NOVATEUR PUBLICATIONS
International Journal Of Research Publications In Engineering And Technology [IJRPET]
ISSN: 2454-7875
VOLUME 2, ISSUE 12, Dec. -2016

MINING WEAKLY LABELED WEB FACIAL IMAGES FOR SEARCH-BASED FACE ANNOTATION

MISS. POOJA P. GADHAVE
(ME Student) Department of Computer Engineering, Dattakala Faculty of Engineering, Pune, Maharashtra, India, poojagadhavep@gmail.com

PROF. B. S. SALVE
(Guide) Department of Computer Engineering, Dattakala Faculty of Engineering, Pune, Maharashtra, India,salvebs1486@gmail.com

ABSTRACT:

This paper investigates a framework of the search-based totally face annotation by mining weakly labeled facial images that are freely available on the world wide web. the one difficult trouble for the search-based face annotation scheme is how to efficiently perform annotation by means of exploiting the list of most comparable facial images and their weak labels which might be regularly noisy and incomplete. Tackleof this trouble, we recommend an powerful unsupervised label refinement method for refining the labels of web facial images the use of machine learning strategies. We formulate the learning trouble as convex optimization and develop powerful optimization algorithms to remedy the huge-scale learning task efficiently. further speed up the proposed scheme, we additionally recommend a clustering-primarily based approximation algorithm which can enhance the scalability extensively. We have got carried out an intensive set of empirical researches on a huge-scale web facial image test bed, in which encouraging outcomes showed that the proposed ULRalgorithms can considerably enhance the overall performance of the promising SBFA scheme.

KEYWORD: Face annotation, content-based image retrieval, machine learning, label refinement, web facial images, and weak label.

INTRODUCTION:

The popularity of various digital cameras and, the fast growth of social media tools for net-primarily based image sharing, recent years have witnessed an explosion of the number of digital images captured, and stored by customers. A large portion of images shared by users on the internet are human facial pictures. some of these facial images are tagged with names however more of them aren't tagged the properly. This has encouraged the study of auto face annotation an crucial method that aims to annotate facial pictures automatically. the auto face annotation can be useful to many real time applications. E,g. with auto face annotation techniques online image-sharing web site, can automatically annotate user's uploaded images to facilitate online image search and management. The besides face annotation also can be carried out in news video area to discover crucial humans appeared within the videos and to facilitate news video retrieval and summarization tasks. Classical face annotation strategies are regularly dealt with as extended face recognition troubles, where different classified models are trained from a set of well classified facial images by employing the supervised or semi-supervised machine learning approach. however, the "model-based face annotation" strategies are limited in several factors. First it is usually time consuming and costly to the acquire a huge amount of human-labeled training facial images. Second, it is usually hard to generalize the models when new training information or new humans are introduced, in which an intensive retraining manner is usually required. last but not least,the recognition overall performance often scales poorly when the number of humans or classes is very big. recently, some emerging research have attempted to discover a promising search-based annotation paradigm for facial image annotation by mining the world extensive web , where a huge quantity of weakly labeled facial images are freely available. instead of training explicit classified models by the normal model-based face annotation strategies, the search-based face annotation paradigm aims to tackle the automated face annotation task by exploiting content-based image retrieval (CBIR) techniques in mining huge weakly labeled facial images on the web.The SBFA framework is information-driven and model-free, which to a degree is stimulated by the search-based image annotation strategies for common image annotations. The principle goal of the SBFA is to assign correct name labels to the given query facial image. Especially, given a novel facial image for annotation, we first retrieve a short list of top most just like facial images from the weakly labeled facial image database after which annotate the facial image by performing voting at the labels associated with the top ok similar facial images. One

project faced by such SBFA paradigm is how to efficiently exploit the short list of candidate facial imagesand their weak labels for the face name annotation project. To tackle the above trouble, we check out and develop asearch-based face annotation scheme. mainly, wepropose a novel unsupervised label refinement scheme by experintal loring machine learning strategies to enhance the labels purely from a weakly labeled information without human guide efforts. We additional propose a clustering- based approximation set of rules to enhance the performance and scalability of this. below is summary, the principle contributions of this paper include the following:

i.We look into and implement a promising search based face annotation scheme by mining huge amount of weakly labeled facial images freely available on the WWW.

ii. We recommend a novel ULR scheme for reinforcing label quality through a graph-based and low-rank learning method.

iii. Recommend an efficient clustering-primarily based approximation set of rules for the huge-scale label refinement troubles.

iv. We performed an intensive set of experimentsand wherein encouraging results were acquired.

We note that a short version of this work had appeared in SIGIR2011. This journal article has been substantially prolonged by which includes a significant amount of new content. The rest of this paper is organized as belows: section 2 reviews the associated our work. section 3 offers an outline of the proposed search-based face annotation framework. section 4 The proposed unsupervised label of the refinement scheme. And segment five shows our experimental outcomes of overall performance evaluations and section 6 discusses the drawback of our excellent work. And Finally in the end , section 7 concludes this paper.

RELATED WORK:

Work is closely associated with several groups of the research work. The first group of the associated work is on the topics of face recognition and verification, which can be classical research issues in the computer vision and a pattern recognition and have been considerably studied for the numerous years. Currently on this years have found some rising benchmark research of the unconstrained face detection, and verification strategies in the facial images that are collected from the web, such as the LFW benchmark researches. Some of the recent study had additionally tried to increase classical face recognition techniques for the face annotation assignment. An complete reviews on face recognition and verification topics can be both in found some survey papers and books. The second group is the about researches of generic image annotation. The classical photo annotation strategies typically apply some existing object reputation strategies to train classification models from human-labeled training images or attempt to deduce of the correlation/ possibilities between images and annotated key phrases. Similar restrained training information; semi-supervised learning techniques have also been used for image annotation. Eg, Wang et al. proposed to refine the model-based annotation results with a label similarity graph by following random walk principle. Similarly, Pham et al. proposed to a annotate unlabeled facial images in the video frames with an iterative label propagation scheme. although semi-supervised learning techniques could leverage both labeled and unlabeled information, it remains fairly time-consuming and expensive to acquire the sufficient well-labeled training information to obtain excellent performance in huge-scale scenarios. A recently, the search-based image annotation paradigm has attracted many and more attention. For e.g, Russel et al.built a huge of the collection web images with ground reality labels to facilitate object recognition research. Most of these works were focused on the indexing search and feature extraction strategies. We unlike these existing works and we recommend a novel unsupervised label refinement scheme that is focused on the optimizing label high-quality of facial images in the direction of the search-based face annotation assignment.

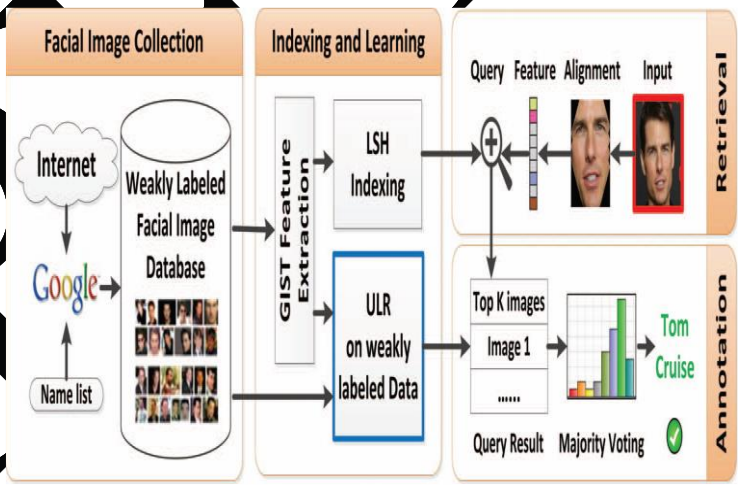
The third group is about face annotation on the personal, family, social images. numerous researches have especially focused on the annotation project on a personal images which regularly contain rich contextual clues, such as personal, family or relatives names, social context, geotags, timestamps and etc. a number of the persons, classes is usually quite small making such annotation tasks less hard. these strategies typically achieve fairly correct annotation results, in which some techniques have been successfully deployed in the commercial applications, Eg. Apple iPhoto, Google Picasa, PixLr, Microsoft easyAlbum, Instagram and facebook face autotagging solution. The fourth group is about the research of face annotation in mining weakly labeled facial images on the web. some research consider a human name as the input query, and the specially aim to refine the text-based search results by exploiting visual consistency of facial images. Eg. Ozkan and Duygulu proposed a graph-based model for locating the densest sub-graph as the most associated result. Following is the graph-based approach, Le and Satoh proposed a new local density score to represent the importance of each returned images and the Guillaumin et al. introduced a modification to the incorporate constraint that is the face is only depicted once in an image.

However and within the generative technique like the gaussian aggregate model was also been adopted to the

name-based search scheme and accomplished comparable results. In recently, a discriminant approach was proposed in to the improve over the generative technique and the avoid the explicit computation in a graph-based approach. by using a ideas from the query expansion and the performance of name-based scheme can be further progressed with a introducing the images of the "friends" of the query name. unlike these researches of filtering the text-based retrieval results, some of the research have attempted to directly annotate each facial image with the names extracted from it is caption information. For eg. Berg et al. Proposed a possibility model combined with a clustering set of rules to the estimate relationship between the facial images and, the names of their captions. For the facial images and the detected names in the same document Guillaumin et al.proposed to iteratively update the task based on a minimal price matching set of rules. in their follow-up work and they in addition improvement the annotation performance by the use of distance metric learning strategies to the achieve more discriminative feature in low-dimension space.

Our work is the one-of-a-kind from the above previous works in main aspects. first of all is our [illegible] goal's to the solve general content-based face annotation trouble using the search-based paradigm, and where facial images are directly used as a query images and the project is to return the corresponding names of the query images. The very restrained research development has been reported in this topic. Some of recent work in particular addressed the face retrieval trouble and in which an effective image representation has been proposed using both local and global features. the second of based on initial weak labels. the suggested [illegible] supervised label refinement set of rules learns an improved new label matrix for all the facial images in the entire name space. however, the caption-based annotation scheme only considers the project between the facial images and the names appeared in their corresponding surrounding-text. As a result on the caption-based annotation scheme is only relevant to the scenario where of the both images and their captions are available and can't be carried out to our SBFA framework due to the dearth of entire caption information. The fifth group is the about researches of purifying web facial images which goals to leverage noisy web facial images for face recognition applications. normally these works are proposed as a simple pre-processing step on the complete system of without adopting sophisticated strategies. Eg. the work in the carried out a modified kmeans clustering technique for cleansing up the noisy web facial images. Zhao et al. proposed a consistency learning technique to train face models for the superstar by mining the text-image co-occurrence on the web as a weak signal of the relevance towards supervised face in learning project from a huge and noisy training set. unlike the above current works, we employ the unsupervised machine learning strategies and recommend a graph-based label refinement set of rules to the optimize a label quality over the entire retrieval database in the SBFA project.

finally, we note that our work is also related to our current work of the WLRLCC technique in and our modern work on the unified learning scheme in 1st instead of the enhancing the label matrix over the whole facial image database, and the WLRLCC set of rules is the focused on learning more discriminative functions for the top retrieved facial images for each person query, which thus is very distinct from the ULR project in this paper. final but not least, and we note that the learning technique for the solving the unsupervised label refinement mission are partly stimulated by some existing researches within the system learning and which includes graphbased semi-supervised learning and multilabel learning strategies.



a) b) c)

Fig. 1. The system flow of the proposed search-based face annotation scheme. (a) We acquire weakly labeled facial images from WWW the usage of web search engines like google and yahoo. (b) We preprocess the crawled web facial images, which include face detection, face alignment, and characteristic extraction for the detected faces; after that, we apply LSH to index the extracted high-dimensional facial features. We apply the proposed ULR approach to refine the raw weak labels collectively with the proposed clustering-based approximation algorithms for improving the scalability. (c) We search for the query facial image to retrieve the top k similar images and use their related names for voting in the direction of auto annotation.

SEARCH-BASED FACE ANNOTATION:

Fig. 1 illustrates the system flow of the proposed framework of the search-based face annotation, which has consists of the below steps:

1. Facial image information collection;
2. Face detection, and facial characteristic extraction;
3. High dimensional in facial characteristic indexing;
4. In learning to the refine weakly labeled information;
5. Comparable face retrieval;
6. And face annotation by way of majority voting on the similar faces with the refined labels.

The first 4 steps are generally carried out earlier than the test phase of a face annotation project, while the final two steps are carried out in the course of the check phase of a face annotation project, which normally should be executed very efficiently. We briefly describe every step below.

Step one is the information collection of a facial images as shown in Fig. 1a, in which we crawled a collection of the facial images from the WWW via an existing web search engine, according to a name of a list that contains the names of persons to be collected. as the output of the crawling procedure, we shall acquire a collection of facial images, and every of them is associated with a few human names. Given the nature of the web images, these facial images are regularly noisy, which do not constantly correspond to the proper human names. Thus, we call in such form of web facial images with the noisy names as weakly labeled facial image information. The second one step is to preprocess web facial images to extract face-associated information, and which includes the face detection and alignment, facial region extraction, facial characteristic representation. For face detection and alignment, we adopt the unsupervised of face alignment approach proposed. For facial characteristic representation, we extract the GIST texture features to the represent the extracted faces. As a end result, every face can be represented by using a d-dimensional characteristic vector.

The third step is, to index extracted capabilities of the faces through applying a few efficient high-dimensional indexing approach to the facilitate project of the similar face retrieval within the subsequent step. In our method, we undertake the locality sensitive hashing, a totally famous and powerful high-dimensional indexing approach. The besides the indexing step, another key step of the framework is to the engage an unmonitored learning scheme to the enhance label quality of the weakly labeled facial images. This technique is a totally essential to the whole searchbased annotation framework since the label quality performs a crucial aspect in the final annotation with overall performance. All the above are the strategies before annotating a query facial image. next, we describe the technique of face annotation during the test phase. Especially, given a query facial image for annotation, we first conduct a similar face retrieval technique to the search for a subset of maximum similar faces from the previously listed facial database. With the a set of top k similar face examples retrieved from the database, and the next step is to annotate the facial image with a label by using a majority voting approach that combines the set of labels associated with these top k similar face examples.

in this paper, we awareness on our attention on one key step of the above framework, i.e. Unsupervised learning method to the refine labels of the weakly labeled facial snap shots.

UNSUPERVISED LABEL REFINEMENT BY LEARNING ON WEAKLY LABELED DATA:

We denote by using X 2 IRn_d the extracted facial image characteristics, in which n and d constitute the variety of facial images and the number of characteristic dimensions, respectively. further we denote by _ ¼ fn1; n2; . . . ; nmg the list of human names for annotation, in which m is the entire quantity of human names. We also denote by Y 2 ½0; 1n_m the preliminary raw label matrix to explain the weak label statistics, wherein the ith row Yi_ represents the label vector of the ith facial image xi 2 IRd. In our application, Y is often noisy and incomplete. Specifically, for every weak label value Yij, Yij 6¼ 0 indicates that the ith facial image xi has the label name nj, at the same time as Yij ¼ 0 shows that the relationship between ith facial photo xi and jth name is unknown. Keep in mind that we typically have kYi_k0 ¼ 1 when you consider that every facial image in our database was uniquely accumulated by a single question. Following the terminology of graph-based totally learning method, we construct a sparse graph by way of computing the weight matrix W ¼ ½Wij_ 2 IRn_n, in which Wij represents the similarity among xi and xj.

4.2 PROBLEM FORMULATION:

The aim of the unsupervised label refinement trouble is to study a refined label matrix F_ 2 IRn_m, that is expected to be greater correct than the preliminary raw label matrix Y, this is a tough challenge when you consider that we've not anything else but the raw label matrix Y and the facts examples X themselves. To tackle this trouble, we suggest a graph-based learning solution primarily based on a key assumption of "label smoothness," i.e., the greater similar the visual contents of facial images, the much more likely they share the same labels. The label smoothness principle can be formally formulated as an optimization trouble of minimizing the subsequent loss characteristic Es (F,W):

$$E_s(F,W) = \frac{1}{2}\sum_{i,j=1}^{n} W_{ij}\|F_{i*} - F_{j*}\|_F^2 = tr(F^\top LF), \qquad (1)$$

wherein k _ kF denotes the Frobenius norm, W is the weight matrix of a sparse graph created from the n facial images, L ¼ D _W denotes the Laplacian matrix wherein D is a diagonal matrix with the diagonal factors as,

$$D_{ii} = \sum_{j=1}^{n} W_{ij},$$

And tr denotes the trace characteristic. Directly optimizing the above loss characteristic is complex as it will yield a trivial solution. to conquer this trouble, we note that the preliminary raw label matrix generally, even though being noisy, still consists of few accurate and beneficial label information. therefore, while we optimize to look for F, we shall keep away from the solution F being deviated excessively from
Y . To this end, we formulate the following optimization assignment for the unsupervised label refinement with the aid of consisting of a regularization term Ep (F,Y) to mirror this concern:

$$F^* = \arg\min_{F\geq 0} E_s(F,W) + \alpha \cdot E_p(F,Y), \qquad (2)$$

Where _ is a regularization parameter and F _ 0 enforces F is nonnegative. Subsequent we talk the way to define the suitable characteristic for Ep(F;Y). One feasible choice of Ep(F;Y) is to genuinely set Ep(F; Y) = ||F _ Y||2F . that is, however, now not suitable as Y is often very sparse, i.e., many factors of Y are zeros because of the incomplete nature of Y . therefore, the above preference is difficult on account that it may genuinely force many factors of F to zeros without considering the label smoothness. A greater suitable preference of the regularization should be carried out only to those nonzero factors of Y . To this end, we suggest the following preference of Ep(F,Y):

$$E_p(F,Y) = \|(F-Y)\circ S\|_F^2, \qquad (3)$$

4.3 ALGORITHMS:

The above optimization tasks belong to convex optimization or greater exactly quadratic programming (QP) problems. It appears to be feasible to resolve them directly by applying generic QP solvers. however, this will be computationally incredibly intensive on account that matrix F can be potentially very huge, as an instance, for a large 400-person database of absolutely 40,000 facial images, F is a 40,000 _ 400 matrix that includes 16 million variables, which is nearly infeasible to be solved by any current generic QP solver.

LIMITATIONS:

Regardless of the encouraging outcomes, our work is restricted in numerous factors. First, we assume every name corresponds to a unique single person. replica name can be a realistic issue in real-life situations. One future direction is to extend our approach to deal with this practical trouble. for example, we can learn the similarity between special names according to the web pages as a way to determine how likely the two different names belong to the identical person. second, we assume the top retrieved web facial images are associated with a question human name. This is absolutely true for celebrities.

However, when the query facial image is not a known person, there won't exist many relevant facial images on the WWW, which therefore could affect the overall performance of the proposed annotation solution. This is a common problem of all current information-driven annotation strategies. This might be partly solved by exploiting social contextual data.

CONCLUSIONS:

This paper investigated a promising search-based face annotation framework and wherein we targeted on the tackling the crucial trouble of improving the label high-quality and proposed a ULR set of rules. To the further development of the scalability, additionally proposed a clustering-based approximation solution, which effectively accelerated the optimization assignment without introducing very high overall performance degradation. From an extensive set of experiments, and we determined the proposed approach accomplished promising outcomes under anothe sort of settings. Our experimental outcomes indicated that the proposed ULR approach substantially surpassed other regular methods in literature. Future work will deal with the problems of duplicate human names and explore and supervised, semi-supervised learning strategies to the further enhance label high-quality with less expensive human manual refinement efforts.

ACKNOWLEDGMENTS:

This work was in part supported by Singapore MOE academic tier-1 grant (RG33/eleven) and Microsoft research Asia grant. Jianke Zhu was supported through national natural science foundation of China under grants (61103105) and fundamental research funds for the central Universities.

REFERENCES

1) *Social Media Modeling and Computing*, S.C.H. Hoi, J. Luo, S. Boll, D. Xu, and R. Jin, eds. Springer, 2011.
2) S. Satoh, Y. Nakamura, and T. Kanade, "*Name-It: Naming and Detecting Faces in News Videos*," IEEE Multimedia, vol. 6, no. 1, pp. 22-35, Jan.-Mar. 1999.
3) P.T. Pham, T. Tuytelaars, and M.-F. Moens, "*Naming People in News Videos with Label Propagation*," IEEE Multimedia, vol. 18, no. 3, pp. 44-55, Mar. 2011.
4) L. Zhang, L. Chen, M. Li, and H. Zhang, "*Automated Annotation of Human Faces in Family Albums*," Proc. 11th ACM Int'l Conf. Multimedia (Multimedia), 2003.
5) T.L. Berg, A.C. Berg, J. Edwards, M. Maire, R. White, Y.W. Teh, E.G. Learned-Miller, and D.A. Forsyth, "*Names and Faces in the News,"* Proc. IEEE CS Conf. Computer Vision and Pattern Recognition (CVPR), pp. 848-854, 2004.
6) J. Yang and A.G. Hauptmann, "*Naming Every Individual in News Video Monologues*," Proc. 12th Ann. ACM Int'l Conf. Multimedia (Multimedia), pp. 580-587. 2004.
7) J. Zhu, S.C.H. Hoi, and M.R. Lyu, *"Face Annotation Using Transductive Kernel Fisher Discriminate,"* IEEE Trans. Multimedia, vol. 10, no. 1, pp. 80-96, Jan. 2008.
8) A.W.M. Smeulders, M. Worring, S. Santini, A. Gupta, and R. Jain, "*Content-Based Image Retrieval at the End of the Early Years,"* IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 22, no. 12, pp. 1349-1380, Dec. 2000.
9) S.C.H. Hoi, R. Jin, J. Zhu, and M.R. Lyu, *"Semi-Supervised SVM Batch Mode Active Learning with Applications to Image Retrieval,"* ACM Trans. Information Systems, vol. 27, pp. 1-29, 2009.
10) X.-J. Wang, L. Zhang, F. Jing, and W.-Y. Ma, "*Anno Search: Image Auto-Annotation by Search,"* Proc. IEEE CS Conf. Computer Vision and Pattern Recognition (CVPR), pp. 1483-1490, 2006.
11) L. Wu, S.C.H. Hoi, R. Jin, J. Zhu, and N. Yu, "*Distance Metric Learning from Uncertain Side Information for Automated Photo Tagging,"* ACM Trans. Intelligent Systems and Technology, vol. 2, no. 2, p. 13, 2011.
12) P. Wu, S.C.H. Hoi, P. Zhao, and Y. He, "*Mining Social Images with Distance Metric Learning for Automated Image Tagging,"* Proc. Fourth ACM Int'l Conf. Web Search and Data Mining (WSDM '11), pp. 197-206, 2011.
13) D. Wang, S.C.H. Hoi, and Y. He, "*Mining Weakly Labeled Web Facial Images for Search-Based Face Annotation,"* Proc. 34th Int'l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR), 2011.
14) P. Belhumeur, J. Hespanha, and D. Kriegman, "*Eigenfaces versus Fisherfaces: Recognition Using Class Specific Linear Projection,"* IEEE Pattern Analysis and Machine Intelligence, vol. 19, no. 7, pp. 711-720, July 1997.
15) W. Zhao, R. Chellappa, P.J. Phillips, and A. Rosenfeld, "*Face Recognition: A Literature Survey,"* ACM Computing Survey, vol. 35, pp. 399-458, 2003.