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CONTRIBUTION OF AI AND MACHINING LEARNING IN ADVANCED MATERIAL CHARACTERIZATION



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Abstract

Background: Artificial intelligence (AI) includes many mathematical methods such as optimization algorithms, approximation technics (surface response), etc. Some methods brought more focus especially in machine learning (ML) and deep learning (DL) algorithms. Their applications is becoming an important tool in the fields of materials and mechanical engineering. It is due to their incredible capability of predictions of parameters and mechanics behaviors. This allows design of new materials and optimal structures beyond intuitions. Parameter identification of complex materiel for instance, involves massive design spaces that are intractable for conventional methods. In addition, simulation of such model under different loading often required days of finite element analysis with high performing computer.

Objective: To present recent contribution of artificial intelligence and machine learning in the field of materiel science

Methods: After an introduction of the key points of the AI and ML, practical examples of materials characterization and integration within optimal structures will be presented to better appreciate the advantages of such powerful prediction tools.

Results: Two main examples will be presented. The first one is related to composites parameter identification and the second one is related to additive manufacturing. AI and ML will be used to predict and tune the numerical models.

Conclusion: Conclusion will focus more on the perspectives of the above methods.

Biography

David BASSIR is as Professor at the French University of Technology UTBM and also a Senior Research at Ecole Normal Supérieur ENS-Paris Saclay University. Previously, he was the dean of IUT at the University of Lorraine (France), Consult for Science and Technology at the French Embassy to serve at the Consulate General of France in Guangzhou (China), General Director of Research at the Ecole Spéciale des Travaux Publics, du Batiment et de l'Industrie (Paris) and Space Craft engineer at GECI Technology in different space agencies such as Arianespace and Astrium Group. He joined the mechanical department of the UTBM as associate professor in 2001 and the Chair Aerospace Structures in 2008 at Technical University of Delft as visiting professor. He holds a Master and a PhD degree in structural optimization from the University of Franche-Comté (France). He has published more than 150 papers in journals, books and conference proceedings, including more than 56 articles in indexed journals. He is also the Editor-in-Chief of the Int. journal IJSMDO (Scopus, EI) that is published by EDP Sciences.