sequence learning, Pattern-based reasoning with SOINN, Word grounding with SOINN for humanoid robot, Word acquisition and grammar learning with SOINN for humanoid robot, Design artificial brain for humanoid robot with SOINN.