

Call for Papers: Special Issue on "Machine learning in Precision and Micro/Nano Metrology"

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Special Issue Information:

Precision and Micro/Nano Metrology (PMNM) is playing an important role across a broad range of science and technology, including precision engineering, optical engineering, production engineering, material sciences, bioengineering nano-science/engineering, etc. However, today's PMNM is facing new challenges. Many physical models used in PMNM are approaching theoretical limits, which makes model-based errors estimation and separation rather complex and unstable. Harsh external disturbances such as unexpected thermal errors and vibrations bringing unknown influences on measurement accuracy. In defect inspections, where the diversity and imbalance of defects makes the establishment of general physical identification or classification models either impossible or unreliable. Modeling establishment and data registration in an inverse process of PMNM, such as the measurement of VLSI critical dimensions using an optical scatterometer always cost large number time and difficult to find global optimal solution. It is emergent to find a new route to assist or improve the conventional model-driven PMNM. On the other hand, today's data technology enables acquisition of large size data. Thus, data-driven machining learning (ML) technologies are gradually implemented to PMNM, and outperformed in several fields with breaking boundaries of the current model-dependent PMNM. ML is expected to be a new trend for PMNM. However, due to inherent challenges of ML technologies, including its explainability, verifiability and repeatability, it still remains many issues to be addressed when ML is implemented for PMNM. This special issue aims to bring together the recent applications of machining learning over a wide range of precision and micro/nano-metrology. The topics include but are not limited to:

- Implementations of ML in development of advanced metrology tools, including:
 - Machine vision and smart computational imaging
 - Interferometric optical metrology
 - Scanning probe microscopy (SPM)
 - Scanning electron microscopy (SEM)
 - Optical scatterometry
 - Hybrid metrology and data fusion
 - Data augmentation in PMNM using ML
 - Calibration of sensors and measuring instruments
 - Optical sensors and instrumentation
 - Non-optical sensors and instrumentation
 - Other emerging and innovative measuring techniques
- Applications of ML in innovative and emerging industries, including:
 - Precision surface texture analysis for condition monitoring and fault diagnosis
 - Micro-defects identification or classification using ML methods
 - Metrology and inspection in semiconductor industry
 - Enhancing modeling for measurement techniques and/or uncertainty analysis
- Remaining open issues of ML in PMNM
 - Advanced ML techniques
 - Explainable and Trustworthy ML in PMNM

Original research papers, review articles and short communications are all welcome

All manuscripts must be submitted through the manuscripts system at:

<https://www.editorialmanager.com/nanm/default.aspx>

Manuscript submission information:

Manuscript submission open date: 1 March 2023

Manuscript submission deadline: 30 October 2023 (papers will be published once accepted, earliest from March 2023).

You are invited to submit your manuscript at any time before the submission deadline. For any inquiries about the appropriateness of contribution topics, please contact Professor Xinghui Li via li.xinghui@sz.tsinghua.edu.cn

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