CALL FOR ABSTRACTS

Special Session on

Inducing physics and domain expert knowledge in deep learning algorithms for interpretable PHM applications

Description
Methods that induce physics and domain expert knowledge machine learning algorithms, such as physics-informed neural networks (PINNs) or graph neural networks (GNNs), have improved the ability to predict complex dynamics with less training data, enable a better generalization ability and a better interpretability of model predictions without sacrificing performance. These characteristics are particularly important for diagnostics and prognostics of complex systems in aerospace applications, where confidence, transparency, and performance are equally important.

Motivation
A broad applicability of pure deep learning-based PHM solutions in real applications is often hindered by their black-box nature, low generalizability with limited data, or overly optimistic predictions. In recent years, particularly the combination of physics-based and deep learning models has been one of the most promising directions in several disciplines to obtain accurate, robust, and interpretable models. PINNs and GNNs have recently attracted a substantial interest from different communities. Several other directions have been proposed on combining underlying physics and domain expert knowledge with deep learning algorithms. The special session aims to foster discussions and exchange of ideas on new directions and to discuss how the numerous proposed approaches can be transferred to industrial applications.

Objective
Provide a session for PHM and machine learning knowledge experts to present and discuss work towards integrating data-driven and physics-based methods, with the goal to enable learning from limited data and improve generalization performance.

Organizers
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