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ABSTRACT
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ADVANCED FIBRE ORIENTATION DETECTION IN COMPOSITE MATERIALS USING LASER SPOT THERMOGRAPHY AND PHYSICS-INFORMED NEURAL NETWORKS

This study focuses on fibre orientation detection in composite materials, utilizing laser spot thermography for experimental data collection. The thermographic data are processed using a physics-informed neural network (PINN), which combines the predictive capabilities of deep neural networks with the representation of physical laws via partial differential equations and boundary conditions. The PINN effectively captures the nonuniform backgrounds in thermograms resulting from laser spot heating, while highlighting the fibre orientations in the model's residual data. Following dimensionality reduction, the key features of fibre orientation are extracted and presented in a concise set of feature plots for visual identification.