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A neural network approach for the blind deconvolution of turbulent flows ROMIT MAULIK[1], OMER SAN[2], Oklahoma State University — We present a single-layer feedforward artificial neural network architecture trained through a supervised learning approach for the deconvolution of flow variables from their coarse grained computations such as those encountered in large eddy simulations. We stress that the deconvolution procedure proposed in this investigation is blind, i.e. the deconvolved field is computed without any pre-existing information about the filtering procedure or kernel. This may be conceptually contrasted to the celebrated approximate deconvolution approaches where a filter shape is predefined for an iterative deconvolution process. We demonstrate that the proposed blind deconvolution network performs exceptionally well in the a-priori testing of both two-dimensional Kraichnan and three-dimensional Kolmogorov turbulence and shows promise in forming the backbone of a physics-augmented data-driven closure for the Navier-Stokes equations.

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