IMPROVING PRECISION FOR IDENTIFYING FACIAL MICRO- EXPRESSION USING SUPPORT VECTOR MACHINE ALGORITHM COMPARED WITH HIDDEN MARKOV MODEL ALGORITHM

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Abstract

Aim: The main goal of this study is to propose a novel identifying facial micro-expression using support vector machine algorithm with hidden markov model algorithm and compare their precision**.**
Materials and Methods: The sample size for support vector machine (N=10) and hidden markov model (N=10) were iterated 20 times to detect micro expressions with g power as 80 %, threshold 1.0 and confidence interval as 95%.
Results: support vector machine has significantly better precision (94.8%) compared hidden markov model precision (90.0%). The statistical significance difference p=1.0 ($p<0.05$) independent sample T-test value state that the results in the study are insignificant.
Conclusion: Support Vector Machine algorithm offer better precision to detect facial micro-expressions than hidden markov models.

Keywords: Micro-expressions, Innovative Support vector machine (SVM), Emotions Hidden Markov Model (HMM), Precision, Machine learning.

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1. Introduction

The goal of this research is to find out how accurate new facial microexpression recognition is (Swinkels et al. 2017). There are several types of algorithms to detect emotions ((Neerja, Neerja, and Walia 2008).(Calvo et al. 2014). There are many types of micro-expressions which are unable to be detected by algorithms (Chew et al. 2012). ((Calvo et al. 2014)2014) The application is that these micro-expressions can be detected by a Innovative support vector algorithm compared with the hidden markov model, by using these scanned images, results find the facial micro-expressions (Zeng et al. 2009).

Our institution is keen on working on latest research trends and has extensive knowledge and research experience which resulted in quality publications (Rinesh et al. 2022; Sundararaman et al. 2022; Mohanavel et al. 2022; Ram et al. 2022; Dinesh Kumar et al. 2022; Vijayalakshmi et al. 2022; Sudhan et al. 2022; Kumar et al. 2022; Sathish et al. 2022; Mahesh et al. 2022; Yaashikaa et al. 2022). The study hole recognized from the survey is that there are numerous strategies proposed for detecting facial micro-expression, however the maximum of the strategies which can be proposed have much less precision rate. The essential goal of this take a look at is to hit upon facial micro-expression through Innovative Support Vector Machines set of rules as compared with a Hidden Markov Model of rules to acquire higher accuracy ((Calvo et al. 2014) 2014).

2. Materials and Methods

The analysis study was carried out in an Open Source lab, Saveetha School of Engineering, Saveetha Institute of Medical And Technical Sciences (SIMATS). The number of teams known for the study area unit 2. The group-1 be a support vector machine algorithmic rule and group-2 be a hidden markov model algorithmic rule. The SVM and HMM were iterated at different times with a sample size of 10 ((Calvo et al. 2014)2014) , 95% confidence interval and pretest power of 80% (Swinkels et al. 2017).Consistent with that, the sample size of support vector machine algorithmic rule (N=10) and hidden mathematician model algorithmic rule (N=10) were calculated ((“Sample Size Calculator” n.d.).

The data set has 1700 pictures once the info preprocessing the dataset is updated to 937 pictures, wherever all the pictures are units of various dimensions. So, all the picture area units were resized to 400×400. The info set was collected from kaggle (anshalsingh 2021).

Support Vector Machine Algorithm (SVM)

Selection of SVM Machine mastering as a baseline version became supposed with the aid of using its achievement in beyond micro-expression research like ((Neerja, Neerja, and Walia 2008).(Calvo et al. 2014). SVM makes use of a hyperplane to split the cluster of statistics into their appropriate classes, thinking that we`ve been given datasets with 2 separate classes that rectangular degree linearly indivisible. There is probably pretty one hyperplane isolating the kinds and consequently the only with the most important margin is selected due to the fact the best/maximum is nicely classified. Since the SVM.

Machine mastering set of rules can be a binary classifier, each micro-expression class becomes skilled on a personal basis, and consequently the common in their overall performance becomes calculated as proven in Fig. 1. During this study, 5-fold pass validation became acquainted with dividing all of the samples into 5 subsets. SVM fashions tended to designate the two dataset codecs that we had (apex frames and photograph sequences). A whole 220 samples have been used for apex body test while 230 samples have been used for experiments finished victimization photograph sequences.

Hidden Markov Model Algorithm

As shown in Fig. 2, forty one facial feature elements were detected in each photo to represent the motions of face regions. They included ten components for the brows, twelve for the eyelids, eight for the mouth, ten for the corners of the lips, and one for the anchor characteristic element at the nostril (Zeng et al. 2009) as proven in Fig. 2. The facial characteristic factors are tracked by the use of a limited Emotions Hidden Markov Model (Chew et al. 2012). Emotions Hidden Markov Model makes use of a non-parametric approach to symbolize the distribution of candidate places and the use of an optimization approach known as limited meanshifts. Emotions Hidden Markov Model outperforms the famous techniques for deformable version fitting. We code the archetypal facial sensations using multiple AUs based on the tracked function components withinside the relevant face areas, which is consistent with Ekman's AU-coded emotion description in (Fritzell et al. 2020).

The software tool accustomed to judge the region based mostly support vector machine algorithmic rule and emotions hidden markov model set of rules rule was in google colab with python synthetic language. The gear was upgraded to an Intel midrange i5 CPU with an 8GB RAM era. The device was upgraded to a 64-bit OS, X64, based on a modern processor and a 917-GB HDD. The

Windows 10 software programme machine makes up the computer code configuration. The analysis was done victimizing IBM SPSS version 2021. It could be an applied mathematics computer code tool used for information analysis. For each projected and existing algorithm 10 iterations were finished with at most 10-20 samples and for every iteration the anticipated exactness was written for analyzing exactness precision.

Statistical Analysis

In this analysis date, place and name square measure the independent variables and stay constant even once ever-changing different parameters, whereas image pixels, emotions, expressions square measure dependent variables reckoning on the inputs and vary for each amendment within the input. freelance T-Test that is employed to match region based mostly support vector machine algorithmic programs and emotions hidden Markov model algorithm to notice facial micro-expressions ((Calvo et al. 2014)2014).

3. Result

The consequences had been taken as an exploitation confusion matrix and preciseness metric. The train:test cut up changed into seventy five:25 as in Table 1. We tend to conjointly do move-validation at the dataset to do away with any biases.

In this test SVM with linear kernels finished higher than opportunity kernels. Rbf gave the worst overall performance, even as poly modified into nearly as suitable due to the linear kernel as shown in Table 2. We tend to try to stay the same and observe the identical for each split and move-tested data consequently to have uniformity in effects.

The suggested pass-validation rating turns into conjointly pretty lots correct sufficient to the accuracy score carried out via the manner of the split. Shows the confusion matrix's warmth map from our multi-elegance type outcomes. We tend to believe that the diagonals have larger weights after a closer examination of the confusion matrix; there are a few misclassifications in every class except elegance 4: Fear. Several samples were incorrectly identified as possible training, such as scorn, disgust, fear, and disappointment.

Fear is appropriately detected in all of the samples. In a few situations, the disgust and melancholy samples were misclassified as anger.This will result in the similarity of options between these emotions as shown in Fig. 3.

4. Discussion

Support vector machine algorithms supported facial micro-expressions detection have higher precision compared to emotions hidden Markov model algorithms. Geo et al have enforced the noise tolerant ensemble continual support vector machine for semi-supervised object detection. It describes the preciseness of the support vector machine algorithmic rule can perpetually improve as continual with the coaching and mining steps consequently (Calvo et al. 2014) have enforced the improved emotions hidden markov model algorithmic rule for object detection. This describes that the support vector machine algorithmic rule is 4% above the hidden markov model algorithmic rule ((Di and Yu 2020)).

We focused on a few distance and area constraints; however, there may be many more interesting functions at the face that may be calculated and utilized to teach the set of principles. Furthermore, not all of the functions help to improve precision, a few perhaps now no longer useful with the alternative functions. For future work, an improved face detection set of rules coupled with a few accurate functions may be researched to enhance the results. Feature choice and discount method may be carried out at the created function to enhance the accuracy of the dataset. Applications together with drowsiness detection among drivers may advance the use of function choice and cascading extraordinary algorithms together.

5. Conclusion

Face popularity in synthetic intelligence is a common hassle. Several smartphones were establishing phones with facial identity to safeguard non-public info and used on Facebook to identify right away while customers of Facebook appear in pictures. Based on the obtained results the Innovative support vector machine algorithm provides 94% precision compared to the hidden markov model algorithm which results in 90% precision.

Declaration

Conflict of interest

No conflict of interest in this manuscript.

Authors Contributions

Author AAR was involved in data collection, data analysis, manuscript writing. Author KSR was involved in conceptualization, data validation, and critical review of manuscript.

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Tables and Figures

Table 1. Mean and Standard deviation comparison precision of SVM is 94.8 % and the HMM Model is 90%.

Algorithms	N	Mean	Std.Deviation	Std.Error Mean
SVM	10	89.5000	3.02765	.95743
HMM	10	85.5000	3.02765	.95743

Table 2. Independent Sample T- test Result is done with confidence interval as 95% and level of significance as 1.0 (Support vector machine algorithm performs significantly better than hidden markov model algorithm with the value of ($p < 0.05$).

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	sig.	t	df	Sig.(2-tailed)	Mean Difference	Std.Error Difference	95% Confidence Interval of the difference	
								Lower	Upper
Accuracy Equal Variances assumed Equal variances not assumed	.000	1.00	2.954	18	.008	4.00000	1.35401	1.1553	6.8444

Loss Equal Variances assumed Equal variances not assumed			2.954	18.000	.008	4.00000	1.35401	1.1553	6.8444

Fig. 1.The Dlib library provides a facial landmark detection feature that shows the location of 68 landmarks on the face. The SVM method divides these 68 elements into distinct sections such as left eye, proper eye, left eyebrow, proper eyebrow, mouth, nose, and jaw.

Fig. 2.AUs are the movements of character muscle tissue or a set of muscle tissue at the object, that is used by object movement coding structures that shows facial expressions of HMM.

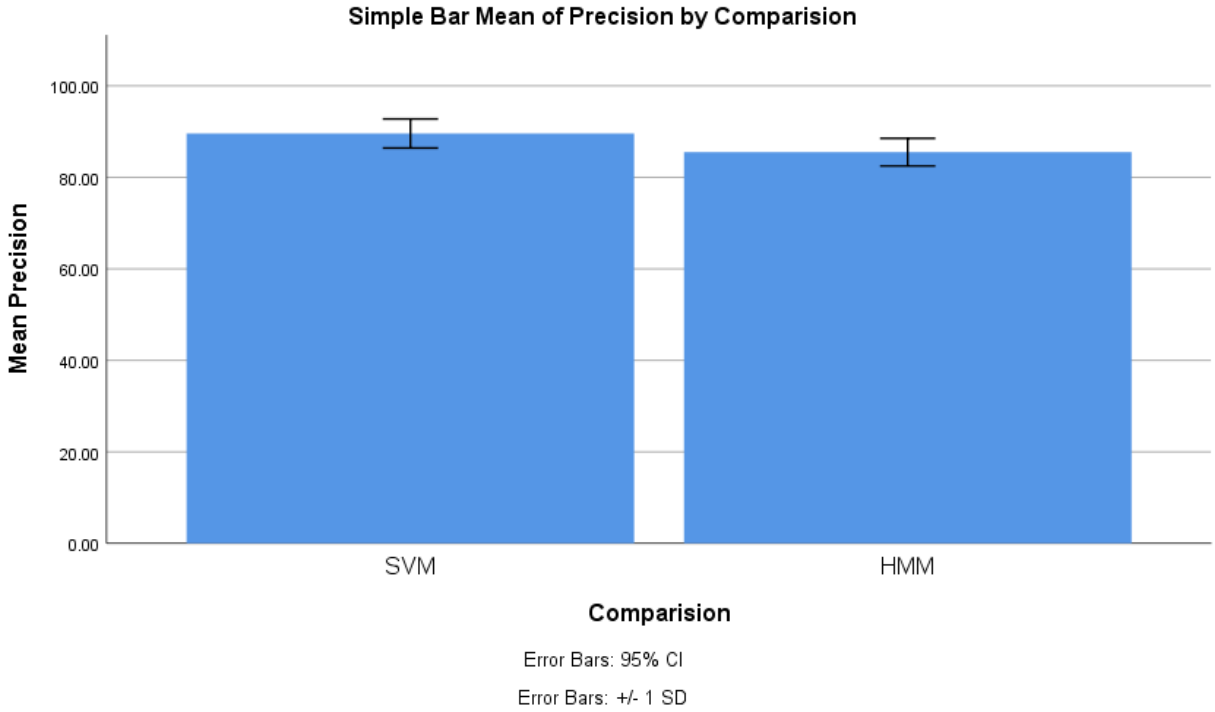

Fig. 3. In terms of mean precision, the SVM and HMM algorithms are compared. The mean precision (94.8%) is higher than the HMM (90 percent). SVM has a somewhat lower standard deviation than HMM. SVM vs HMM on the X axis. Axis Y: Mean detection ± 1 SD.