

Optimizing the Capacity of a Convolutional Neural Network for Image Segmentation and Pattern Recognition

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Abstract : In this paper, we study the factors which determine the capacity of a Convolutional Neural Network (CNN) model and propose the ways to evaluate and adjust the capacity of a CNN model for best matching to a specific pattern recognition task. Firstly, a scheme is proposed to adjust the number of independent functional units within a CNN model to make it be better fitted to a task. Secondly, the number of independent functional units in the capsule network is adjusted to fit it to the training dataset. Thirdly, a method based on Bayesian GAN is proposed to enrich the variances in the current dataset to increase its complexity. Experimental results on the PASCAL VOC 2010 Person Part dataset and the MNIST dataset show that, in both conventional CNN models and capsule networks, the number of independent functional units is an important factor that determines the capacity of a network model. By adjusting the number of functional units, the capacity of a model can better match the complexity of a dataset.

Keywords : CNN, convolutional neural network, capsule network, capacity optimization, character recognition, data augmentation, semantic segmentation

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