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Modeling subgrid-scale stress by deconvolutional artificial neural networks in large eddy simulation of turbulence ZELONG YUAN, Southern University of Science and Technology, CHENYUE XIE, Princeton University, JIANCHUN WANG, Southern University of Science and Technology — A deconvolutional artificial neural network (DANN) framework is proposed to model the subgrid-scale (SGS) stress in large eddy simulation (LES) of turbulence. The filtered velocities at the local spatial stencil geometry are used as input features of the DANN models to recover the unfiltered velocity. The grid width of the DANN models is chosen to be smaller than the filter width, in order to accurately reconstruct the effects of SGS dynamics. The DANN models with reasonable local stencil geometry can predict the SGS stress more accurately than the conventional approximate deconvolution method (ADM) and velocity gradient model (VGM) with high correlation coefficients (larger than 99%) and low relative errors (less than 15%) in the *a prior* study. In the *a posteriori* analysis, the DANN model is superior to the implicit large eddy simulation (ILES), the dynamic Smagorinsky model (DSM), and the dynamic mixed model (DMM) in the prediction of the velocity spectrum, various statistics of velocity and the instantaneous coherent structures without increasing the considerable computational cost. Besides, the trained DANN models without any fine-tuning can predict the velocity statistics and reconstruct SGS energy flux well for different filter widths. These results indicat

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