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Open Invited Track on
Data-driven modeling and learning in dynamic networks

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Abstract

With the growing spatial complexity of engineering systems, e.g., in power networks, transportation networks and industrial production systems, also referred to as cyber-physical systems of systems, there is a strong need for effective modelling tools for dynamic networks, being considered as interconnected dynamic systems, whose spatial topology may change over time. A similar development can be observed in (bio)physical systems as e.g. in systems biology and neurosciences. Consequently there is a strong need for developing methods for data-driven modelling and learning in dynamic networks.

Both identification methods and machine learning methods are currently being developed to provide data-driven tools for modeling and learning in systems that are structurally interconnected in dynamic networks. The modeling and learning aspects include estimation of dynamics as well as interconnection structure (topology) and cause-effect relationships. Moreover the selection of relevant signals, and the setup of appropriate experiments (excitations), will be considered, as well as aspects of distributed computational resources, as e.g. in distributed estimation, modeling and control.

This invited track intends to bring together researchers in academia and industries working on the emerging topic of data-driven modeling and learning in dynamic networks.

Evaluating IFAC Technical Committee

IFAC TC 1.1. Modeling, Identification and Signal Processing

Detailed Description

For the 2023 IFAC World Congress in Yokohama, Japan, an Open Invited Track is organized on the theme:

Data-driven modeling and learning in dynamic networks

In this track, contributions will be collected concerning all aspects related to identification, data-driven modeling and machine learning in systems that are structurally interconnected in dynamic networks. This includes questions of modeling, representations, analysis and model reduction of dynamic networks, as well as of (data-driven) learning and control of networks.
We solicit contributions both in theory, new methods and algorithms, as well as in applications.

Particular subjects of interest are:

- Local module identification
- Machine learning approaches to modeling structured systems
- Network identifiability
- Sparse topology estimation
- Experiment design and signal allocation problems
- Physical networks and network analysis
- Model reduction in networks
- Fundamental representations of interconnected systems
- Security aspects in networks
- Fault detection and diagnosis in networks
- Scalable algorithms
- Data-driven multi-agent and distributed control
- Distributed estimation and identification
- Heterogeneous data
- Hybrid networks
- Inference of causal relationships, Granger causality

Applications may include:

- Power grids
- Biological and gene regulatory networks
- Brain networks, neuroscience
- Large scale systems in process control
- Infrastructural systems,
- Smart buildings
- Robotic networks
- Transportation networks

Updated information and background is available at:
https://www.sysdynet.eu/ifac2023-open-invited-track/

When submitting a contribution to this Open Invited Track, authors are requested to refer to the Open Invited Track Code: 9v3i4.

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