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An Improved convolutional neural network algorithm for 3D MRI brain images

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Abstract

Convolution neural network is a multi-layered network that is very popular today. This network is very popular due to feature extraction from images, videos, etc. In this paper, we first apply three fundamental changes to the convolution neural network architecture and thus introduce a new convolution neural network that is very resistant to noise. Then we compare the newly introduced algorithm. We do this for the MNIST dataset in noisy and non-noisy mode. The results show that even if we add 40% noise to the original data, the output of the proposed method is the same as the none-noise mode. We then suggest using the IMCNN + KNN hybrid algorithm to increase the classification accuracy. For this purpose, we use the ABIDE¹ database related to Magnetic Resonance Imaging of Autism Spectrum Disorder (ASD). The accuracy of classifying Normal Control with autism in the proposed method, even in the presence of noise, is 98.9%, which is a significant improvement over the CNN algorithm.

Keywords: improved convolutional neural network (IMCNN), Autism Spectrum Disorder (ASD), Noise reduction, k-nearest neighbors algorithm (KNN)

¹ Autism Brain Imaging Data Exchange (ABIDE)