A Comprehensive Study on Deep Image Classification with Small Datasets

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Abstract Convolutional Neural Networks (CNNs) showed state-of-the-art accuracy in image classification on large-scale image datasets. However, CNNs show considerable poor performance in classifying tiny data since their large number of parameters over-fit the training data. We investigate the classification characteristics of CNNs on tiny data, which are important for many practical applications. This study analyzes the performance of CNNs for direct and transfer learning based training approaches. Evaluation is performed on two publicly available benchmark datasets. Our study shows the accuracy change when altering the DCNN depth in direct training to indicate the optimal depth for direct training. Further, fine-tuning source and target network with lower learning rate gives higher accuracy for tiny image classification.

Keywords Deep image classification · CNN · Transfer learning

1 Introduction

Image classification [1–3] is one of the major tasks in computer vision investigated for many years. Many application areas, such as image captioning [4], object tracking [5, 6], scene understanding [7], and event detection [8], for a multitude of other purposes [9, 10], used image classifying as the primary task. Compared to

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