

# **The 21st IEEE International Conference on Machine Learning and Applications (IEEE ICMLA 2022)**

## **2<sup>nd</sup> International Workshop on: Machine Learning for Irregular Time Series (ML4ITS 2022)**

December 12-15, 2022, The Bahamas, Caribbean

<https://www.icmla-conference.org/icmla22/>

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### **Background and Aims**

Time series data is ubiquitous. The broad diffusion and adoption of the Internet of Things (IoT) and major advances in sensor technology are examples of why such data have become pervasive. These technologies have applications in several domains, such as healthcare, finance, meteorology, and transportation. Deep Neural Networks (DNNs) have recently been used to create models that improve on the state of the art for some of these tasks, and Deep Learning (DL) has been beneficial for avoiding heavy data pre-processing and feature engineering in time series classification and forecasting. Time series data influences both political and industrial decisions every day. Yet, there is, surprisingly, rather limited research in Machine Learning (ML) for time series - especially in situations where data is scarce or of low quality.

In many real-world applications, we may encounter the following two scenarios: 1) the amount of available training data is limited, or 2) there is a huge amount of available data which is scarcely labelled or not labelled at all, due to high costs of data collection and annotation. The future of Artificial Intelligence (AI) will be about “doing more with less.” As such, there is a need to focus on modern AI techniques that can extract value from such challenging datasets. These considerations can also contribute to the increasing need to address sustainability aspects of ML and AI. Hence, there is a need to overcome the limited availability of data and scarcity of labeled data for (multivariate) time series modeling. In this context, data heterogeneity (e.g., non-stationarity, multi-resolution, irregular sampling) and noise pose further challenges.

The main scope of this workshop is to advance the state-of-the-art on time series analysis for “irregular” time series. We define time series to be “irregular” if they fall under one or several of the following categories:

- a) Short: univariate and multivariate time series with a limited amount of data and history;
- b) Multiresolution: multivariate time series where each signal has a different granularity or resolution in terms of sampling frequency;
- c) Noisy: univariate/multivariate time series with some additional perturbation appearing in different forms. In this class, we also include time series with missing data;
- d) Heterogeneous: multivariate time series, usually collected by many physical systems, that exhibit different types of embedded, statistical patterns and behaviors;
- e) Scarcely labeled or unlabelled: univariate/multivariate time series where only a small part of the data is labeled or completely unlabelled.

This workshop will be the second ML4ITS workshop. For information on the first workshop, see <https://ml4its.github.io/ml4its2021/>. The workshop intends to offer the ideal context for dissemination and cross-pollination of novel ideas in designing machine learning models suitable to deal with irregular time series.

### **Scope/Topics**

We specifically call for contributions addressing one (or more) of the irregularity aspects mentioned above (a) - (e). Accordingly, topics of interest for the workshop include, but are not limited to:

- Methods for Data Imputation and Denoising,
- Generative models for Synthetic Data generation,
- Transfer Learning and Transformer architectures for Time Series forecasting and classification (e.g., using FNN, CNN, Recurrent NN, LSTM).
- Transformers architectures and Attention mechanisms for Time Series analysis
- Graph Neural Networks for Anomaly Detection and Failure Prediction.
- Quantification of uncertainties.
- Use of Deep Neural Networks (e.g., FNN, CNN, Recurrent NN, LSTMs) for Time Series modeling and forecasting.
- Unsupervised and Self-Supervised Learning for different Time Series related tasks.
- Few-Shot Learning and Time Series Classification in a low-data regime.
- GAN for Time Series analysis (i.e., Anomaly Detection, Data Imputation, Data Augmentation, Data Generation, Privacy).
- Physical-informed Deep Neural Networks for Time Series Forecasting.
- (Deep) Reservoir Computing and Spiking Neural Networks for Time Series and Structured data analysis.
- Representation Learning for Time Series Analysis

## **Submission Guidelines and Instructions**

Papers must be written in English and formatted according to the procedures outlined in the main conference<sup>1</sup>.

We invite prospective authors to contribute to the workshop in one of the following forms:

- Regular paper: original and innovative contributions (max length eight pages including references);
- Short paper: innovative ongoing research showing relevant preliminary results (max length four pages);
- Presentation only: work already published elsewhere, which is relevant and which may solicit fruitful discussion at the workshop (no page restrictions, any format, will not be included in the proceedings).

Each submission will be evaluated based on relevance, significance of contribution, and quality by at least three program committee members. Regular and short submitted papers cannot be identical or substantially similar to versions currently under review at another conference, have been previously published, or have been accepted for publication. All accepted regular and short papers will be published according to the host conference's procedures. Reviews are double-blind. At least one author of each accepted paper must attend the workshop to present.

## **Paper Publication**

Accepted papers will be published in the IEEE ICMLA 2022 conference proceedings (published by IEEE).

## **Important Dates:**

- Submission Deadline: September 9, 2022
- Notification of Acceptance: October 7, 2022
- Camera-ready papers & Pre-Registration: October 14, 2022

## **Workshop Organizers/Chairs:**

Erlend Aune, Head of Simula@BI (Research center), Associate Professor of Data Science at the Norwegian University of Science and Technology and BI Norwegian Business School.

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<sup>1</sup> <https://www.icmla-conference.org/icmla22/howtosubmit.html>

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### **Programme Committee**

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