A CREATIVE GENERATIVE NEURAL NETWORK FOR FINE ART SYNTHESIS FROM RECOGNISED IMAGES

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For deep learning, studying and simulating human creative mental processes are actual topics. It is convenient to use fine art images for these purposes [1]-[2]. A need for large datasets often becomes a problem in training generative models.

The aim of our research is in optimization of the network architecture and its parameters for effective training on relatively small datasets. The resulting model has a Generative Adversarial Network (GAN) architecture consisting of two neural networks: a generator (R-operator) and a discriminator (S-operator). In terms of Creative Processes Theory (creative operator C=R+S), a generator performs rotational synthesis and a discriminator provides selection. For an implementation of the latter, we have chosen a convolutional neural network, which technologically imitates functions of cerebral cortexes. The generator has a deconvolution architecture.

We suggest changes to a typical block structure of a convolutional network consisting in elimination of a pooling layer and addition of a Batch Normalization layer after every convolution layer [3]. It makes the model simpler and the training time shorter. Each of the blocks has a ReLU activation function for increasing convergence velocity of stochastic gradient descent.

The generator network consists of six convolutional blocks while the discriminator network has only four blocks of this type. A sigmoid activation function is used in the discriminator for classifying real and fake images.

The developed generative model can be trained with relatively small datasets (500 images). During training and testing, model images are generated from random noise. Thus, a generative model has been developed for creating fine art from recognized images using small graphic datasets.

References:

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3. K. Ganguly “Learning Generative Adversarial Networks”, Birmingham: Packt Publishing Ltd., 2017.