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Learning CNNs from Weakly Annotated Facial Images

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Abstract

Learning of convolutional neural networks (CNNs) to perform a face recognition task requires a large set of facial images each annotated with a label to be predicted. In this paper we propose a method for learning CNNs from weakly annotated images. The weak annotation in our setting means that a pair of an attribute label and a person identity label is assigned to a set of faces automatically detected in the image. The challenge is to link the annotation with the correct face. The weakly annotated images of this type can be collected by an automated process not requiring a human labor. We formulate learning from weakly annotated images as a maximum likelihood (ML) estimation of a parametric distribution describing the weakly annotated images. The ML problem is solved by an instance of the EM algorithm which in its inner loop learns a CNN to predict attribute label from facial images. Experiments on age and gender estimation problem show that the proposed algorithm significantly outperforms the existing heuristic approach for dealing with this type of data. A practical outcome of our paper is a new annotation of the IMDB database [26] containing 300k faces each one annotated by biological age, gender and identity labels.

1. Introduction

Convolutional neural networks (CNNs) learned from examples achieve the state-of-the-art performance in many face recognition problems. Achieving good performance however requires a large set of facial images annotated by an attribute label to

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