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Attendance capture system using face recognition

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ABSTRACT

Aim: This study aims to improve upon the Visual Geometry Group Algorithm by developing a Face Net Algorithm system that can identify masked faces, as mask usage is now essential due to the COVID-19 epidemic.
Materials and Methods: In total of 112 samples, Each group has 56 samples and the number of iterations are 10 for each group. The G power for calculating statistical tests is set at 80%. A total of 2800 images which makes 2240 training images and 560 tested images—make up the research dataset, which is obtained from Kaggle.com combined with self-obtained images.
Results: The accuracy results for the Innovative Face Net algorithm is (87.7%), and the Visual Geometry Group (VGG-16) technique is (90.2%). For both methods that were taken into consideration for masked face identification, a 0.001 ($p < 0.05$) significance value was discovered.
Lastly, as compared to the Face Net method, the visual geometry group's (VGG-16) algorithm significantly improves accuracy.

Keywords: Innovative Face Recognition, Machine Learning, Mask, Face Net, Visual Geometry Group, Covid, Social Protection.

INTRODUCTION

A method for recognizing faces in photographs is called face recognition. Hand sanitizers, masks and maintaining social distance in public are all important precautions during the epidemic. It has been described in this study as a novel approach for enhancing identification and face recognition of a person wearing a mask using machine learning techniques. It is vital to first ascertain whether or not a face is wearing a mask before identifying it [1]. Face mask detection devices from the Internet of Things (IoT) are widely utilized today for social protection and public safety. The use of manual efforts in public monitoring has decreased as a result of the gradual use of these automatic face mask detecting systems [2]. After close observation, it was found that several of the algorithms did not perform any better when recognizing a mask-covered face. The study used the Face Net and Visual Geometry Group (VGG-16) machine learning algorithms. This research has been the basis for several applications. Hospitals for social protection, smart devices, and public surveillance are a few examples. Consider using face biometrics to identify the person who will be recognized by the attendance marking IOT machine for innovative face recognition [3]. Digital photos make up the dataset, and the training dataset for the images is examined before making a prediction [4]. Neural networks can be used to reduce noise brought on by overlapping facial detection patterns [5]. This research focuses on the better output for recognizing the face identity with a mask with an improved accuracy.

About 100 papers, In the past five years, associated with the subject have appeared in a range of reputable journals and databases, from IEEE Explore, Science Direct, Springer, and others. The compressed vector representation of the image is what is used for Visual Geometry Group-16 feature's extraction. This study caught our attention because it utilized unsupervised machine learning feature extraction techniques for 3D face restoration [6]. When utilizing huge datasets, the innovative face recognition method using Visual Geometry Group (VGG-16) has a problem. The Face Net technique is shown in this study as one deep learning approach that performs well with large datasets [7]. The neural network design was modified for important applications in this study to employ less processing resources, which considerably increased the accuracy level [8]. It is possible that both the Visual Geometry Group-16 method and the General Adversarial Networks approach will accomplish the same objective. The vision-based techniques described in this paper's description of how to use CNN algorithms to identify patterns in webcam [9]. This cutting-edge study is the best of those that tries to identify a person's face when people are wearing a mask, which increases social protection and determines whether their face is in the proper position while wearing the mask preventing Covid. [10].

The research gap observed is the face wearing a mask is incorrectly detected and recognized. So, the study aim is to develop a more accurate mask for Innovative Face Recognition using Face net algorithm in comparison with Visual Geometry Group algorithm. Relevant data have been gathered and listed some of the best articles above based on the extensive knowledge. Some research articles result in less precise findings. The objective is to reduce the spread of Covid-19 and recognizes facial identification by wearing a mask and developing a device with social protection.

MATERIALS AND METHODS

Cloud Computing Laboratory researchers from the Saveetha institute of Medical and Technical sciences in Chennai came up with the idea and executed the study. Two unique groups were taken into account for this investigation. The Visual Geometry Group (VGG-16) and Face Net algorithms have both been taken into consideration. Out of 112 samples, 56 samples with number of iterations 10 are available for each of these algorithms to execute the code [11]. The

sample size is calculated using clincalc.com. A total of 2800 images which makes 2240 training images and 560 tested images-make up the research dataset, which is obtained from Kaggle.com named CoMask20 and combined with self-obtained dataset. A sample size of 0.5G was determined using factors such as G power 80%.
Python was used to code the work that is being proposed using Jupyter Notebook and Google Colab. Both machine learning and deep learning require the Windows 10 OS as a platform. Intel Core i5 is the processor configuration needed. As a minimum need for quick and easy access to the code, 8GB of RAM is advised. The Innovative Face Recognition image dataset with a mask is necessary for the training of the complete system.

FaceNet algorithm

The FaceNet algorithm comes under the technique of supervised learning created by Google company. It is a form of convolution neural networks in machine learning. Its application is mainly for Innovative Face Recognition. The mappings of faces from multi dimensions are taken as the input and finds whether the image contains a face. Figure 1 displays the architecture of the Innovative Face Recognition with a mask using Face Net algorithm.

Algorithm

Step 1: Input is the data set of images that have been preprocessed.
Step 2: The face embedding is detected from the image using the image processing.
Step 3: The patterns are to be extracted from the face i.e., eyes and forehead.
Step 4: Later the patterns of the face are trained and tested.
Step 5: The trained embeddings of face are sent to classification after the application of Face Net.
Step 6: The accuracy has been calculated for the samples present in the dataset and the results are obtained.

Visual Geometry Group's algorithm VGG-16

In convolutional neural networks, the VGG-16 algorithm is one subdivision of the Visual Geometry Group. Acquiring skill in task transfer is crucial for comprehending how this operates. It has a wide range of capabilities, including advanced face recognition, image processing, text classification, audio recognition, and translation. Also, it operates with pre-trained data. Using 16 layers of neural network, classification is made simple.

Algorithm

Step 1: First, import the dataset and load the training layers' weights.
Step 2: Data is divided for testing and training after picture processing.
Step 3: Retrain the images using their weights at the output layers in step three.
Step 4: The visual geometry group algorithm needs to be applied for every face pattern that the live stream's extraction software finds.
Step 5: The final phase is forecasting the precision of the identity's identification in the live stream.
Step 6: Bounding boxes in the output are used to identify the faces, and a mask is used to identify the faces.

Statistical Analysis

We use IBM SPSS to do the statistical analysis. We employ the following metrics as independent variables: frequency, volume, accuracy, distance, and number of photos. The dependent variables include the quantity of faces, photos, and masks. The Independent t-test is performed by comparing mean accuracies. The kaggle website has been used for collecting the relevant image datasets. Significance value table is also known using the tool and the value of p is 0.001. The independent variables are taken from the [12]. Thanks to the t-test, we were able to get the medians, means, standard deviations, and SME's for the separate samples.

RESULTS

The suggested FaceNet method has been ran several times using the Jupyter Notebook. Group 1's Visual Geometry Group (VGG-16) method achieved 90.2% accuracy, while group 2's FaceNet algorithm achieved 87.7% accuracy. Thus, the FaceNet algorithm outperforms the Visual Geometry Group (VGG-16) technique. The accuracy has increased because to this novel method. Calculations are also made for the relevant tables and graphs.

To illustrate the estimated accuracies, Table 1 displays the 56 samples used by the Visual Geometry Group (VGG-16) technique and the FaceNet approach. All of the computed mean accuracy, standard error mean, and standard deviation values for the Visual Geometry Group-16 & FaceNet algorithms are shown in Table 2. Table 3 displays the results of an independent t-test that was performed to compare the Visual Geometry Group-16 method with the FaceNet algorithm. The p-value was found to be less than 0.05, indicating that the system is statistically significant.

Face identity for the user using FaceNet algorithm is displayed in Figure 2 and the architecture diagram for the FaceNet has been shown in Figure 1. The face from different angles as well as

with medium lightning can be detected using the FaceNet algorithm. This algorithm doesn't work well for several hairstyles for the same person. Despite its shortcomings, it outperforms the method used by the Visual Geometry Group-16. Figure 3 displays the visual geometric group-16 confusion matrices together with FaceNet. When contrasted with conventional methods, the false value that is positive is reduced.
The graphical representation is displayed in Figure 4 in terms of mean accuracy and compares classification using Visual Geometry Group (VGG-16) (87.7%) and FaceNet (90.2%). Classification with path modeling has a higher observed mean accuracy than FaceNet. Visual Geometry Group-16vs FaceNet on the X axis Y axis Average precision. Error bar +/- 2SD and 95% CI.

DISCUSSION

The Visual Geometry Group (VGG-16) algorithm did not perform as well as the FaceNet method, according to the results. Consequently, when comparing the two algorithms' accuracy, FaceNet had a high accuracy of 87.7% whereas Visual Geometry Group (VGG-16) had only 90.2% accuracy.

The publication proposed a new approach for face detection using a mask that is not appropriate for the study after comparing the two algorithms and measuring their accuracy [13]. Smart device unlocking also makes use of biometric face finding. Facial vectors were necessary for the feature extraction process to be able to recognize the face from various angles [14]. This research presents a person-tracking gadget that was constructed in the OpenCV environment. To record the camera data, we employed picture capture and feature extraction. As a general social precaution, people have been advised to avoid close contact with others since the COVID-19 epidemic. In the research, it is mentioned that there is an Android software called Heatmaps that can identify crowds and alert the police [15], [16]. Attempting to identify people while concurrently detecting several faces is difficult and produces lower accuracy [17], [18]. As a result, only one face may be detected at a time. The dataset that contained low-quality photographs makes it challenging to identify faces and their identities using a mask and the Visual Geometric Group-16 algorithm to safeguard social devices.

There were certain limitations on the system. Innovative Face Recognition using a mask was difficult to use when the face was not clearly visible. It did not produce better results when the camera or image quality was poorer or there was no lighting. Processing the Visible Geometry Group (VGG-16) algorithm takes a very long time. After recognition, it took a long time to get the desired results. When there were numerous persons in one frame, it could not detect them with accuracy. Therefore this proves an disadvantage. Consequently, it is clear that the Visual Geometry Group (VGG-16) technique is only effective for smaller datasets and is unreliable for varied angles. The proposed technique can be utilized to detect from a few different angles of the face.

CONCLUSION

Progress in innovation Face has poor precision. Recognizing individuals when concealed for the sake of social safety is the present technical hurdle. Consequently, the Visual Geometry Group (VGG-16) method's accuracy is 90.2% while the FaceNet algorithm's high accuracy of recognition is 87.7%, demonstrating that the FaceNet algorithm is the most effective and preferred approach, per the study.

REFERENCES

[1] M. L. Mokeddem, M. Belahcene, and S. Bourennane, "COVID-19 risk reduce based YOLOv4-P6-FaceMask detector and DeepSORT tracker," Multimed. Tools Appl., pp. 1–25, Nov. 2022.

[2] X. Jiang, T. Gao, and Z. Zhu, "FCOS-Mask: Fully Convolution Neural Network for Face Mask Detection," 2022 7th International Conference on Image, Vision and Computing (ICIVC). 2022. doi: 10.1109/icivc55077.2022.9886728.

[3] S. Yavuzkiliç, Z. Akhtar, A. Sengür, and K. Siddique, "DeepFake Face Video Detection Using Hybrid Deep Residual Networks and LSTM Architecture," AI and Deep Learning in Biometric Security. pp. 81–104, 2021. doi: 10.1201/9781003003489-4.

[4] N. Ashraf, L. Khan, S. Butt, H.-T. Chang, G. Sidorov, and A. Gelbukh, "Multi-label emotion classification of Urdu tweets," PeerJ Comput Sci, vol. 8, p. e896, Apr. 2022.

[5] T. Edirisooriya and E. Jayatunga, "Comparative Study of Face Detection Methods for Robust Face Recognition Systems," 2021 5th SLAAI International Conference on Artificial Intelligence (SLAAI-ICAI). 2021. doi: 10.1109/slaai-icai54477.2021.9664689.

[6] S. Basak, P. Corcoran, R. McDonnell, and M. Schukat, "3D face-model reconstruction from a single image: A feature aggregation approach using hierarchical transformer with weak supervision," Neural Netw., vol. 156, pp. 108–122, Dec. 2022.

[7] R. K. Shukla, A. K. Tiwari, and V. Verma, "Identification of with Face Mask and without Face Mask using Face Recognition Model," 2021 10th International Conference on System Modeling & Advancement in Research Trends (SMART). 2021. doi: 10.1109/smart52563.2021.9676204.

[8] J. Goga, R. Vargic, J. Pavlovicova, S. Kajan, and M. Oravec, "Structure and Base Analysis of Receptive Field Neural Networks in a Character Recognition Task," Sensors , vol. 22, no. 24, Dec. 2022, doi: 10.3390/s22249743.

[9] M. S. M. Shahar and L. Mazalan, "Face Identity for Face Mask Recognition System," 2021 IEEE 11th IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE). 2021. doi: 10.1109/iscaie51753.2021.9431791.

[10] P. Sroison, "Face Mask Detection using Machine Learning." doi: 10.36227/techrxiv.19549546.
[11] H. N. Vu, M. H. Nguyen, and C. Pham, "Masked face recognition with convolutional neural networks and local binary patterns," Appl Intell (Dordr)*, vol. 52, no. 5, pp. 5497–5512, 2022.*
[12] A. C. Elliott and W. A. Woodward, Quick Guide to IBM® SPSS®: Statistical Analysis With Step-by-Step Examples. SAGE Publications, 2019.

TABLES AND FIGURES

Table 1. The accuracy of the FaceNet algorithm using the visual geometry group (VGG-16) is shown in the table below.

Iterations	Face Net	VGG-16
1	93.14	90.35
2	91.08	84.28

3	90.27	91.33
4	89.01	87.16
5	91.22	83.12
6	88.36	89.70
7	86.81	83.90
8	95.36	90.14
9	92.20	86.68
10	94.93	90.58

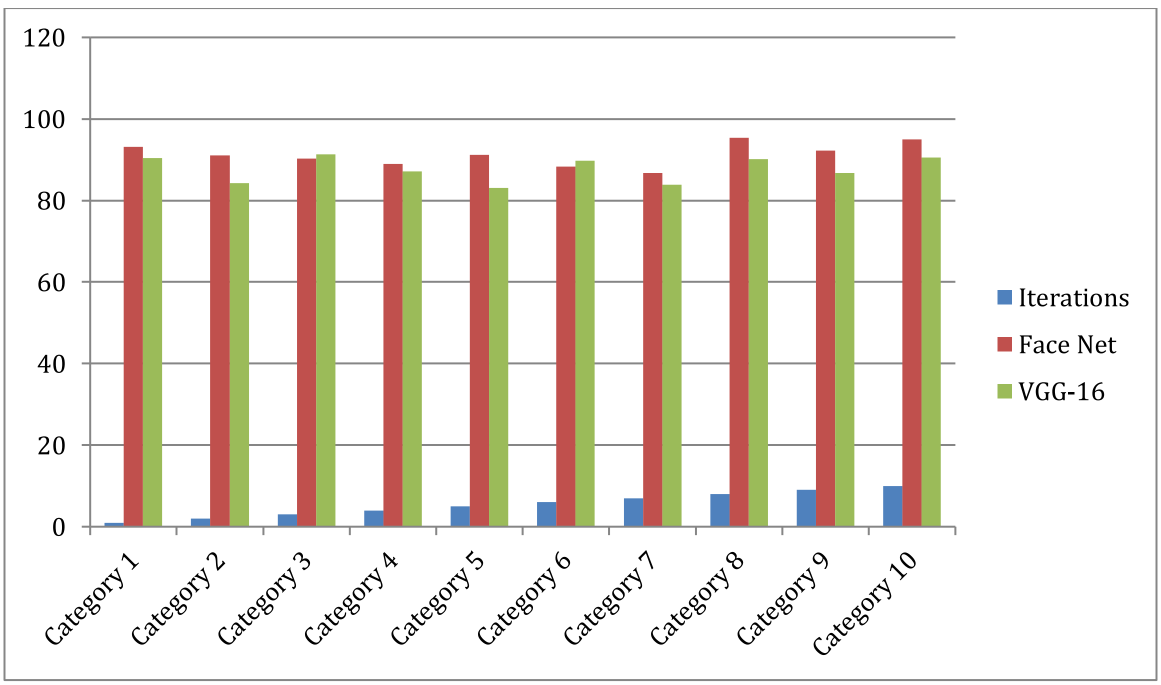

Table 2. With N=10 for both methods, this table shows the average values of accuracy, deviation from mean, & standard error for FaceNet & Visual Geometry Group (VGG-16).

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	Groups	N	Mean	Normal variation	Rate of Standard Error
Accuracy	Face Net	10	90.2901	2.76812	0.87541
	VGG16	10	87.7240	3.10769	0.98273

Third Table. A $p<0.05$ significance level two-tailed independent samples t-test was used to compare the algorithms created by the Visual Geometry Group sixteen (VGG-16) against FaceNet. A final score of 0.001 was recorded.

	The Levine's Test checks whether the variances are equivalent.		test to see whether the means are equal					
	F	**Sig.**	**t**	**df**	**sign. (two-tailed)**	**Average disparity**	**Departure from the standard error**	confidence in the difference at the 95% interval

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									Lower	**Upper**
Accuracy	**Assumption of equal variance**	0.75	0.0397	2.6	18	0.001	3.51121	1.31600	0.74918	6.24539
	Equal Variances Not Assumed			2.6	17	0.001	3.51121	1.31600	0.74656	6.28498

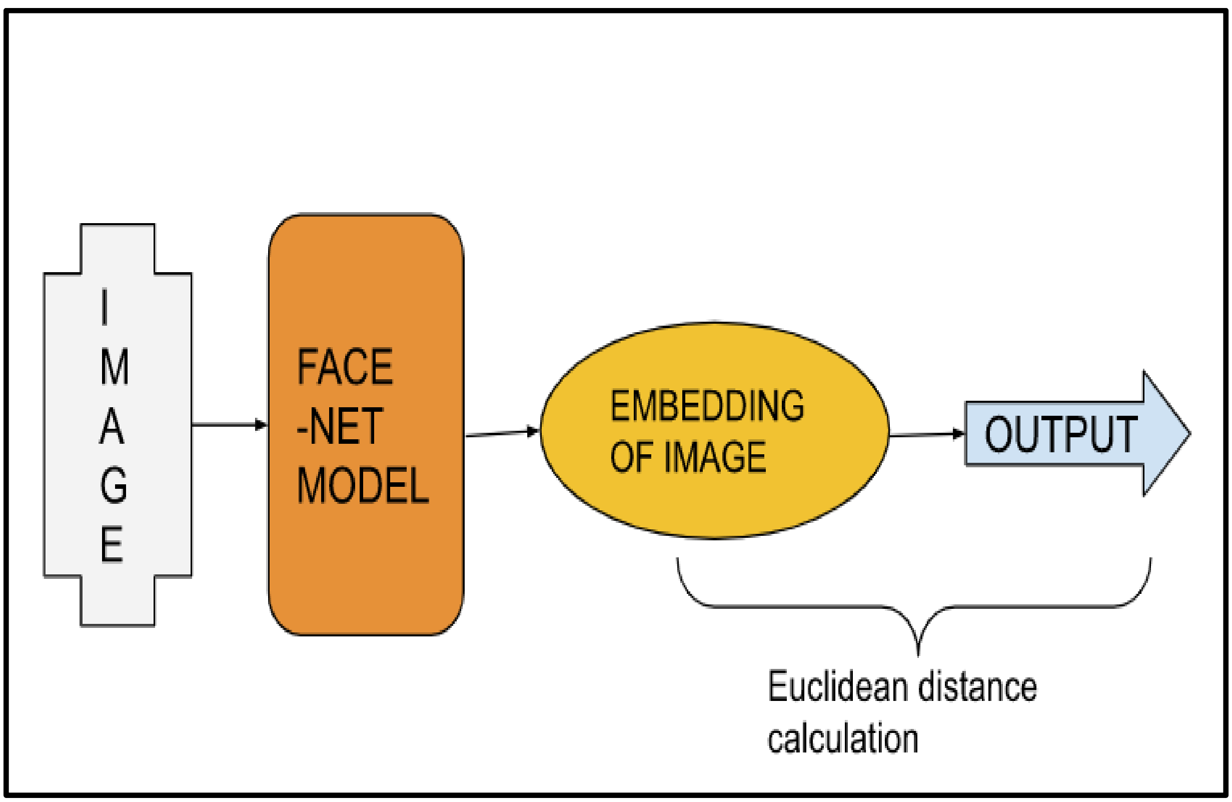

Fig. 1. Innovative Face Recognition's mask-wearing architecture is shown in the diagram above.

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Figure 2 displays the final output of the Face Net algorithm for the Shriya user.

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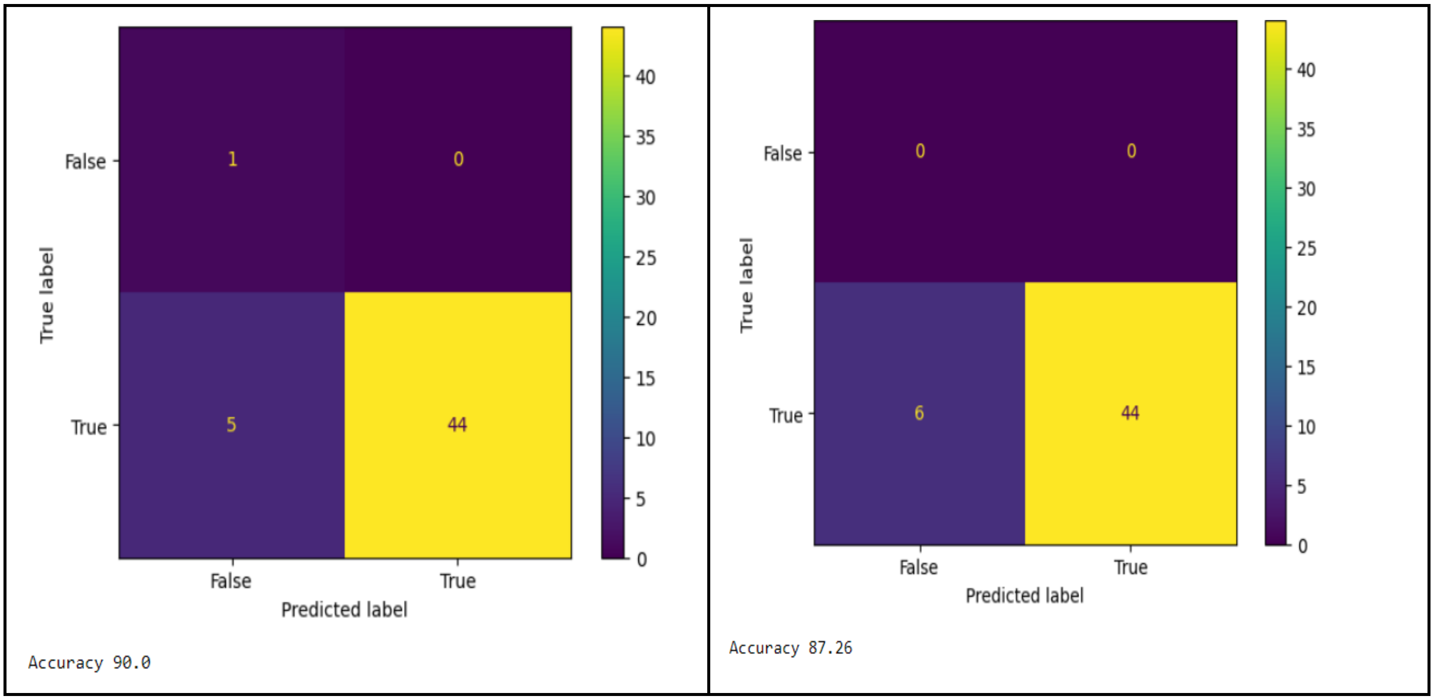

Fig. 3. The confusion matrix for the FaceNet and Visual Geometry Group-16 algorithms.

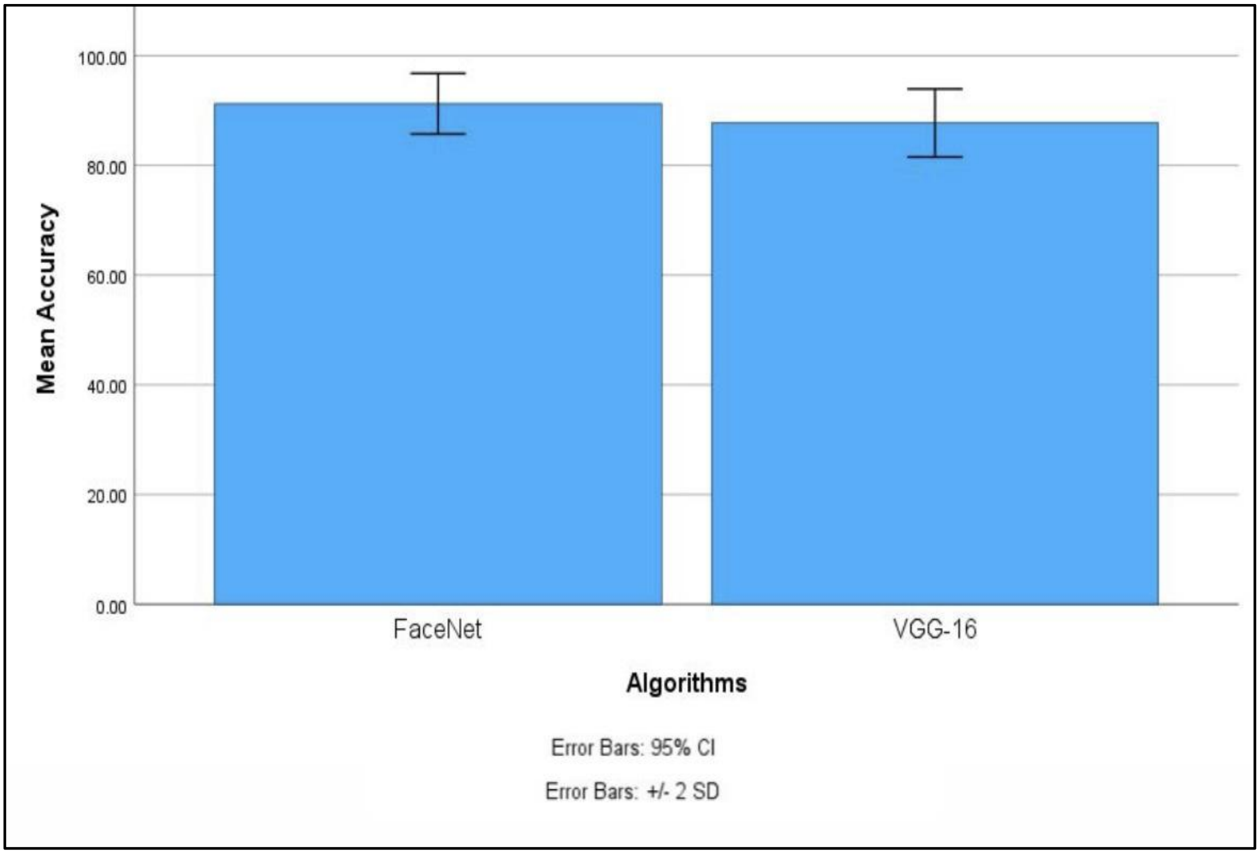

Fig. 4. Mean accuracy, comparison classification using Visual Geometry Group (VGG-16)(87.7%) and FaceNet (90.2%). The average accuracy of classification using novel route modeling is greater than that of FaceNet. The X-axis shows Visual Geometry Group-16 while the Y-axis shows FaceNet. Accuracy that is average. The 95% confidence interval and error bar are accompanied by two standard deviations.