

SAFEPROCESS 2027, Delft, June 29-July 2, 2027

<https://conferences.ifac-control.org/safeprocess2027/>

Invited Session: “Learning and Set-Membership Methods for Reliable Monitoring, Estimation, filtering and Diagnosis”

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Please send us your intention to contribute to this session before October 5, 2026 with the following information: title, abstract, name of authors.

Papers must then be submitted following the standard procedure no later than October 31, 2026 on PaperCept with the code of the session (that will be provided by the IFAC WC organizers after the acceptance of the session).

Recent advances in sensing technologies, cyber-physical systems, and industrial digitalization have considerably increased the availability of operational data while simultaneously raising the need for reliable and trustworthy monitoring and diagnosis techniques. Although data-driven and learning-based approaches have achieved remarkable success in many applications, safety critical systems often require methods capable of explicitly accounting for uncertainty, providing performance guarantees, and ensuring reliable decision-making under incomplete or corrupted information.

In parallel, set-membership approaches including interval analysis, zonotopes, ellipsoidal methods, and reachability techniques have emerged as powerful alternatives for handling bounded uncertainties and deriving guaranteed estimates. More recently, increasing attention has been devoted to combining learning algorithms with set-based methods in order to benefit simultaneously from the flexibility of machine learning and the robustness guarantees offered by deterministic uncertainty representations. This invited session aims to bring together researchers working on learning-based and set-based approaches for monitoring, state estimation, fault diagnosis, anomaly detection, health monitoring, and safety supervision. The objective is to foster exchanges between traditionally separate communities and encourage new methodologies combining model-based reasoning, bounded-error estimation, machine learning and uncertainty quantification for safety-critical applications

The session welcomes both theoretical developments and industrial applications. A non-exhaustive list of topics is provided below:

- Learning-based monitoring and diagnosis
- Set-membership estimation
- Interval analysis and interval observers
- Guaranteed state estimation
- Zonotopic and ellipsoidal estimation
- Reachability analysis
- Physics-informed machine learning
- Hybrid model/data-driven diagnosis
- Fault detection and isolation
- Fault-tolerant estimation
- Uncertainty quantification
- Explainable and trustworthy AI for diagnosis
- Bayesian and deterministic uncertainty representations
- Digital twins for monitoring
- Safety supervision of cyber-physical systems
- Industrial application