LongDbName: IEEE Xplore Digital Library
ShortDbName: edseee
AN: edseee.10974355
Title: Data-Driven AI for Topology Optimization: A Comparative Study of CNN and Self-Attention Enhanced Architectures in Data-Constrained Scenarios
PublicationDate: 20241115
Contributors: Jing, Xiao; Guo, Moyi;
DocTypes: Conference;
PubTypes:
CoverDate: 20241115
PeerReviewed: true
Source: 2024 3rd International Conference on Artificial Intelligence, Human-Computer Interaction and Robotics (AIHCIR), Artificial Intelligence, Human-Computer Interaction and Robotics (AIHCIR), 2024 3rd International Conference on, AIHCIR
IsiType: GEN
DOIDS: ;
ISBNS: 979-8-3315-3403-5;
ISSNS: ;
PublisherLocations: ;
RecordType: ARTICLES
BookEdition:
Publisher: IEEE
PageStart: 243
PageEnd: 248
PageCount: 6
Volume:
Issue:
Abstract: This study investigates the application of deep learning techniques for topology optimization, focusing on scenarios with limited data. We compare the performance of a gradient-based optimizer with two neural network architectures: a Convolutional Neural Network (CNN) and a CNN enhanced with self-attention. Using a dataset of 1000 perturbed topology optimization (TO) solutions, our results demonstrate that both neural networks can capture essential structural patterns, with the CNN+self-attention model showing superior performance in handling complex material distributions. These findings highlight the potential of deep learning methods to complement traditional optimization approaches, offering a promising direction for efficient and scalable structural design.
DOI: 10.1109/AIHCIR65563.2024.00048
Language:
Subjects: Computing and Processing; Deep learning; Training; Learning systems; Network topology; Neural networks; Layout; Topology; Convolutional neural networks; Optimization; Robots; Topology Optimization; Data-Driven AI; Deep Learning; Convolutional Neural Networks; Self-Attention; Gradient-Based Optimizer; Structural Design;
plink: https://research.ebsco.com/linkprocessor/plink?id=70d07d85-c913-35ce-94d1-e05a870b77d7