# RECURRENT CONNECTIONS FACILITATE LEARNING SYMMETRY PERCEPTION

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## ABSTRACT

Symmetry is omnipresent in nature and perceived by the visual system of many species, that are capable to acquire this ability with very limited visual experience. Symmetry perception requires evaluating non-local spatial relations and its underlying neural mechanisms remain elusive. Here, we evaluate Deep Neural Networks (DNNs) architectures in facilitating learning symmetry perception with few examples. We demonstrate that classic feed-forward DNNs that excel at modelling brain areas for object recognition, are unable to acquire a general notion of symmetry, even when the DNNs implement architectures that can capture non-local spatial dependencies, such as 'dilated' convolutions and the recently introduced 'transformers' architecture. Yet, we find that recurrent architectures are capable of learning to perceive symmetry with few examples. Recurrent networks decompose the non-local spatial dependencies into a sequence of local operations, that are reusable for any novel image. Our results suggest that recurrent connections are essential for symmetry perception.