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# A survey of the contribution of a retinotopic transformation on a visual task

Jean-Nicolas Jeremie<sup>\*1</sup>, Emmanuel Daucé<sup>2</sup>, and Laurent Perrinet<sup>1</sup>

<sup>1</sup>Institut de Neurosciences de la Timone – Aix Marseille Université : UMR7289, Centre National de la Recherche Scientifique : UMR7289, Aix Marseille Université, Centre National de la Recherche Scientifique – France

<sup>2</sup>École Centrale de Marseille – Centre National de la Recherche Scientifique - CNRS – France

## Résumé

Foveated vision is characteristic of many animal species, including humans. Understanding the function of this retinotopic mapping, especially in comparison to other species that lack this feature, is still an open debate. With respect to the generality and difficulty of this task, a scientific question is to understand how this is achieved. Here, we propose that a retinotopic mapping may be one essential ingredient in that efficiency and study the advantages of this transformation in the context of image classification. Inspired by this neuroscientific observation, we decided to exploit the potential of artificial neural networks to test our hypothesis and retrained several networks on a categorization task. We use a logarithmic polar mapping which can be directly used to transform the input to classical deep learning classification algorithms using a Convolutional Neural Networks (CNN). We chose to implement a transfer learning protocol on VGG16 networks, which offers a good compromise between computation time and accuracy. We apply this architecture to the recognition of the presence of an animal in the image. First of all, the network is still able to categorize the presence of an animal in logarithmic polar space with more than 90% accuracy rate. Second, compared to a similar network trained with images in linear space, it retains good categorization robustness when exposed to a geometric transformation such as a rotation. Moreover, using a saliency map protocol we qualitatively find that the retinotopic transformation improves the robustness and the localization of image classification when it is directed towards an isolated object. This opens perspectives for the use of the logarithmic polar mapping in models of visual search, in particular by introducing biologically-inspired saccades in computer vision algorithms to efficiently localize and detect targets.

**Mots-Clés:** deep learning, vision, retinotopy, visual search, VGG16

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<sup>\*</sup>Intervenant