

# IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS

## Special Issue on

### Robust Learning of Spatio-Temporal Point Processes: Modeling, Algorithm, and Applications

In the era of big data, asynchronous events are recorded over time and often associated with location information, which show important value for business and society such as neural spiking train study, earth quack prediction, crime analysis, infectious disease diffusion forecasting, condition-based preventative maintenance, behavior-based personalization and location-based service. The (spatio-temporal) point process is a solid framework for dealing with the multi-dimensional event data in the continuous space/time domain, which treats each event as a point associated with the time stamp, location and other attributes. The model captures the instantaneous happening rate of the events and the spatial-temporal dependency between historical and current events, which can be used both for future events prediction, and for causality estimation. Moreover, the underlying correlation structure of the observed point process can also carry important interpretations which call for effective and robust learning methods against censored/missing observation, noises/outliers and data sparsity especially when the dimension is high.

However, the impact of point process in sequential data modeling and learning has not been fully tapped in the machine learning community. Although some pioneering works have shown that combining point process with cutting-edge machine learning techniques is beneficial for artificial intelligence systems in time/space sensitive scenarios, the study on the connection with reinforcement learning, adversarial learning, deep learning and graph-based learning are still in a very early stage. Additionally, the practical applications of point process-based sequential models are still limited to the scalability and flexibility problems. Interested topics in this special issue include, but are not limited to:

#### *Theoretical Methods:*

- Fundamental theory of point processes
- Scalable simulation and learning of large-scale point processes
- Causality and latent structure analysis
- Predictive model of point processes
- Learning sequential models with missing data
- Online learning of point processes
- Clustering for point processes
- Space/sequence modeling and learning

#### *Innovative Models and Algorithms:*

- Deep learning for point processes
- Adversarial learning for point processes
- Reinforcement learning for point processes

- Graph embedding and point process
- Point process learning with noisy observation

#### *Applications*

- Sequential behavior modeling and analysis
- Anomaly detection for sequential data
- Healthcare and EHR data analysis
- Location and time-sensitive recommendation
- Query suggestion and trending topic detection
- Neural spiking data analysis;
- Information diffusion modeling

#### *Systems and tools*

- Systems and softwares for point processes
- Spiking neural models, tools and systems

#### **IMPORTANT DATES**

- 20, September, 2019: Submission deadline.
- 30, December, 2019: Reviewer's comments to authors.
- 1, March, 2020: Submission deadline of revisions.
- 30, May, 2020: Final decisions to authors.
- June, 2020: Publication date

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