

DATA-DRIVEN MODELING FOR STRUCTURAL DESIGN AND PERFORMANCE ESTIMATION OF VEHICLES

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ABSTRACT

In recent years, machine learning approaches have been widely used in many engineering fields, thus leading to complex behavior. Vehicle development and estimation require structural stiffness, material behavior, design optimization, occupant injury, and more. This mini symposium is dedicated to a broad view of vehicle performance using machine learning techniques.

Numerical simulations are used to model various mechanical behaviors, including vehicle structural analysis, material behavior, crash deformation, injury estimation, and design optimization. Simulations are generally based on the finite element method, and the target object is discretized into a mesh. Moreover, the simulations deal with different scales, including the full vehicle, components, and test pieces. Hence, the challenges of numerical simulations for predicting such phenomena are complex and involve mechanics and numerical techniques.

Data-driven modeling is powerful for reducing computational costs in various situations using surrogate models. Preparing numerical results and selecting appropriate machine learning techniques are necessary for constructing models. In addition, generative AI is a novel method of broader engineering assistance and automation.

Therefore, the main topic is machine learning techniques that efficiently and accurately handle conventional numerical results. Subjects include the structural deformation, occupant injury, network model construction, data argumentation, and data generation. Finally, we hope for submissions that provide solutions to improve computational accuracy and efficiency, reduce training time, and handle complex structural behavior.