Synergizing Additive Manufacturing and Artificial Intelligence: Analyzing and Predicting the Mechanical Behavior of 3D-Printed CF-PETG Composites

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Abstract : This paper delves into the combination of additive manufacturing (AM) and artificial intelligence (AI) to solve challenges related to the mechanical behavior of AM-produced parts. The article highlights the fundamentals and benefits of additive manufacturing, including creating complex geometries, optimizing material use, and streamlining manufacturing processes. The paper also addresses the challenges associated with additive manufacturing, such as ensuring stable mechanical performance and material properties. The role of AI in improving the static behavior of AM-produced parts, including machine learning, especially the neural network, is to make regression models to analyze the large amounts of data generated during experimental tests. It investigates the potential synergies between AM and AI to achieve enhanced functions and personalized mechanical properties. The mechanical behavior of parts produced using additive manufacturing methods can be further improved using design optimization, structural analysis, and AI-based adaptive manufacturing. The article concludes by emphasizing the importance of integrating AM and AI to enhance mechanical operations, increase reliability, and perform advanced functions, paving the way for innovative applications in different fields.
Keywords : additive manufacturing, mechanical behavior, artificial intelligence, machine learning, neural networks, reliability, advanced functionalities

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