
A neural network based on fixed-point layers for geodesical morphological operators

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Résumé

Convolutional neural networks (CNNs) are widely used for image classification problems. However, CNNs accuracy depends largely on tests data quality and data augmentation used during training. Indeed, CNNs performance is not guaranteed when perturbations occur. We proposed a Morphological Neural Network (MNN) based on fixed-point layers for geodesical morphological operators to provide noise robustness. The idea is to perform and control a reconstruction, from noisy inputs, which yields output images as invariant as possible to perturbations. Indeed, each morphological layer in our MNN aims to provide both interpretability at deep stage of the network, and an invariance to a certain type of perturbation.

Our proposed architecture succeeds in performing accurate reconstruction for a wide range of additive perturbations, especially folded normal noise, with low data augmentation during training. Besides, the combination of our MNN and CNN allowed us to obtain better classification accuracy than single CNN for a wide range of perturbations.

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