

The 22nd World Congress of the International Federation of Automatic Control
July 9 – 14, 2023, Yokohama, Japan

Applications of machine learning in Additive Manufacturing

Invited Track Code: bbnqn

This proposal is endorsed by TC51 Manufacturing Plant Control

Chairs:

Prof. Yaoyao Fiona Zhao, McGill University, Montreal, Canada

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Additive Manufacturing (AM) is a fast-growing field creating a new manufacturing philosophy. It has become a new paradigm for industrial manufacturing. AM results in a new manufacturing environment with very little geometrical and topological restrictions. Additionally, there is no need for manufacturing tool preparation. However, AM also brought forward the challenge of highly coupled material-design-process phenomenon. It is generally very difficult to model the mathematical relations of various correlated factors influencing materials, designs and process parameters. The high-fidelity physical-based models are too computationally heavy to provide fast and accurate results. Even though AM process is highly digitized, the digital models are stored in different format containing various levels of information at different dimensional and temporal scales. With the advancement of data acquisition and storage technologies, machine learning technologies have been increasingly adopted to discover hidden knowledge and build highly complex relationships in digital manufacturing systems. Highly digitized AM design, simulation and manufacturing chain supported with sensor networks could produce high volume data which creates a highly feasible condition to apply machine learning techniques for various purposes.

This session provides an excellent forum for scientists, researchers, engineers and industrial practitioners to meet and share experiences, theoretical knowledge or case studies on the application of machine learning in AM. Authors are invited to submit full papers describing original research work associated with various aspects of machine learning application in AM such as data processing, machine learning model development, application examples in design, material development, process control.

The specific topics include, but not limited to,

- Data fusion, integration and registration for machine learning
- Machine learning for AM design
- Machine learning for AM process monitoring, modeling, and control
- Machine learning for AM defects identification and prediction
- Auto machine learning development for AM
- Machine learning for material development and analysis in AM
- Knowledge fusion and transfer learning to support the adaptation of AM technology

- Computer Vision driven machine learning in AM
- Informatics for machine learning-driven AM
- Advances in AM systems to support in-situ machine learning applications
- Physics-driven machine learning in AM
- Novel algorithmic developments in support of machine learning in AM
- Digital Twin and Cloud-based machine learning applications to support industrial AM

Submission:

For author guidelines, please refer to <https://www.ifac-control.org/conferences/author-guide>. All papers must be submitted electronically using Symposium Manuscript Management System (CMMS). All papers must be prepared in a two-column format in accordance with the IFAC manuscript style. Please use the official IFAC instructions and template to prepare your contribution as full-length draft paper and submit it online by October 31, 2022. Submission details are available on the symposium website. All submissions must be written in English. All papers that conform to submission guidelines will be peer-reviewed by IPC members. The corresponding author submits the paper online (pdf format) as an invited session paper. Submission as an invited paper requires the invited session code bbnqn. Special issues of IFAC World Congress 2023 are planned in IFAC and other high-ranked journals (e.g. IJPR)

Deadlines:

Submission deadline: 31st October 2022

Notification of paper acceptance: 21st February 2023

Camera ready version submission: 31st March 2023