Large Neural Networks Learning From Scratch With Very Few Data and Without Explicit Regularization

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Abstract : Recent findings have shown that Neural Networks generalize also in over-parametrized regimes with zero training error. This is surprising, since it is completely against traditional machine learning wisdom. In our empirical study we fortify these findings in the domain of fine-grained image classification. We show that very large Convolutional Neural Networks with millions of weights do learn with only a handful of training samples and without image augmentation, explicit regularization or pretraining. We train the architectures ResNet018, ResNet101 and VGG19 on subsets of the difficult benchmark datasets Caltech101, CUB_200_2011, FGVCAircraft, Flowers102 and StanfordCars with 100 classes and more, perform a comprehensive comparative study and draw implications for the practical application of CNNs. Finally, we show that VGG19 with 140 million weights learns to distinguish airplanes and motorbikes with up to 95% accuracy using only 20 training samples per class.

Keywords : convolutional neural networks, fine-grained image classification, generalization, image recognition, over-parameterized, small data sets

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