Introduction

In this paper, we propose an accurate edge detector using richer convolutional features (RCF). Since objects in natural images possess various scales and aspect ratios, learning the rich hierarchical representations is very critical for edge detection. CNNs have been proved to be effective for this task. In addition, the convolutional features in CNNs gradually become coarser with the increase of the receptive fields. According to these observations, we attempt to adopt richer convolutional features in such a challenging vision task. The proposed network fully exploits multiscale and multilevel information of objects to perform the image-to-image prediction by combining all the meaningful convolutional features in a holistic manner. Using VGG16 network, we achieve state-of-the-art performance on several available datasets. When evaluating on the well-known BSDS500 benchmark, we achieve ODS F-measure of 0.811 while retaining a fast speed (8 FPS). Besides, our fast version of RCF achieves ODS F-measure of 0.806 with 30 FPS.

Network Architecture

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Evaluation on BSDS500 Dataset

Motivation

We build a simple network based on VGG16 to produce side outputs of conv3_1, conv3_2 and conv3_3. One can clearly see that convolutional features become coarser gradually, and the intermediate layers conv3_1 and conv3_2 contain lots of useful fine details that do not appear in conv3_3.

Multiscale

The original image is resized to construct an image pyramid. And these multiscale images are input to RCF network separately for a forward pass. A simple average of these edge maps will output high-quality edges.