IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 5, June 2022
Impact Factor: 6.252

Face Recognition at Varying Angles Using Support Vector Machine Algorithm

Dr. Vijay G R[1], Karthik T V[2], Bivuti Bhusan Behera[3], Darshan Gowda R[4], Dhanush H A[5]
Associate Professor, Department of Information Science and Engineering[1]
Projecties, Department of Information Science and Engineering[2,3,4,5]
Sri Jagadguru Chandrashekaranatha Swamiji Institute of Technology, Chickballapur, Karnataka, India

Abstract: *Face recognition is process of detecting facial images in real time and identifying facial image. Detecting and recognizing persons face to authenticate by their Multiview angled face is a real valued problem in machine vision. Multiview faces are having difficulties due to non-linear representation in the feature space. Facial images in surveillance or cellular scenarios often have large view-point variations in terms of pitch and yaw angles. This makes facial recognition more challenging. The main objective of this project is to Build a face recognition system which can identify facial images at different angles. Identifying suspects whose faces may be partially visible due to the varying angles at which CCTV cameras are typically placed. Identifying suspects by analysing CCTV feeds even when frontal face has not been clearly captured is the key challenge to this problem statement. This face recognition model is able to identify both frontal face and profile face this problem can be achieved using support vector machine (SVM) algorithm.*

Keywords: Face recognition, Support Vector Machine, Face Detection.

I. INTRODUCTION

Biometric authentication systems primarily use in security scenarios such as in sensitive area surveillance and access control. On the use of authentication systems largely in public and private places for access control and security, face recognition/verification has attracted the attention of vision researchers. Several approaches have been proposed for face recognition based on 2D and 3D images. Identity verification of authentic persons by their multi-view faces is a real valued problem in machine vision research. However, in rotated multi-view face recognition system some difficulties occur due to non-linear representation in feature spaces. To minimize this limitation, a global representation approach to non-linear feature spaces is necessary Facial recognition is a way of identifying or confirming an individual's identity using their face. Face recognition systems can be used to identify people in photos, videos, or in real time. Face recognition is a biometric security component. Everyone has had the experience of not seeing anyone they know because of changes in posture, facial expressions, and light [7][8]. It is therefore not surprising that a computerized scanning system may face similar problems. Despite years of computer science, scientists from around the world have been unable to duplicate human performance.

II. IMPLEMENTATION

The Face recognition model we created using open Face model which is used to extract the 128-face embedding of a person and caffe model is used to detect the face of a person in realtime using OpenCV library and our face recognition model is trained using 128 face embeddings by using SVM algorithm and our model is able to recognize the face of a person in real time at different angles [1].

2.1 Proposed System Architecture

Figure 1 represents the input dataset being provided that is basically the face and then in the second phase the face detection using Caffe Model[2] is taking place. The third phase includes the extraction of facial features using Open face and the processed output is fed as input to the training face recognition model, this model takes the extracted features as input and trains the face model. The trained face model provides an output which is fed as input to the Face Recognition using OpenCV and this provides the necessary output to us based on the face fed into the system and it recognizes the face using the following model.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 5, June 2022
Impact Factor: 6.252

Fig 1. Proposed system Architecture

2.2 Face Detection using Caffe Model

We can perform fast, accurate face detection with OpenCV using a pre-trained deep learning face detector model called Caffe (Convolutional Architecture for Fast Feature Embedding) model. This model takes 3 arguments the path to the image dataset, the path of the caffe prototxt file describes the network architecture for deployment time and the path to the pre trained caffe model [5]. After giving required arguments to the caffe model we load the network using OpenCV library, to achieve the best accuracy we run the model on BGR images resized to 300x300[3].

2.3 Extracting Face Embeddings Using OpenFace Model

After detecting the faces in the images using caffe model we pass the output of caffe model to the open face model we need to find a way to represent the face in numerical embedding. We can represent it using a pre-trained deep neural network called OpenFace. During the training portion of the OpenFace pipeline, 500,000 images are passed through the neural net. OpenFace trains these images to produce 128 facial embedding's that represent a generic face of a individual person. OpenFace uses Google's Face Net architecture for feature extraction and uses a triplet loss function to test how accurate the neural net classifies a face The embedding is a generic representation of anybody's face. Unlike other face representations, this embedding has the nice property that a larger distance between two face embedding's means that the faces are likely not of the same person.

```
[-0.16597123  0.11949642  0.10122138 -0.12254387 -0.11838274 -0.02759848
  0.01384261 -0.07288168  0.06527785 -0.13963827  0.17559825 -0.08519795
 -0.25020906 -0.0102928  -0.01079375  0.21948609 -0.21553843 -0.19072869
 -0.13214052 -0.10856642  0.01477439  0.07908501 -0.05431245  0.11583221
 -0.1715932  -0.23868942 -0.10927209 -0.01475592  0.01510147 -0.08837818
 -0.00252565  0.03029939 -0.17696191  0.00717495  0.04937807  0.12862331
 -0.01091681 -0.09640069  0.1934087   0.01389313 -0.23863317  0.01766105
  0.15954995  0.26412117  0.21739453 -0.00336392 -0.03702538 -0.05539587
  0.10163558 -0.28075284  0.05129996  0.20316276  0.02803321  0.16820049
 -0.02042791 -0.12237336 -0.00515839  0.22946236 -0.21929839  0.03012473
  0.10334508 -0.19385433  0.010464   -0.1046315   0.159848    0.14616895
 -0.19181257 -0.22495562  0.19514428 -0.23470432 -0.11755507  0.07461189
 -0.0839375  -0.09592333 -0.35081255  0.03915626  0.32692659  0.20959754
 -0.10889891 -0.01162777 -0.09144997 -0.02747694  0.00839157  0.15324235
 -0.02081387 -0.0425766  -0.06370837  0.0559925   0.19876704  0.04837478
  0.00898859  0.25267416  0.04914283  0.0009048   0.00353496  0.14037418
 -0.15166469 -0.07702    -0.10442869  0.03603458 -0.10455432 -0.05006842
  0.01399595  0.18746354 -0.10759938  0.24044091 -0.03882578 -0.01190661
 -0.12068785  0.03638472 -0.02094681 -0.02857181  0.10984001 -0.22919109
  0.14735889  0.20415246 -0.00772358  0.09734803  0.10852756  0.12523061
 -0.03349054 -0.08732443 -0.17586364 -0.09488015  0.04729999 -0.0654182
  0.10575557  0.07663471]
```

Fig 2. 128 Facial Embeddings

2.4 Training Face Recognition model using SVM (Support Vector Machine)

The facial embeddings obtained from the openface model are trained using support vector machine algorithm SVM generates optimal hyperplane in an iterative manner, which is used to minimize an error. The core idea of SVM is to find a maximum marginal hyperplane (MMH) that best divides the dataset into classes. The training data given to the SVM classifier is the set of face embeddings and the set of labels. A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane. In other words, given labeled training data (supervised learning), the algorithm outputs an optimal hyperplane which categorizes new examples [6]. The operation of the SVM algorithm is based on finding the hyperplane that gives the largest minimum distance to the training examples [4].

III. CONCLUSION

This Face recognition system which is trained using SVM can recognize the facial image of a person at varying angles in real time. even when the frontal face of a person is not completely visible this system can detect and recognize the both frontal and profile face at different angles with the accuracy of 97% as the face recognition model is trained using 128 facial embeddings of a individual person using openface model this face recognition system can be used to recognize the terrorist and criminals using surveillance in public places.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 5, June 2022
Impact Factor: 6.252

REFERENCES

[1]. Yongmin Li, Shaogang Gong, Jamie Sherrah and Heather Liddell "Multi-view Face Detection Using Support Vector Machines and Eigenspace Modelling" Date of Conference: 30 Aug.-1 Sept. 2000 IEEE.

[2]. Md. Omar Faruqe Md. Al Mehedi Hasan "Face Recognition Using PCA and SVM"

[3]. Sonia Kuwelkar Neel Ramakant Borkar "Real-Time Implementation of Face Recognition System".IEEE 2017 International Conference on Computing Methodologies and Communication.

[4]. M Arafah1, A Achmad , Indrabayu and I S Aren "Face recognition system using Viola Jones, histograms of oriented gradients and multi-class support vector machine" The 3rd International Conference on Science, Journal of Physics.

[5]. X. Zhang, Y. Gao "Face recognition across pose: A review" Pattern Recognition 42(11) (November 2009) 2876–2896

[6]. B. Babenko, P. Doll´ar, Z. Tu, S. Belongie "Simultaneous learning and alignment: Multi-instance and multi-pose learning" In Workshop on Faces in 'Real-Life' Images: Detection, Alignment, and Recognition, 2008

[7]. U. Kurmi, D. Agrawal. Study of Different Face Recognition Algorithms and Challenges. International Journal of Engineering Research (ISSN:2319-6890)(online),2347-5013(print) Volume No.3, Issue No.2, pp : 112-115 01 Feb. 2014

[8]. Cheung, K.W., Chen, J., Moon, Y.S.: "Pose-tolerant non-frontal face recognition using EBGM." In: IEEE Int. Conf. on Biometrics: Theory, Applications and Systems, IEEE (September 2008)