International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 12 | Dec 2022 www.irjet.net p-ISSN: 2395-0072

FACE SHAPE CLASSIFIER USING DEEP LEARNING

Rohan S[1], Suhas R Vittal[2], Neeraj H Gowda[3], Dr. Priya R Sankapal[4]

[1,2,3] Student, Dept. of Electronics and Communication, BNMIT, Bangalore, Karnataka, India
[4] Assistant Professor, Dept. of Electronics and Communication, BNMIT, Bangalore, Karnataka, India

---

Abstract - Beauty and cultural activities, such as hairstyles, clothes and accessories, and other costumes, demand an understanding of a person's face shape, which is not always accurate or efficient and requires specialist expertise. In this paper, we present a computer-aided system based on image processing and deep learning that can automatically recognize the facial form without the need for an expert. As input, the system receives face photos and delivers them to a pre-trained model. This algorithm classifies and predicts outcomes based on face shape across five shapes: heart, oval, square, oblong, and circle, and provides results for the best match with an accuracy of 82%.

Key Words: Deep Learning, K-Nearest Neighbors, Linear Discriminant Analysis, Support Vector Machines with Linear Kernel, Convolutional Neural Network.

1. INTRODUCTION

Our faces are our first and last impressions. Thus, we must learn to leverage this. Understanding our face shape helps us enhance our potential. We can highlight or hide features with a little expertise in this area. By determining our face shape, we can learn how to style ourselves to look appealing and natural rather than unpleasant and boring. Finding our face form assists our style. Our outfit choices are benefited from our face structure.

Re-trainable custom image classifiers make face shape classifiers easier to design. The classifier should be capable of recognizing whether a frontal view image of a human face is heart, oblong, oval, round, or square. Fashion stylists recommend frames and hairstyles based on face form. OPSM Opticians advocate bigger frames for oblong-shaped faces to balance long and wide features and avoid transparent rimless frames that exaggerate length and width. Similar apps recommend hats, makeup, jewelry, and other fashion accoutrements.

These recommendation algorithms could be part of a bigger personal digital assistant linked to social media and product advertisements. Algorithms could potentially advise virtual or cosmetic facial changes to improve one's appearance. Face-shape categorization systems can speed up facial recognition, but more abstracted profiling schemes employing system-learned classes may be better. Online guides, apps, and mobile apps are available face shape classifiers in the literature. Two scientific articles are peer-reviewed. Published face shape classification methods collect pre-defined features from images and train classifiers using these methods: K-Nearest Neighbors (KNN), Linear Discriminant Analysis (LDA), Support Vector Machines with Linear Kernel (SVMLIN), and SVM-RBF [2]. (MLP). While published overall accuracies of 64.2% to 85.0% look good, it would be interesting to compare these results with a classifier employing convolutional neural networks (CNNs), which are becoming more prominent in picture classification challenges.

1.1 MOTIVATION

Having prior knowledge about our own facial shapes helps us make better choices about apparel and fashion. Our ability to style ourselves to look our best without consulting an expert on how our clothing choices relate to our face shape is helped by the coherence of our face shape and the fashion choices that we choose.

1.2 OBJECTIVES

This project aims at developing a neural network to recognize a person's face shape from facial photos and present the results. This approach is best for face shape identification at opticians, beauty salons, and at home. Our goal is to help consumers find the perfect style for their face shape. This allows women choose from a wide variety of beautiful clothes, hairstyles, and makeup for different occasions. This project can be implemented into e-commerce platforms to assist us choose clothes that suit our facial shapes and eliminate items that don't. Face shape classification helps us choose products in all areas where we shop.

2. LITERTURE SURVEY

Face recognition, one of the most successful image analysis and comprehending applications, has garnered attention in recent years. After 30 years of research, feasible technology and a wide range of commercial and law enforcement applications explain this tendency. Machine recognition systems have matured, yet many real applications limit their success. Face identification in outdoor photographs with changing illumination and position is still a major challenge.

Thus, current systems cannot match human vision. Face shape detection, another spinoff from face recognition, offers a wide range of applications in businesses that cater to individuals, such as fashion and e-commerce. We referenced to papers and publications on face classifications, a mix of face recognition and image classification.

Our survey showed that CNN was best for our strategy because it found and clustered features of each category without training. We conducted this study to give an up-to-date review of face classification literature and to shed light on machine face recognition research.

3. METHODOLOGY

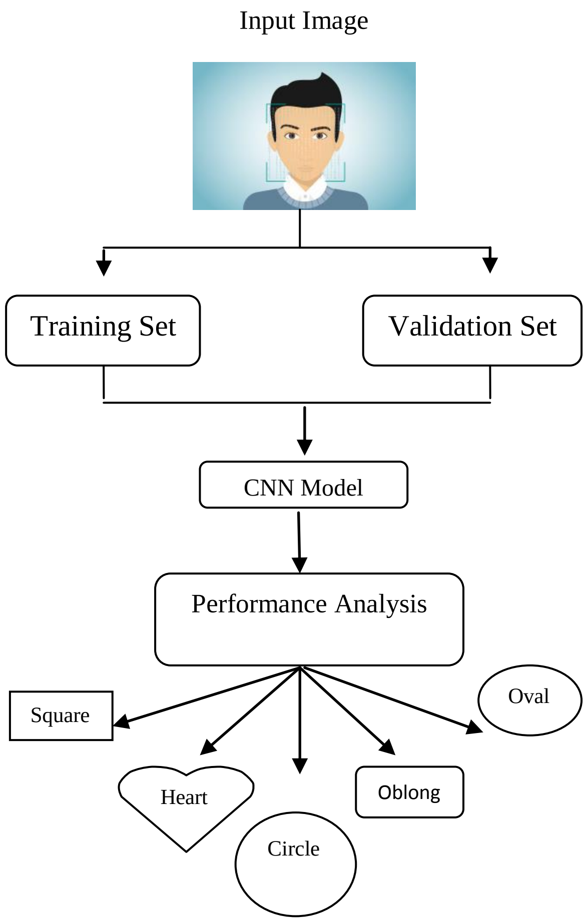

Fig -1: Block Diagram

The data set is divided into training and testing sets; the CNN model is trained using the training sets, and then tested on the testing data sets to analyze its performance. Performance metrics such as accuracy are assessed among the five categories specified above.

Convolutional Neural Network (CNN) based machine learning algorithms have been created to automatically analyze face appearance-based difficulties. The issue of feature alignment can be solved using CNNs, and experimental results show that they perform well on challenging test images. A system that employs a hierarchical process in which it first approximately identifies the position of the eyes, nose, and mouth before improving the outcome through the detection of various facial feature points.

A proposed face recognition system uses a particular CNN architecture that enables nonlinear mapping of the image's area into a lower dimensional subspace for better classification. The technique was used on numerous public face databases and was able to outperform traditional face recognition logics in terms of recognition rate.

Users can use this dataset to train and test the accuracy of their own convolutional neural networks because it contains thousands of images of handwritten numbers. Many people have produced and gathered a variety of well-known datasets to aid in the development and study of convolutional neural networks.

4. Results

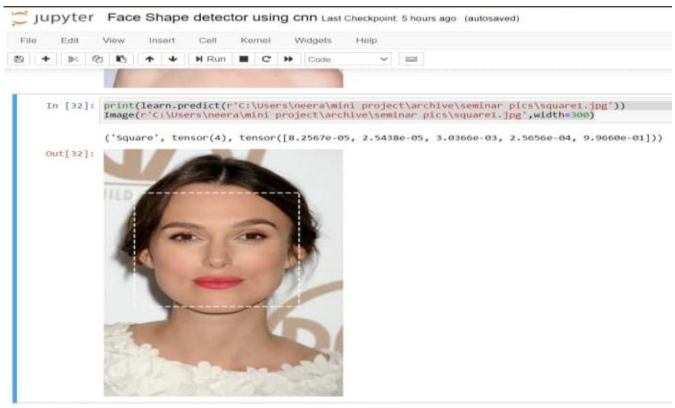

Fig -2: Output of the Algorithm

Fig -2 demonstrates the square shape of the input image's outcome, as seen in the image. The CNN algorithm classifies the image into 5 possible shapes and then predicts which shape is the most appropriate.

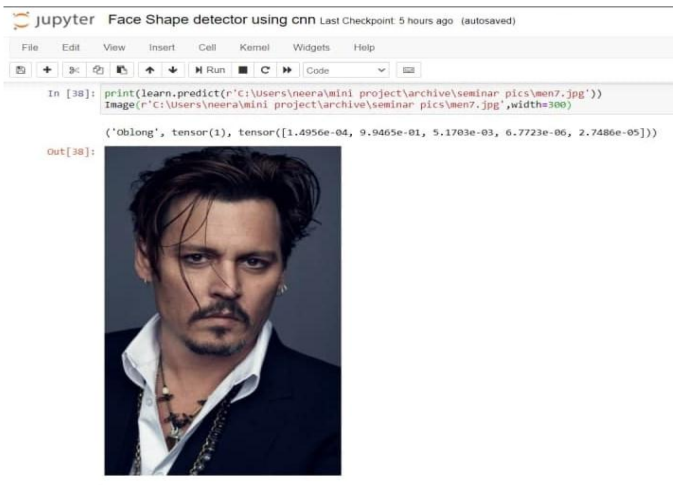

Fig -3: Output of the Algorithm

```
In [14]: learn.fine_tune(10, 10e-3)
```

epoch	train_loss	valid_loss	accuracy	time
0	2.178339	1.545776	0.456250	20:37

epoch	train_loss	valid_loss	accuracy	time
0	1.262536	1.076123	0.607500	19:57
1	0.873222	1.090557	0.652500	13:29
2	0.697785	1.401260	0.641250	12:49
3	0.523694	1.342047	0.685000	13:03
4	0.389929	1.067941	0.692500	12:51
5	0.262922	0.833553	0.756250	12:34
6	0.157744	0.662112	0.818750	13:02
7	0.082655	0.704086	0.812500	13:20
8	0.045938	0.708419	0.818750	11:37
9	0.024223	0.671172	0.826250	12:45

Fig -4: Accuracy of the model

After training for up to 10 epochs, the overall accuracy of the face shape classifier algorithm is around 82%. The model's accuracy can be further increased by performing further epochs, resulting into better performance of the algorithm.

```
In [19]: interp.plot_confusion_matrix()
```

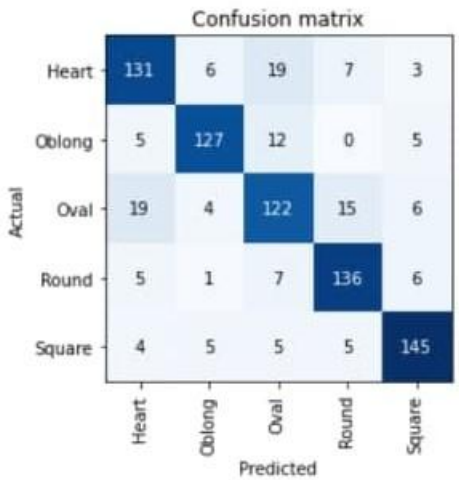

Fig -5: Confusion Matrix

Using a confusion matrix, we evaluate the performance of our model. This is frequently used to describe how a classification model, also known as a "classifier," performed on a set of test data for which the true values were known.

5. CONCLUSIONS

This application reads a facial photograph as input and provides the most accurate prediction of the face shape. The outcomes of each image analysis show that the system is trained, validated, and tested. The built system can accurately determine facial form. There is, nevertheless, room for some prospective improvements. This system will be trained on 5000 faces of women ranging in age from 20 to 40 years to recognize shapes such as square, oval, oblong, round, and heart. This technique can be used to develop applications such as eyeglasses, haircuts, and apparel to provide a nice feeling of fashion.

REFERENCES

[1] SV Rajapaksha and BTGS Kumara "Hairstyle Recommendation Based on Face Shape Using Image Processing".

[2] H. N. Gunasinehe and T.G.I Fernanda "Identifying the Face shape of a Person using Machine Learning Techniques".

[3] Pallab P. "Face It – The Artificially Intelligent Hairstylist".

[4] Adonis Emmanuel DC. Tio "Face shape classification using Inception v3".

[5] Amir Zafar and Tiberiu Popa. 2016. Face and Frame Classification using Geometric Features for a Data-driven Frame Recommendation System. In Proceedings of the 42nd Graphics Interface Conference (GI '16). Canadian Human Computer Communications Society, School of Computer Science, University of Waterloo, Waterloo, Ontario, Canada, 183-188.

[6] W. Sunhem and K. Pasupa, "An approach to face shape classification for hairstyle recommendation," Eighth International Conference on Advanced Computational Intelligence (ICACI), Chiang Mai.

[7] Eshwar S G, Gautham Ganesh Prabhu J, A. V. Rishikesh, Charan N A and Umadevi V, "Apparel classification using Convolutional Neural Networks," International Conference on ICT in Business Industry & Government (ICTBIG), Indore.