Modelling of single lap functionally graded adhesive bonded joint using finite element analysis and machine learning

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Abstract. Functionally Graded Adhesive Joints (FGAJs) have strong and efficient mechanical properties that vary gradually along the overlap length. This leads to a reduction in shear and peel stress concentration at the joint edges and an increase in joint failure load. Finite Element Method (FEM) has been widely used for stress analysis and strength prediction of connected structures to obtain more accurate stress distribution. In this study, we propose a new application for predicting the strength of FGAJs efficiently and accurately based on FEM and an Artificial Neural Network (ANN) model that can accurately and effectively predict the stress distribution in FGAJs. The crack initiation critical parameters under different conditions will be obtained, and the relationship between the bonding material and the critical damage parameters will be explored. Reducing or eliminating stress singularity at the bonding ends will be also investigated with the intention to increase failure load.