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AGE AND GENDER CLASSIFICATION USING CONVOLUTIONAL NEURAL NETWORKS

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Abstract_ Automatic age and gender classification has become relevant to an increasing amount of applications, particularly since the rise of social platforms and social media.Nevertheless, performance of existing methods on real-world images is still significantly lacking, especially when compared to the tremendous leaps in performance recently reported for the related task of face recognition.In this paper we show that by learning representations through the use of Open CV, a significant increase in performance can be obtained on these tasks.To this end, we propose a simple convolutional net architecture that can be used even when the amount of learning data is limited.We evaluate our method on the recent Audience benchmark for age and gender estimation and show it to dramatically outperform.

1.INTRODUCTION

Age and gender play fundamental roles in social interactions. Languages reserve different salutations and grammar rules for men or women, and very often different vocabularies are used when addressing elders compared to young people. Despite the basic roles these attributes play in our day-to-day lives, the ability to automatically estimate them accurately and reliably from face images is still far from meeting the needs of commercial applications. This is particularly perplexing when considering recent claims to super-human capabilities in the related task of face recognition.

In this paper we attempt to close the gap between automatic face recognition capabilities and those of age and gender

estimation methods. To this end, we follow the successful example laid down by recent face recognition systems: Face recognition techniques described in the last few years have shown that tremendous progress can be made by the use of deep convolutional neural networks (CNN).

We test our network on the newly released Adience 1 benchmark for age and gender classification of unfiltered face images. We show that despite the very challenging nature of the images in the Adience set and the simplicity of our network design, our method outperforms existing state of the art by substantial margins.

2.LITERATURE SURVEY

[1] T. Ahonen, A. Hadid, and M. Pietikainen. Face description with local binary patterns: Application to face recognition. Trans. Pattern Anal. Mach. Intell., 28(12):2037–2041, 2006. 2 This paper presents a novel and efficient facial image representation based on local binary pattern (LBP) texture features. The face image is divided into several regions from which the LBP feature distributions are extracted and concatenated into an enhanced feature vector to be used as a face descriptor. The performance of the proposed method is assessed in the face recognition problem under different challenges. Other applications and several extensions are also discussed.

[2] S. Baluja and H. A. Rowley.Boosting sex identification performance. Int. J. Comput. Vision,71(1):111–119, 2007. 2

This paper presents a method based on AdaBoost to identify the sex of a person from a low resolution grayscale picture of their face. The method described here is implemented in a system that will process well over 109 images. The goal of this work is to create an efficient system that is both simple to implement and maintain; the methods described here are extremely fast and have straightforward implementations. We achieve 80% accuracy in sex identification with less than 10 pixel comparisons and 90% accuracy with less than 50 pixel comparisons. The best classifiers published to date use Support Vector Machines; we match their accuracies with as fewas 500 comparison operations on a 20× 20 pixel image. The AdaBoost based classifiers presented here achieve over 93% accuracy; these match or surpass the accuracies of the SVM-based classifiers, and yield performance that is 50 times faster.

[3] A. Bar-Hillel, T. Hertz, N. Shental ,and D. Weinshall. Learning distance functions using equivalence relations. In Int. Conf. Mach. Learning, volume 3, pages 11–18, 2003.2

We address the problem of learning distance metrics using side-information in the form of groupsof "similar" points. We propose to use

the RCA algorithm, which is a simple and efficient algorithm for learning a full ranked Mahalanobis metric (Shental et al., 2002). We first show thatRCA obtains the solution to an interesting optimization problem, founded on an information theoretic basis. If the Mahalanobis matrix is allowed to be singular, we show that Fisher's linear discriminant followed by RCA is the optimal dimensionality reduction algorithm under the same criterion. We then show how this optimization problem is related to the criterion optimized by another recent algorithm for metric learning (Xing et al., 2002), which uses the same kind of side information. We empirically demonstrate that learning a distance metric using the RCA algorithm significantly improves clustering performance, similarly to the alternative algorithm. Since the RCA algorithm is much more efficient and cost effective than the alternative, as it only uses closed form expressions of the data, it seems like a preferable choice for the learning of full rank Mahalanobis distances.

[4] W.-L. Chao, J.-Z.Liu, and J.-J. Ding. Facial age estimation based on label-sensitive learning and age-oriented regression. Pattern Recognition, 46(3):628–641, 2013. 1, 2

This paper provides a new age estimation approach, which distinguishes itself with the following three contributions. First, we combine distance metric learning and dimensionality reduction to better explore the connections between facial features and age labels. Second, to exploit the intrinsic ordinal relationship among human ages and overcome the potential data imbalance problem, a label-sensitive concept and several imbalance treatments are introduced in the system training phase. Finally, an age-oriented local regression is presented to capture the complicated facial aging process for age determination. The simulation results show that our approach achieves the lowest estimation error against existing methods

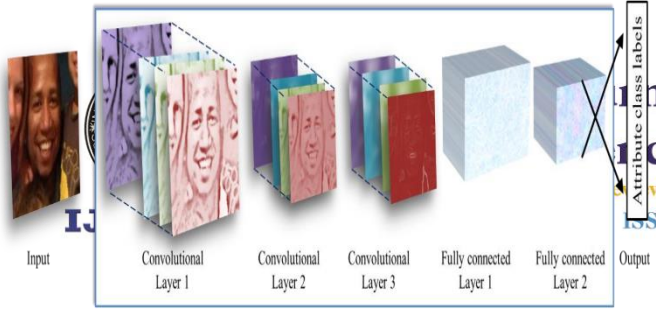
3.PROPOSED SYSTEM

In this paper we show that by learning representations through the use of Open CV, a significant increase in performance can be obtained on these tasks.

To this end, we propose a simple convolutional net architecture that can be used even whenthe amount of learning data is limited.

We evaluate our method on the recent Audience benchmark for age and gender estimation and show it to dramatically outperform current state-of-the-art methods.

3.1 IMPLEMETATION



A detailed survey of gender classification methods can be found in [34] and more recently in [42]. Here we quickly survey relevant methods. One of the early methods for gender classification used a neural network trained on a small set of near-frontal face images. In [37] the combined 3D structure of the head (obtained using a laser scanner) and image intensities were used for classifying gender.

FIG: 1 Illustration Of CNN Architecture

The network contains three convolutional layers, each followed by a rectified linear operation and pooling layer. The first two layers also follow normalization using local response normalization [28]. The first Convolutional Layer contains 96 filters of 7×7 pixels, the second Convolutional Layer contains 256 filters of 5×5 pixels, The third and final Convolutional Layer contains 384 filters of 3 × 3 pixels. Finally, two fully-connected layers are added, each containing 512 neurons.

Most of the methods discussed above used the FERET benchmark both to develop the proposed systems and to evaluate performances. FERET images were taken under highly controlled condition and are therefore much less challenging than in-the-wild face images.

Moreover, the results obtained on this benchmark suggest that it is saturated and not challenging for modern methods. It is therefore difficult to estimate the actual relative benefit of these techniques. As a consequence, experimented on the popular Labeled Faces in the Wild (LFW) benchmark, primarily used for face recognition. Their method is a combination of LBP features with an AdaBoost classifier. As with age estimation, here too, we focus on the Adience set which contains images more challenging than those provided by LFW, reporting performance using a more robust system, designed to better exploit information from massive example training sets.

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4.RESULTS AND DISCUSSIONS

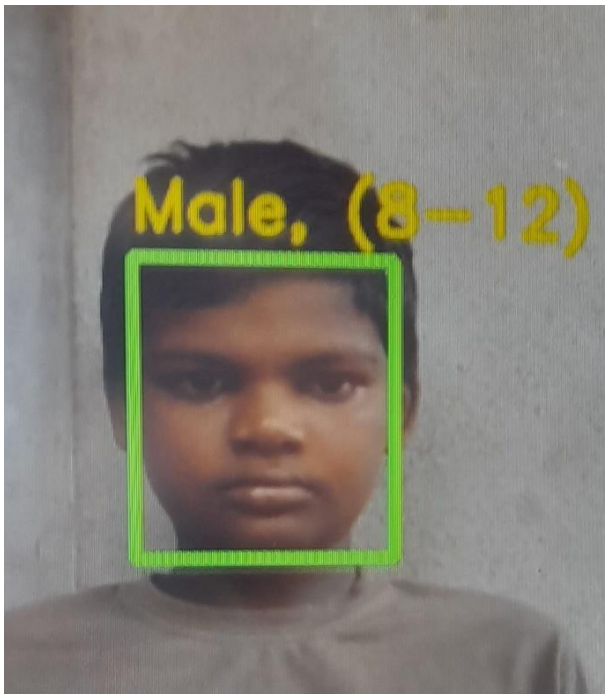

Fig 2:Gender Detection

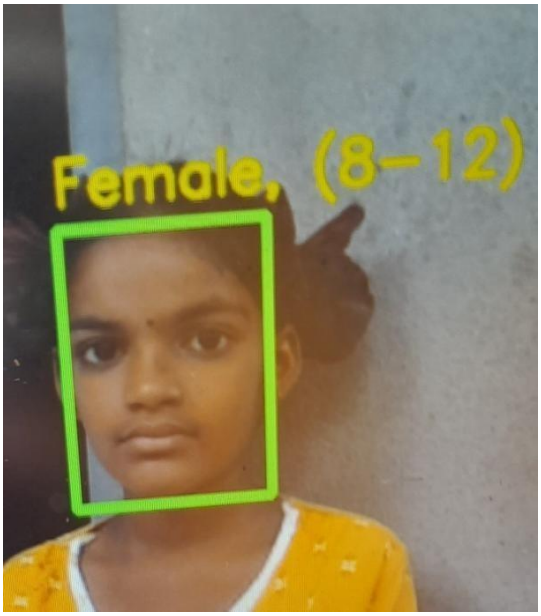

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Fig 3:Gender Detection

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5.CONCLUSION AND FUTURE SCOPE

Though many previous methods have addressed the problems of age and gender classification, until recently, much of this work has focused on constrained images taken in lab settings. Such settings do not adequately reflect appearance variations common to the real-world images in social websites and online repositories. Internet images, however, are not simply more challenging: they are also abun-dant. The easy availability of huge image collections provides modern machine learning based systems with effectively endless training data, though this datais not always suitably labeled for supervised learning.

Taking example from the related problem of face recognition we explore how well deep OpenCV perform on these tasks using Internet data. We provide results with a lean deep- learning architecture designed to avoid overfitting due to the limitation of limited labeled data. Our network is "shallow" compared to some of the recent network architectures, thereby reducing the number of its parameters and the chance for overfitting. We further inflate the size of the training data by artificially adding cropped versions of the images in our training set. The resulting system was tested on the Adience benchmark of unfiltered images and shown to significantly outperform recent state of the art.

Two important conclusions can be made from our results. First, OPENCV can be used to provide improved age and gender classification results, even considering the much smaller size of contemporary unconstrained image sets labeled for age and gender. Second, the simplicity of our model implies that more elaborate systems using more training data may well be capable of substantially improving results beyond those reported here.

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