

Understanding Biological Visual Attention Using Convolutional Neural Networks

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Presentation Abstract Summary Selective visual attention enhances performance on difficult visual tasks. Studies have investigated the neural correlates of attention, but connecting neural changes to performance changes is challenging. To tackle this, we utilize deep convolutional neural networks (CNNs), which are both capable of performing visual tasks and represent images similarly to the ventral visual stream. Specifically, we test variants of the feature similarity gain (FSG) model of attention and find that the variant of FSG that best increases performance is also the best match to the neural data. In addition, on a task that requires attention to one feature while reading out another, FSG can enhance performance. However, using gradient calculations, we show that attentional modulation should in this case depend on tuning to both task-relevant features. Thus, this work validates, extends, and refines an existing model of biological attention by incorporating it into a deep network.

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