Adversarial Multi-Scale Features Learning for Person Re-Identification

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ABSTRACT

Person re-identification (Re-ID) is the task of matching a target person across different cameras, which has drawn extensive attention in computer vision and has become an essential component in the video surveillance system. Pried can be considered as a problem of image retrieval. Existing person re-identification methods depend mostly on single-scale appearance information. In this work, to address issues, we demonstrate the benefits of a deep model with Multi-scale Feature Representation Learning (MFRL) using Convolutional Neural Networks (CNN) and Random Batch Feature Mask (RBFM) is proposed for pre- id in this study. The RBFM is enlightened by the drop block and Batch Drop Block (BDB) dropout - based approaches. However, great challenges are being faced in the pre-id task. First, in different scenarios, appearance of the same pedestrian changes dramatically by reason of the body misalignment frequently, various background clutters, large variations of camera views and occlusion. Second, in a public space, different pedestrians wear the same or similar clothes. Therefore, the distinctions between different pedestrian images are subtle. These make the topic of pre-id a huge challenge. The proposed methods are only performed in the training phase and discarded in the testing phase, thus, enhancing the effectiveness of the model. Our model achieves the state-of-the-art on the popular benchmark datasets including Market-1501, duke mtmc -re-id and CUHK03. Besides, we conduct a set of ablation experiments to verify the effectiveness of the proposed methods.

KEYWORDS: Re-ID, Multi-scale Feature Representation Learning, and Batch Drop Block

INTRODUCTION

It is well-known that the accuracy of face recognition systems deteriorates quite rapidly in unconstrained settings. Thiscanbe attributed to degradations arising from blur, changes in illumination, pose, and expression, partial occlusions etc. Motion blur, in particular, deserves special attention owing to the ubiquity of mobile phones and hand-held imaging devices. Dealing with camera shake is a very relevant problem because, while tripods hindermobility, reducing the exposure time affects image quality. Moreover, in-built sensors such as gyros and accelerometers have their own limitations in sensing the camera motion. In an uncontrolled environment, illumination and pose could alsovary, further compounding the problem. The focus of this paper is on developing a system that can recognize faces across non-uniform (i.e., space-variant) blur, and varying illumination and pose. Traditionally, blurring due to camera shake has been modeled as a convolution with a single blur kernel,and the blur is assumed to be uniform across the image. However, it is space-variant blur that is encountered frequently in hand-held cameras. While techniques have been proposed that address the restoration of non- uniform blurs by local space-invariance approximation recent methods for image restoration have modeled the motion-blurred image as an average of projectively transformed images. Face recognition systems that work with focused images have difficulty when presented with blurred data. Approaches to face recognition from blurred images can be broadly classified into four categories. (i) De-blurring-based in which the probe image is first de-blurredand then used for recognition. However, de- blurring artifactsare a major source of error A good survey article on this issue can be found in. jointly tackle some of these issues under one framework. Patel etal.have proposed a dictionary-based approach to recognizing faces across illumination and pose. A sparse minimization technique for recognizing faces across illumination and occlusion has been proposed in,while,which is based on similar principles, additionally offers robustness to alignment and pose. But these works do not deal with blurred images.

A very recent work formally addresses the problem of recognizing faces from distant cameras across both blur and illumination wherein the observed blur can be well-approximated by the convolution model. To the best of our knowledge, the only attempt in the literature at recognizing faces across non-uniform blur has been made in which the uniform blur model is applied on overlapping patches to perform recognition on the basis of a majority vote.However,they do not explicitly model illumination changes going from gallery to probe. We would like to point out that both limit their discussion to frontal faces.

LITERATURE SURVEY

A wide variety of systems requires reliable personal recognition schemes to either confirm or determine the identity of an individual requesting their services. The purpose of such schemes is to ensure that the rendered services are accessed only by a legitimate user and no one else. Examples of such applications include secure access to buildings, computer systems, laptops, 3cellular phones, and ATMs. In the absence of robust personal recognition schemes,these systems are vulnerable to the wiles of an impostor. Biometric recognition, or, simply, biometrics, refers to the automatic recognition of individuals based on their physiological and/or behavioral characteristics.

By using biometrics, it is possible to confirm or establish an individual's identity based on "who she is", rather than by "what she possesses"(e.g., an ID card) or" what she remembers" (e.g., a password). Describe a holistic face recognition method based on subspace Linear Discriminant Analysis (LDA). The method consists of two steps: first we project the face image from the original vector space to a face subspace via Principal Component Analysis where the subspace dimension is carefully chosen, and then we use LDA to obtain a linear classifier in the subspace. The criterion we use to choose the subspace dimension enables us to generate classseparable features via LDA from the full subspace representation. Hence we are able to solve the generalization/over fitting problem when we perform face recognition on a large face dataset but with very few training face images available per testing person. In addition, we employ a weighted distance metric guided by the LDA eigenvalues to improve the performance of the subspace LDA method. Finally, the improved performance of the subspace LDA approach is demonstrated through experiments using the FERET dataset for facerecognition/verification, alargemugshot dataset for person verification, and the MPEG-7 dataset. We believe that this approach provides a useful framework forother image recognition tasks as well. Automatic recognition of people is a challenging problem which has received much attention during recent years due to its many applications in different fields. Face recognition is one of those challenging problems and upto date,there is no technique that provides a robust solution to all situations. This paper presents a new technique for human face recognition. This technique uses an image-based approach towards artificial intelligence by removing redundant data from face images through image compression using the two-dimensional discrete cosine transform (2D- DCT). The DCT extracts features from face images based on skin color. Featurevectors are constructed by computing DCT coefficients. A self-organizing map (SOM) using an unsupervised learning technique is used to classify DCT-based feature vectors into groups to identify if the subject in the input image is "present" or "not present" in the image database. Face recognition with SOM is carried out by classifying intensity values of grayscale pixels into different groups. Evaluation was performed in MATLAB using an image database of 25 face images, containing five subjects and each subject having 5 images with different facial expressions. After training for approximately 850 epochs the system achieved a recognition rate of 81.36% for 10 consecutive trials.The main advantage of this technique is its high-speed processing capability and low computational requirements, in terms of both speed and memoryutilization.

PROPOSED SYSTEM

In this proposed face recognition DBT that is robust to non-uniform i.e space varying motion blur arising from relative motion between the camera and the subject. We will assume that only a single gallery image is available. The camera transformations can range from in-plane translations and rotations to out-of-plane translations, out-of-plane rotations and even general 6D motion. Observe that the blur on the faces can be significantly non-uniform. The simple yet restrictive convolution model fails to explain this blur and a space-varying formulation becomes necessary.

ADVANTAGES

1. Appropriatethis proposed method of recognition allows us to circumvent the challenging and ill-posedproblem of single image blind-de-blurring.
2. It efficiently deals with blurred images.
3. This is the first attempt to systematically address face recognition under (i) non-uniform motion blur and (ii) the combined effects of blur, illumination and pose.
4. We prove that the set of all images obtained by non-uniformly blurring a given image forms a convex set. We also show that the set of all images obtained from a face image by non- uniform blurring and change of illumination forms a bi-convexset.
5. We extend our method to non-frontal situations by transforming the gallery to a newpose.

RESULT AND DISCUSSIONS

One of the most challenging problems face recognition deals with is an appropriate separation of the data that belong to thesame class. In face recognition, a class represents all data of the same subject, ie, all images ofthe same person. The goal is to implement an automated machine supported system that (after initialization and training by representative sample of images) recognizes person's identity in the images that were not trained before. This can have various practical applications such as automated person identification, recognition of race, gender ,emotion, age etc. The area of face recognition is well develop dusing
➢ Support VectorMachine(SVM)
➢ Principle Component Analysis(PCA)
➢ Linear Discriminant Analysis(LDA) Kernelmethod.

SUPPORT VECTOR MACHINES

SVM map data from an original space into a higher dimensional feature space using non-linear mapping. An original algorithm from the original space is used in the feature space.

Although the high-dimensional space increases the difficulty of the problem (curse of dimensionality),a trick for computing the scalar products in the feature space exists. Computation of the scalar product between two feature space vectors can be done using kernel functions. Using kernel functions, the feature space need not be computed explicitly. The SVM method was originally developed as a linear classifier. Later it was modified utilizing kernel methods so that it allows also non-linear mapping of data to the feature space.

PRINCIPLE COMPONENT ANALYSIS

Principal Component Analysis(PCA) is a dimensionality reduction technique which is used for compression and recognition problems. It is also known as Eigen space Projection or Karhunen-Loeve Transformation. PCA projects images into a subspace such that the first orthogonal dimension of this subspace captures the greatest amount of
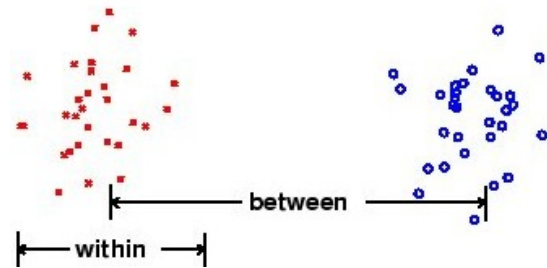
variance among the images and the last dimension of this subspace captures the least amount of variance among the images.The main goal of PCA is the dimensionality reduction, therefore the eigen vectors of the covariance matrix should be found in order to reach the solution. The eigen vectors correspond tothe directions of the principal components of the original data, the statistical significance is given by their corresponding eigenvalues.

LINEAR DISCRIMINANTANALYSIS

Linear Discriminant analysis explicitly attempts to model the difference between the classes of data. LDA is a powerful face recognition technique that overcomes the limitation of Principle component analysis technique by applying the linear discriminant criterion. This criterion tries to maximize the ratio of the determinant of the between-class scatter matrix of the projected samples to the determinant of the within class scattermatrix of the projectedsamples. Linear discriminant group images of the same class and separates images of different classes of the images. Discriminant analysis can be used only for classification not for regression. The target variable may have two or more categories. Images are projected from two dimensional spaces to c dimensional space, where c is the number of classes of the images. To identify an input test image, the projected test image is compared to each projected training image, and the test image is identified as the closest training image.The LDA method tries to find the subspace that discriminates different face classes.

Fig 1: Plot of two categories of classes

Linear discriminant analysis finds a Linear transformation (discriminant function) of the two predictors, X and Y that yields a new set of transformed values that provides a more accurate discrimination than either predictor alone:

Transformed Target = C1*X + C2*Y

The following figure shows the partitioning done using the transformation function

Fig 2: Partitioning done using the transformation function

Maximizing the between class scatter matrix, while minimizing the within-class scatter matrix, a transformation function is found that maximizes the ratio of between- class variance to within-class variance and find a good class separation as illustrated as follows:

Fig 3: Class Separations in LDA.

CONCLUSION

Face recognition is a challenging problem in the field of image analysis and computer vision that has received a great dealof attention over the last few years because of its many applications in various domains. Research has been conducted vigorously in this area for the past four decades so, and though huge progress has been made, encouraging results have been obtained and current face recognition systems have reached a certain degree of maturity when operating under constrained conditions; however, they are far from achieving the ideal of being able to perform adequately in all the various situations that are commonly encountered.

The ultimate goal of researchers in this area is to enable computers to emulate the human vision System we have proposed a new LDA-based face recognition system. It is known that the major drawback of applying LDA is that it may encounter the small sample size problem. When the smallsample size problem occurs, the within-class scatter matrix SW becomes singular. We have applied a theory from linear algebra to some projection vectors.
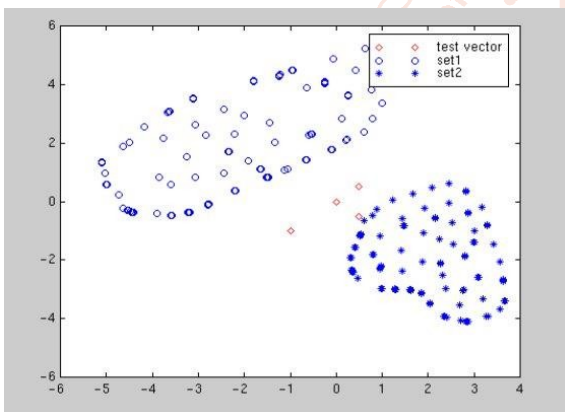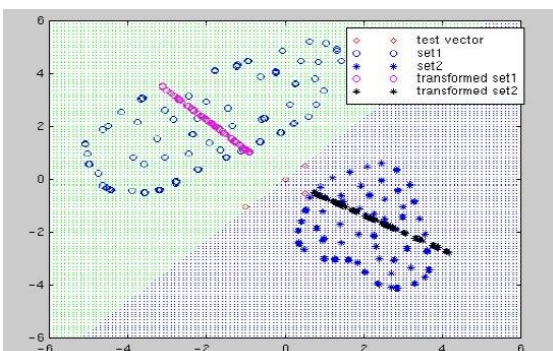
The application of LDA to study the discriminatory power of various facial features in spatial and wavelet domain is presented. Also, an LDA-based feature extraction for face recognition is proposed and tested. A holistic projection-based approach to face feature extraction is taken in which eigen templates are the most discriminant vectors derived from LDA of face images in a rich enough database.

FUTURE WORK

The weighted combination of similarity or dissimilarity scores suggested by all projection coefficients is the basis for membership values .Several results on face recognition and gender classification are presented, in which highly competitive recognition accuracies are achieved with a small number of features .The feature extraction can be applied to WT representation of images to provide a multiscale discriminate framework. In such cases the system becomes more complex at the expense of improving separability and performance.

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