Mechanisms of convolutional neural networks for learning three-dimensional unsteady wake flow[1] SANGSEUNG LEE, DONGHYUN YOU, Pohang University of Science and Technology — Recently, convolutional neural networks (CNNs) have been applied to predict or model flow dynamics. However, mechanisms of CNNs for learning flow dynamics are still not well understood, while such understanding is highly necessary to reduce trial-and-errors in designing networks. In the present study, we investigate the mechanisms of a CNN for prediction of three-dimensional unsteady wake flow behind a circular cylinder. Feature maps in the CNN are visualized to compare flow structures that the CNN extracts from flow at different flow regimes. A Fourier analysis is conducted to reveal the mechanisms, which enable the CNN to predict flow dynamics at different flow regimes, of a convolution layer to integrate and transport wave number information from flow. The integration and transportation characteristics of information of flow variables and histories in the CNN are discussed.

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