

Deep Image Reconstruction from Human Brain Activity

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Presentation Abstract Summary Machine learning-based analysis of human fMRI patterns has enabled the visualization of perceptual contents. However, it has been limited to the reconstruction with low-level image bases or to the matching to exemplars. Recent work showed that visual cortical activity can be decoded (translated) into hierarchical features of a deep neural network (DNN) for the same input image, providing a way to make use of the information from hierarchical visual features. Here, we present a novel image reconstruction method, in which the pixel values of an image are optimized to make its DNN features similar to those decoded from human brain activity at multiple layers. We found that the generated images resembled the stimulus images (both natural images and artificial shapes) and the subjective visual contents such as illusions and imagery. The results suggest that hierarchical visual information in the brain can be effectively combined to reconstruct perceptual and subjective images.

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