

LIE DETECTION USING MACHINE LEARNING

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Abstract

Detecting lies is important in many areas, such as police investigation, airport security etc. There are many technologies to detect lies.

Through this paper we are going to describe how investigation related to lies can be easily detected using machine learning. Lie detection also called deception. Detection uses questioning techniques to ascertain truth and falsehood in response which can be used by police at the time of investigation. In this paper, features of speech and physical values are used to make sure about truth and lie using artificial intelligence. The system can detect changes in the eyes, voice, gestures and postures. Basically we want a system with the help of which we can easily identify the lie of the person using different methods.

Keyword: E.E.G and Machine Learning, Face Reading Technology, Support Vector Machine, Linear Regression

I. INTRODUCTION

From the past years people have designed or developed different technologies or software to detect lies but not a single device are accurate in detecting lies. In that technologies lies are detected based upon calculating modification in humans[9] stress, heartbeat, pulses or skin conductivity. And according to that changes person is considered to be lying or not. But this procedure to is not always used for detecting lies as some persons are professional in hiding their stress level so to remove all these problem we have tried to proposed a model by using different algorithm for detecting lies. That is why we have used machine learning

algorithms in it. With the help of machine learning we can determine by the facial expression or movement of a person and find whether the person is speaking truth or not. In this process, firstly we need a person to whom we can ask various correlated questions whose answers are not unknown to us. For this the Artificial Intelligence to use recognize the image processing as all have different "facial" expression. we really want to know if the person is speaking truth or false, then machine will automatically start detecting according to the person's micro-expressions and different postures of face such as "eyebrow" movement, "lip" positioning etc, and will check it with the previous stored data. And according to that it will give conclusion whether that person is actually lying or not. This process is more superior than that of polygraph and it will give accurate result.

II. MOTIVATION BEHIND THIS TECHNOLOGY

During twentieth century Polygraph was used for detecting lies. Polygraph is a machine which is used for recording the person's heartbeat, pulse, blood pressure etc.[5] But many problem with polygraph was that it was very slow and also is not always correct. Polygraph makes more errors making innocent people guilty than guilty people innocent. It is also not suitable in the situation when a person who is going to be interrogated aware of the situation that his pulse, stress is going to be

measured then they may have control on it. On the other hand Facial reading and EEG can be used for detecting as with facial expressions a liar can be easily detected. Therefore, there is a great need to develop a system for lie detection which is frequently based on facial micro-expression.

III. MACHINE LEARNING

Machine Learning is a study of algorithms and statistical models which our computer system uses to perform various task. It examines various amount of data by forming it into some patterns, then generate some codes and find new data formed. This method is used for better predictions. We have chosen machine learning for detecting lies because a person can have different expressions in different situations which forms different patterns and it become difficult to find small changes in the face so we can use different algorithms of machine learning for detecting lies.

IV. EEG AND MACHINE LEARNING FOR LIE DETECTION

Electroencephalography is known as “EEG” [10].it is an electrophysiological monitoring approach to report electrical activity of the mind. It is a test which is used to record all the activities of brain. An EEG records the wave patterns of the brain. One more device referred to as the Emotive Epop+ in which allowed us to get the raw EEG records whilst someone is mendacity or telling the reality. One person may be used as a topic and other person had to asked him multiple questions and he had to answer all the question then his answers are recorded in EEG using Emotive headset. Later we used the Microsoft Azure system which is used for building, testing, and managing applications through data centers.



Figure 1: E.E.G(Electroencephalography Monitoring)

V. FACE READING TECHNOLOGY FOR LIE DETECTION

Face reading is a method which automatically analyze the facial expression like eyes, cheeks, ears, and other facial aspects[1]. For detecting movement it uses FACS and thermal camera to trace the emotions beyond a person pores and skin. The

FACS is used for measuring facial muscle movements of every facial expressions. It was created by Carl-Herman in 1970. It was further developed by Paul Ekman and Wallace Friesen in 1997.

The component of facial movement which we observe is known as Action Unit(AU). Each facial expression can be divided into several components. Action units represent the muscular activity which produces momentary changes in facial expression. The researchers believed that specific behaviours can constitute unique intellecture face. As humans have inflexible shape of cranium. Expressions had been became action gadgets by means of Paul Ekman. This task used the ones motion devices the usage of FACS to pick out face patterns and examine them. Then the use of these collections of various expressions the undertaking continues the essential statistics and in database to merge with

records.

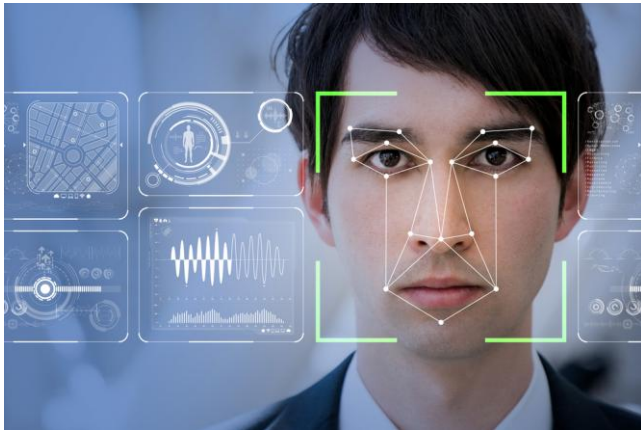


Figure 2: Face Reading Technology

VI. TWO CLASS SUPPORT VECTOR MACHINE

Support vector Machines(SVMs) is a machine learning algorithm that is used to classify regression associated challenges. SVM algorithm is used to find a hyperplane in an N-dimensional area that classifies the records points. To separate the two classes of facts points, there are many hyperplanes

and from which some are chosen Now our subsequent objective is to discover the aircraft which has most margin. Maximizing the margin distance offers supplementry so that we may also certain approximately the type of facts points extra correct. elegance it performs properly for experiments that incorporate multiple hundred functions. This model is a supervised gaining knowledge of model that can be requires classified statistics. the algorithm analyzes enter data and recognizes styles in a multi-dimensional characteristic place referred to as the hyperplane. More then input example is represented as point on this area, and also mapped to output instructions inside the sort of manner that instructions are divided via as widespread and clean an opening as possible.

VII. LINEAR REGRESSION

Regression analysis is a form of predictive modelling technique which is used to investigate the relationship between a dependent and independent variables. Regression determines the strength of predictors. Linear regression is a machine getting to know set of rules. Regression is a method of modelling a target value based on unbiased predictors. Linear Regression is a sort of analysis in which variety of independent variables is one. There is linear relationship between the unbiased and dependent variable .The cause of linear regression is to locate the linear courting among x for input and y for output. At the same time as constructing a linear version it's miles said that we are trying to decrease the error an algorithm does making predictions, and we got that by way of deciding on a function to help us measure the error. In this the data is modelled in a straight line.

Here show that

There is a relationship between x and y:-

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n$$

where,

- y is a response
- β are the coefficients.
- x is a feature
- n is no. of terms like 1,2,3.....

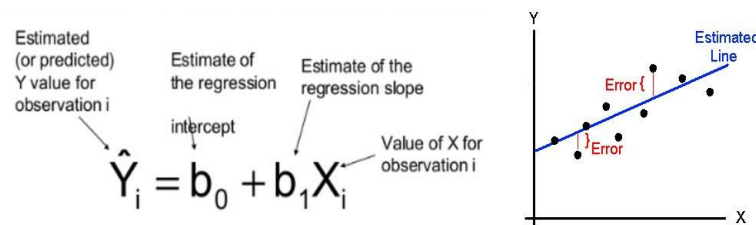


Figure 3: Linear Regression

VIII. LIE DETECTION MACHINE

Now we are going to describe how our system is going to work. It follows three steps. The first step is finding the face inside the streaming for asking the question or to interrogate them. Then by the use of algorithm it finds the pixels clustered which is similar to human face. Then the process moves for the feature extraction so that it can easily classify eyes, nose, eyebrows, lips, line of mouth etc. And try to recognize the changes in the expressions of the face. These techniques predicated on searching and studying geometric skills of “eyes”, “lips”, “nostril” and the “line of mouth” and apprehend the relative modifications between them. This information is used for finding different “face expressions”. The presence of a few expressions can define the line among truth or lie. Our task is targeted to discover the alternate by using face Reading technology, EEG and then check the changes using different algorithms, it came to the end and check if there’s any indication of lie or iniquity.

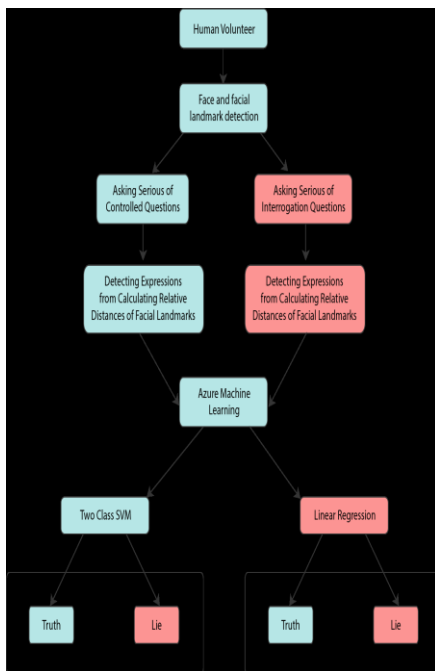
Figure 4: Lie Detection Process

As per the Figure it shows how this system is going to work. First of all a volunteer is needed then the process start with the detection of facial landmarks of the volunteer for the test in actual camera we also use EEG to record all the brain activities of the volunteer. After that, we ask the volunteer a few common questions called “controlled In this stage, the volunteer is needed to tell the truth. After that the algo is used to start investigating the expression of the volunteer at time the of answering them by calculating the difference on the

facial landmarks to find the expressions of face during telling the truth.

And in the next part we want volunteer to lie replying the questions.

Now it comes the next step which is quite complicated a part of our workflow. We begin asking a number of questions and our algorithm does the identical analysis whilst we were asking the managed questions. On this stage, the volunteer can pick out to lie or inform the reality. We take most of these use it first to create and train our version in “Azure”. “Azure” Machine Learning is used to feed the EEG information to determine when a person is telling the true fact or not. In which we can evaluate the model to decide how correct it's far.



IX CONCLUSION

We have concluded a system for detecting lies with the help of Machine Learning. In this we have used EEG which is used to monitor the activities of brain. We also have used Face reading technology

to trace the emotion beyond the pores of the skin. We have used SVM algorithm which is used in classification problem by dividing it into two classes. Through our research we have tried to carry out the Lie detection Machine which can be very useful to detect lies. For analyzing human visual morphology we use facial Landmark Detection for detecting micro expressions. However, there are many challenges which our system is facing like faces covered with makeup, goggles, beard and due to which it is difficult for detecting landmarks of face properly.

In a while our research brought about the truth that lie detection cannot only done with visual morphology alone but it also used to interpret the brain activity by means of extracting the raw EEG records and also need to observe the voice and speech measures. As it is using all these things in a single system it is quite costly so future research is also needed. Visual information combined with both the brain signal and Facial associated data, in which most probable to provide a better lie detection system. we also hope that our proposed lie detection system will be of best used in future.

X. FUTURE SCOPE

Within the future we simply want this research to move one step ahead with a view to acquire knowledge from its preceding consequences and with some new method for more sure results than now. In future we also want the growth of the accuracy stage by way of replacing our hardware machine with good quality of cameras we want to take multi angled photographs for shooting the emotions greater correct and through this special angles can be easily diagnosed. More significantly, we would really like to capture and also analyze brain signals, collect and test voice and speech statistics and additionally consist of a temperature sensor which determines a person's body temperature during the time of interrogation. This technology can be used by police for investigation, as people are expert in telling lies during investigation so we must have smart lie detection

system so that a guilty person can be punished and innocent person can be free.

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