

AI based SVM: A novel method for emotion prediction and analysis

Saroj Kumari ¹ and Dr. Ratnesh Pathak ²

Assistant Professor, ¹ Yogoda Satsanga Mahavidyalaya, Dhurwa, Ranchi, 834004, India
(jusasep@gmail.com)

Assistant Professor, ² Yogoda Satsanga Mahavidyalaya, Dhurwa, Ranchi, 834004, India
(ratneshpathak1981@gmail.com)

Abstract

Human faces display a variety of emotions that highlight the person's mood and feelings. If work is to be provided in accordance with an individual's mood following emotion detection, facial expression recognition plays a crucial role in the productivity output. This paper examines the use of support vector machines, a type of artificial intelligence approach, to predict basic facial expressions like happiness, sadness, and rage.

Because of its superior classification accuracy and ability to handle high-dimensional data, the SVM classifier is utilized. The suggested approach offers encouraging results in emotion classification, according to experimental study.

The Yale Dataset, which includes a variety of facial image sets with different expressions, is utilized.

The test data is fed into a support vector machine classifier using the Orange tools, which extracts features from photos that correspond to the fundamental emotions of human faces. Support Vector Machines perform better.

Keywords: Human Emotion, Facial expression, Image processing, Facial Expression, Support Vector Machine.

Introduction

Human communication and decision-making heavily rely on emotion. Facial expressions, speech patterns, body language, and physiological cues can all be used to identify human moods. Since emotional states are directly reflected in facial movements, facial expression-based emotion identification is one of the most successful techniques.

Human passionate elements have centered around local area knowledge like correspondence getting capacity, dynamic capacity and furthermore helps in understanding social part of human existence. Feeling show key job during correspondence. Feeling acknowledgment is upheld out in different ways, it very well might be oral or non-verbal .Voice (Audible) is oral type of correspondence and look, activity, body stances and motion is non-verbal type of correspondence.

The majority of facial expressions are alterations brought on by an individual's enthusiastic situation, implications, or local correspondences. According to the research, the computer system that is employed for the improved technique can discern facial emotions with ease. Facial expressions are important in any human-machine interaction.

There are primarily two methods for explaining facial traits. The first is the geometric feature-based method, which uses geometric relationships between facial features to explain facial emotion.

Thus, electronic and constant facial expression would assume significant part in human and machine correspondence. Facial expression recognition acknowledgment would be helpful from human capacities to logical practices. Expectation of expressions assumes essential parts for applications which depend on feeling acknowledgment. This paper talks about an alternate method for facial expression recognition.

The support vector machine (SVM) is used to organize a variety of facial expressions after the distinctive facial element focuses are first and foremost discovered. One kind of classification method that relies on the outcome of statistical learning theory and ensures strong generalization performance is the support vector machine [15]. Adopting these all-encompassing strategies and achieving passably good performance is quite difficult.

Individuals express the effects through a progression of activity on face, body developments, a few motions, voice conduct, and other physiological signs, for example, pulse and sweat, and so on. The analysts concentrated on the connection between machine and influences. It is nearly new in current years that impact highlights were gotten and dealt with by machine.

The facial appearance acknowledgment strategies have normally endeavored to analyze demeanor of six fundamental feelings named as glad, shock, miserable, nausea, dread and anger[1] [2]. The compression or decrease of at least one muscle characterizes facial development. It takes after to facial muscles of distinctive individual. It is created by Paul Ekman and Wallace V. Friesen in 1978[13].

Besides, the framework isolates the facial appearance acknowledgment framework into changed stages as face following, facial element extraction and characterization and having various systems are followed in various parts [2] [5]. Contingent upon the disparate data extricated from the image and the feeling order methods utilized, there are different look acknowledgment calculations [6] [8] have been declared.

As per earlier frameworks which give some information on the general condition of the facial perspectives including the look scene or the images arrangement being seen [9] [10].

Viola and Jones [7] utilize the Ad Boost calculation to deliberately ignore a hunt window the images at various scales to recognize a fast facial feeling that portrays a specific facial position.

As indicated by Shenchuan Tai and Huang [6] facial feeling first physically centers around include points of picture in the primary casing and afterward utilizes cross connection of optical stream to deal with highlights and numerical models. Manual checking procedures are not appropriate without fail.

Business, Nehazz, and Benyettou [16] utilize worked on probabilistic neural organizations for looks that depend on changed information bases to assess their exhibition.

Chang and Chen [2] utilize neural networks as a classifier. Be that as it may, there are challenges in utilizing back engendering neural networks which are gradually gathered. The learning stage is extremely sluggish.

The paper presents a concise prologue to facial expression that depicts six essential facial expression and elements and gives a passing on a near investigation of prior proposed well known methods for mechanized facial feeling acknowledgment.

Categorizing Facial Expressions & It's Features

Human feelings viably change from start to finish of the day, contingent upon physical or mental state. In spite of the fact that people are loaded up with a ton of feelings, present day brain research characterizes six essential looks as glad, dismal, shock, dread, repugnance, and outrage as normal feelings [3]. The activities of the facial muscles help to perceive human feelings. The fundamental highlights of the face depend on the eyebrows, mouth, nose and eyes.

Table -1: Universal Emotion Identification

Universal Emotion Identification		
Emotion	Definition	Motion of Facial part
Anger	It is perhaps the most perilous emotion. It is unsafe feeling; people are attempting to keep away from this feeling. These are the Secondary feelings of outrage, aggravation, disturbance, disappointment, disdain and abhorrence.	Teeth bolted and lips pressed, eyebrows drawn down, upper and lower lips pulled up and open eyes.
Fear	Fear is the danger emotion which causes physical or mental harm. These are the Secondary emotions of fear, Horror, nervous, anxiety, worry.	Insincere eyebrow down, inside eyebrow up, mouth open, jaw fallen.
Happy	It is most typical statement. There are the Secondary feelings are satisfaction, pride, alleviation, trust, delight, and fervor.	Mouth edge up, uncovered mouth, lip twist, cheeks and kinks around eyes.
Sad	It is inverse feeling of cheerful. These are optional feelings are experiencing upset, despair and urgency.	Eyebrows raised, mouth side down, shut eye, lip side pulled down.
Surprise	The cause of this emotion is when unexpected things happen. These are the Secondary emotions of surprise, wonder.	Eyebrows up side, open eye, mouth open, jaw delivered.
Disgust	It is the feeling of dislike. There are many reason of disgust i.e. taste, smell, sound or tough.	Lip corner depressor, nose flaw, and lower lip depressor.



Figure 1. Six basic Facial Expressions

Data Collection

Front view face image lifted from the Yale dataset. As a result, it is try to use the database as a training set for facial emotion recognition.

The appearance and features of people's also depend on different societies, backgrounds and other things. It

likewise relies upon contrasts in skin tone, there are additional trademark contrasts between individuals from various pieces of the country. Therefore, working on this wide variety of databases is a daunting task. Despite the six basic emotions I have use only few of them for practical use. There are 12 different images of the dataset are taken which all are belongs to both male & female.

Implementation

Finding facial expressions is the first step in the facial expression recognition process, which is completed in several stages. First, import the photos from the dataset and transform them into data tables using the Orange data mining tools. create a.csv file thereafter for additional processing. Test the dataset after choosing the target column (various emotions). Use the Support Vector Machine classifier to examine the various facial emotions in the form of a confusion matrix following testing.

The different feature points from the faces have extracted from the different features of facial parts such as nose, eyes, mouth. These features have used to train SVM (Support Vector Machine) classifier including the expression given to each feature of different facial parts. These calculations above have never been adjusted for demeanor acknowledgment reason in light of the fact that the face appearance acknowledgment framework is plainly not quite the same as various methodologies. This assumes that the faces in the image are not always full frontal, but may vary in head posture and may be skewed to the right or left i.e. there may be little change in emotion due to these actions of face.



Feature Extraction

To perceive facial expression we really want to dissect the mathematical elements of the face.

The diverse mathematical elements of various piece of face like eyebrows, eyes, mouth should be removed. Right off still up in the air the included marks of the image. These elements are called landmark spots which are likewise called central issues or facial element focuses that address individual focuses on a facial region for example the diverse element points of the mouth or the eyes and the distinctive of the eyebrows.

The landmark points are manually marked using training set of facial images. It is use to frame a model of these focuses. The size of the training dataset is addressed by a bunch of 'n' milestone focuses which is essentially deterministic where utilize various focuses for the eyes, nose, mouth and eyebrows to discover the specific position.

Repeated experiments showed that the various manually marked points on the facial features (separate points for the eyes, nose, mouth and eyebrows) are enough to guess the geometry of the original shape.

Phases of defining facial feature:

- 1) Image points physically marked around the facial landmarks points on each face image from the used dataset.
- 2) The respective 'landmark' points are marked manually using a training dataset of images & points are stored as array or structure.
- 3) After that calculate the different correlation between different features.
- 4) Each training image dataset is partial to build a gray-level model
- 5) Construct the whole model as an equivalent way to frame a perfect of shape appearance.
- 6) Finally, this model is being planned with assistance of information mining instrument named "Orange" over the test dataset images utilizing Support Vector Machine.

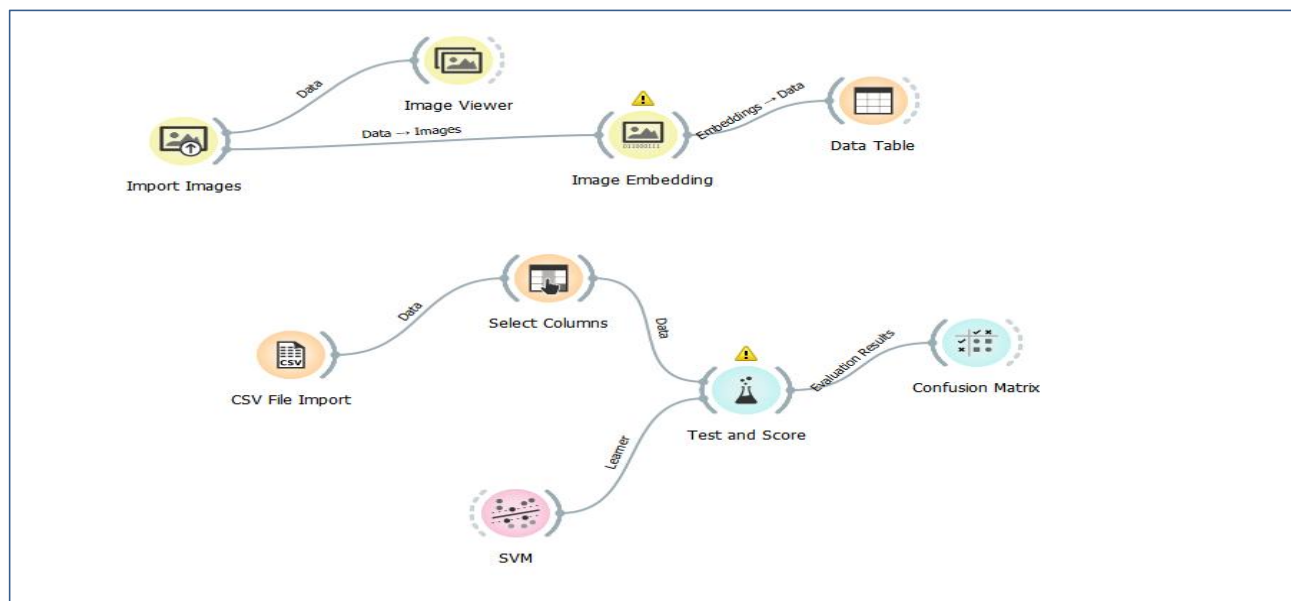


Figure 3. Data Analysis using SVM by Orange tool

Classification

The following undertaking is to group the information for example separated highlights should be arranged by the specific set to which it has a place. The recognized face should have a place with one of these fundamental classes as happy, sad, normal and surprised.

Support Vector Machine (SVM) has been executed for this. Standard SVM takes an assortment of dataset and surmise for every information images from preparing information [14]. So, the Support Vector Machine algorithm forms a model that provides new set in one or the other category. SVM (Support Vector Machine) classifier dependent on Ad boost algorithm[4] which is utilized to find human face. Promotion support calculation coordinates with the classifier by mining highlights with week classifier to solid classifier. This is one of the sort of an iterative burden update process.

The train dataset faces are characterized with the name of the facial expression. To group the training dataset into different categories, Support Vector Machine is used which takes the train dataset and mark as parameters. It characterizes every preliminary picture into various classes dependent on the Support Vector Machine train dataset.

Trained a cascade of Support Vector Machine classifiers, utilizing a subset of component. Each Support Vector Machine classifier in the cascade train to go about as an articulation locator, yielding positive reaction, assuming that its appearance is available and negative reaction in any case. So for example an

SVM trained as a "happy detector" would classify between expressions that are happy and not happy.

Experimental Result

Now going to explain the experiments done using about 12 faces that it can detect. These faces belong to the same person. Using the same frame it also detects more than 2 images. These recognized faces are stored in a database and served as SVM where each facial expression is recognized.

The aftereffect of acknowledgment is portrayed in the table underneath. This outcome is when about very nearly 12 appearances gets separated from the datasets.

		Predicted					Σ
		anger	happy	normal	sad	surprise	
Actual	anger	0	0	1	0	0	1
	happy	0	1	2	0	0	3
	normal	0	2	1	0	0	3
	sad	0	1	1	0	0	2
	surprise	0	1	1	0	0	2
Σ		0	5	6	0	0	11

Figure 4. Confusion matrix

In this paper [11] using facial expression extract the features for further classification. The different expressions that are estimated to calculate the overall accuracy level of different facial emotion using this technique.

Conclusion

In this paper we have attempted to introduce a technique that is capable of perceives and characterizing facial feelings utilizing wide methods of images handling. It very well may be utilized to distinguish one more arrangement of articulations by changing the train dataset from which it tends to be remade. Expanding the quantity of images in the preparation dataset, its related marks in the Support Vector Machine, the various articulations grouped here can be expanded.

It comprehends a greatest acknowledgment achievement which dependent on set of 12 arrangements of facial expression images. This outcome is from a bunch of images from the Yale dataset. Utilizing more number of images in the preparation dataset there is an expansion in execution. Because of as far as possible, the quantity of train dataset images was restricted.

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