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Inverse Airfoil Design Using Generative Adversarial Network[1]
PRIYAM GUPTA, PRINCE TYAGI, RAJ KUMAR SINGH, Delhi Technological University — This research proposes Deep Learning-based Inverse Airfoil Design framework using Generative Adversarial Networks.The objective of the inverse design problem in this study is to design airfoil shapes which produce desired Pressure Distribution at given flow conditions.The Convolutional Neural Network based Generator extracts features from the pressure coefficient profiles and predicts the corresponding airfoil shape coordinates.The Discriminator then attempts to differentiate between the actual and the predicted airfoils.A Bezier layer is embedded in the generator to ensure smooth-contoured aerodynamic surfaces without any sharp deformities.The GANS are trained on a database of airfoil shapes and pressure coefficient distribution obtained for Reynold's number of 100,000 and a range of angle of attacks.The trained generator efficiently generated the desired airfoil with an L2 error of less than 1.5%.The results show that the GAN based framework is computationally time efficient and highly accurate.

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