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Keynote Paper

# Machine Learning Based Design of Composite Structures

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## ABSTRACT

Despite the technical importance of composite materials and structures, systematic design frameworks for them are limited because conventional optimization techniques face difficulties in handling the high-dimensional design space consisting of an astronomical number of material combinations and configurations as well as a complex nonlinear response beyond the linear response regime. With the advancement of machine learning (ML) techniques, extensive efforts are underway to establish alternative data-driven design frameworks for finding the optimal microstructure, external shape, and processing condition of composite materials and structures. In this talk, I would like to propose systematic composite structure design strategies using machine learning by accounting for the size of design space, dataset size, and the fidelity of the dataset. I will then introduce a few case studies concerning the optimization of nonlinear characteristics such as strength and toughness, design of a composite microstructure with very small dataset which limits the usage of the deep neural network, and the development of composite analysis model with less accurate but large homogenization model dataset with the aid of accurate but small experimental dataset.

## REFERENCES

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