

Abstract Submitted
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Deep Operator Neural Networks (DeepONets) for prediction of instability waves in high-speed boundary layers¹ PATRICIO CLARK DI LEONI, CHARLES MENEVEAU, Johns Hopkins University, GEORGE KARNI-ADAKIS, Brown University, TAMER ZAKI, Johns Hopkins University — We show how DeepONets can predict the amplification of instability waves in high-speed flows. In contrast to traditional networks that are intended to approximate functions, DeepONets are designed to approximate operators and functionals. Using this framework, we train a DeepONet that takes as inputs an upstream disturbance and a downstream location of interest, and provide as output the amplified profile at the downstream position in the boundary layer. DeepONet thus approximates the linearized Navier-Stokes operator for this flow. Once trained, the network can perform predictions of the downstream flow for a wide variety of inflow conditions without the need to calculate the whole trajectory of the perturbations, and at a very small computational cost compared to discretization of the original flow equations.

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