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Recognizing Criminal Intent through Facial Expressions

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Abstract

Artificial intelligence is developing rapidly as a result of recent advances in the identification of image and emotion patterns in human facial features. On the other hand, the rise in crime and wrongful imprisonment are causing society to disintegrate. Artificial intelligence has greatly aided in the development of our contemporary society. Knowing the issue and the appropriate set of instruments to address it is an essential skill, and having the ability to apply those tools effectively elevates one to the rank of supreme being in the cosmos. False imprisonment is an issue that requires attention. Recognizing the facts,1 in 20 criminal prosecutions in the US alone end in an incorrect conviction. Innocent persons who have been unfairly convicted make up 1% of US jail populations, or about 20,000 people, according to the Innocent Project group. Facial emotion detection and datasets gathered based on the study "Criminality in the face" can be used by artificial intelligence to help lessen the problem of false convictions. According to a Kinesics survey, specific body motions and movements can be used as a kind of non-verbal communication. By Ray Birdwhistell in 1952, the phrase was first used. As the proverb "Face is the index of mind" states, facial expressions are an important aspect of non-verbal communication. Analyzing a person's face might provide insight into the circumstances around a criminal suspect.

Keywords- CNN; ROI; Facial expressions, Artificial Intelligence;

I. INTRODUCTION

In psychology, facial emotion detection software can assist with the assessment and treatment of mental health conditions that involve emotions, such as depression or anxiety. By analyzing the facial sentiment exerted by the suspect, their psychological patterns can be determined. As per the saying face is the window of the mind. When subtle changes in the face are monitored carefully one can deduce the way one mind works. It is a tragic reality that innocent people are sometimes wrongfully accused of crimes they did not commit. This can occur for a variety of reasons, ranging from eyewitness misidentification to faulty forensic evidence, to malicious intent on the part of the accuser. Regardless of the cause, the consequences of being wrongly accused of a crime can be devastating, including damage to one's reputation, financial ruin, and even imprisonment.

This was an idea that flashed into my mind when I was watching the sitcom namely “Brooklyn

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Nine-Nine".The sitcom is about the 99th police precinct in Brooklyn, New York City. There's an episode name "The Box" Season 5 and Episode 14. It's about a dentist who murdered his boss/colleague. When the boss found out that he's been stealing meds from the hospital. The case can't be moved forward because there was no murder weapon was found. Without the murder weapon or the murderer's confession, he can't be arrested. Detective Jake Peralta makes him confess to the murder the dentist committed dramatically. Using the input he had from the interaction and the person's body language he deducted a theory that helped the case and the case was closed. of course, it's a fictional scenario but the core idea was something based on reality. This made me think if an AI is trained to analyze the small movements in a suspect face can lead to a faster and more reliable end to the case.In this project, the software is created and trained to monitor the constant change in the suspect's face to find any different movements that could tailor them to the crime or to identify them as innocents. Usually, the common procedure to find if the suspect is guilty or not is to use an instrument called Polygraph. But to go through with the polygraph, also known as lie detector the police have to get consent from the advocate of the suspect or the higher officials but using a camera that can analyze the suspect's face and deduce if he/she is guilty of the crime or not.

II. Literature Survey

In this paper the authors have studied that by analyzing Audio and Video footages a person's emotion can we deduced. This gives the ability to deduce ones emotion not only by analyzing their face but also by their voice. The change in frequency and other parameters can be used to deduce their emotion [1]. Deduce is to reach a conclusion by applying rules of logic to given premises. But in no way it's 100% certain that we could reach the truth. Even for humans it's not an easy thing to identify one's emotion. We can deduce once emotion has proven by the famous fictional character Sherlock Holmes created by Arthur Conan Doyle.The criminality from face Illusion as that theconcept of telling someone if their criminal or not is an illusion and the reasons why. Studying this papers gives us the idea about the flaws in the system and to rectify the mistakes in them [2]. In this paper they've made it possible to find if some is a criminal or not with the means of CCTV Footage [3].

III. Existing System

There are many thoughts on the idea of reducing the crime rate through the means of new technology. The knowledge of science grows every day. Once new technology "phone" is an old technology now. As the though process of human being on this earth gets filled with new information every sec [4],
we tend to come up with new ideas even as we sleep. One of history's most famous physicists, Albert Einstein dreamt that he was walking through a farm where he found a herd of cows huddled up against an electric fence [5]. When the farmer suddenly switched the electric fence on, he saw the cows jump back at the same time although the farmer saw them jump one by one in a Mexican wave [6]. That's what inspired Einstein's Theory of Relativity events look different depending on where you'are standing, because of the time it takes the light to reach your eyes. The concept of identifying a person if he/she is a criminal or not using their face is an concept that's be hanging out in this world since the idea of facial emotion recognition was made possible thanks to the invention of Artificial Intelligence [7]. Just like the dreams of all the Scientists and thinking who worked on the design for Airplane [8]. The field of invention and design is like a scrambled puzzle with a hazy thought of the end product in the mind not knowing whether the piece will fit in the great puzzle. Each take turn bringing their thoughts into the puzzle to solve it and presents the world with a new invention and hope to make a change in our world [9]. Doing my research I happened to notice many researches have worked on the idea of bring justice to people who've framed for crime they haven't committed [10]. The existing system proposes we can use the CCTV cameras around us to identify the criminal in the bunch. Some papers opens a windows to the possibility to the concept of identifying the criminal traits in a human's ace. And the development in facial emotion recognition has come a long way ahead.

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IV. Proposed System

The proposed system is a combination of every system. The facial emotion recognition extracts the data needed for the AI Model to use an input. When the Video feed is fed into the AI Program, the Video is converted into images based on the FPS metadata of the video. FPS stands for "Frames per Second" [11]. A second of video consist of certain amount of images that run in a sequence to make the illusion of things moving. Flipbooks is a simple explanation of this phenomenon [12]. "Today, filmmakers typically shoot video at a minimum of 24 fps because this is believed to be the lowest frame rate required to make motion appear natural to the human eye[1]" [13]. So a second of video yields 24 images. These images are run through ROI process where the Contrast, Alpha, Saturation, Whites, Blacks, adjusting these parameters isolates the face from the foreground and background. 255 Dots are plotted on important landmarks of the face extracted from the image [14]. Movement of these dots from each frame to frame forms a pattern that can be analyzed and predictions on the emotion is excreted can be deducted. This patterns are then checked by the AI that is trained on the criminal face dataset to check the emotion

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excreted contributes to criminal attributes [15]. Units these are the Example of the dataset collected from the landmarks from the faces the AI has been trained from. This is how the data looks like the "391 211" labeling the landmark and the xyz marking the landmarks' coordinates [16].

Research by psychologists such as Paul Ekman has identified several universal facial expressions that are associated with specific basic emotions. These include happiness, sadness, anger, fear, surprise, and disgust. These expressions are recognized across different cultures and are believed to be hardwired in humans. Facial expressions are produced by the movement of facial muscles. For example, a smile involves the contraction of certain facial muscles, while a furrowed brow is associated with anger or concentration. These muscle movements are linked to the emotional state of an individual.

Humans are skilled at recognizing the emotions of others based on their facial expressions. This ability to "read" emotions from facial cues is essential for social interaction and empathy. It allows us to respond appropriately to the emotional needs of others. While some facial expressions are universal, there can be cultural variations in the interpretation and display of emotions. Cultural norms and context can influence how people express and perceive emotions through facial expressions. Figure I. The proposed system block diagram is given below. This diagram shows how the input is considered and what are steps involved in various blocks we see in the further discussion below.

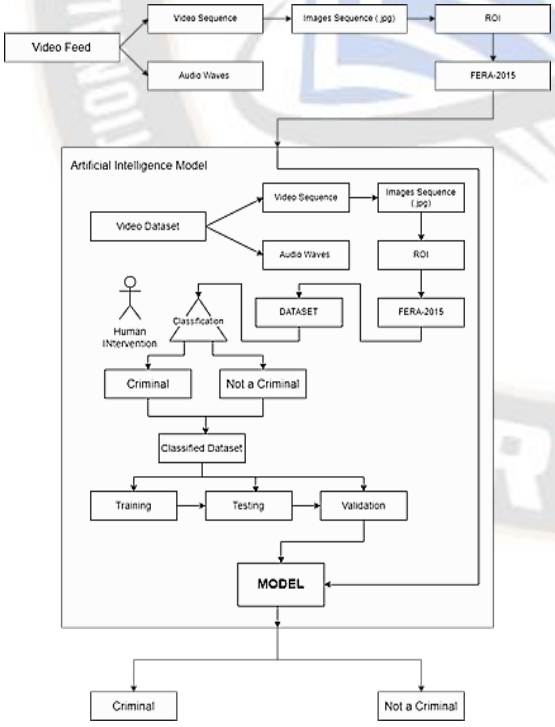

Figure I. The proposed system Block diagram

V. Experimental Result

The program is been developed to extract the landmark coordinates from a live or a recorded video. Their upwards 30 muscles in human face when they Move these landmarks move with them changing the data passed as the parameters to the AI Model [17-22]. Recognizing criminal intent through facial expressions is a complex and controversial topic that intersects psychology, neuroscience, artificial intelligence [37], and the legal system [26-29].

The idea behind this concept is to use facial expressions and other nonverbal cues to predict whether a person has criminal intent or is likely to engage in unlawful behavior. Facial expressions can vary greatly depending on the cultural, social, and contextual factors. What might be considered a suspicious expression in one culture could be perfectly normal in another. This introduces challenges when trying to create a universal model for recognizing criminal intent through facial expressions [30-33].

Advances in technology, including facial recognition software and artificial intelligence, have enabled the development of emotion recognition systems. These systems can analyze facial expressions to detect emotions, with applications in fields like marketing, human-computer interaction, and mental health assessment. While there are common patterns in facial expressions for specific emotions, individual differences exist. Some people may have more expressive faces than others, and personal experiences and temperament can also influence how emotions are expressed. This Figure II. Shown the 255Dots are plotted on important landmarks of the face on my practical test on real-time capturing.

The facial feedback hypothesis suggests that changes in facial expressions can influence emotional experiences. For example, forcing a smile can potentially lead to a more positive emotional state, supporting the idea that there is a bidirectional relationship between facial expressions and emotions. People can also control their facial expressions to some extent to mask or amplify their true emotions. This is known as emotion regulation and is essential for social interactions and maintaining emotional composure in various situations. They often last just a fraction of a second and are difficult to fake. Researchers have studied microexpressions in contexts like deception detection and emotional assessment.

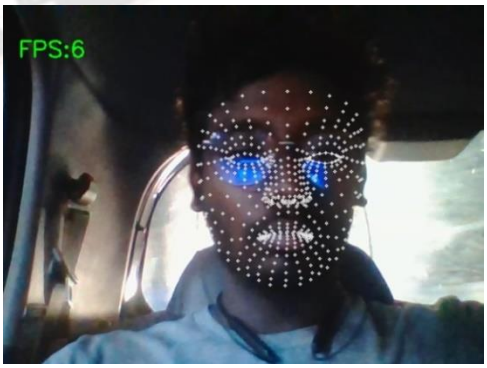

Figure II. 255 Dots are plotted on important

landmarks of the face.

391 211
x: 0.6215530633926392
y: 0.4609089493751526
z: -0.04405107721686363

397 221
x: 0.6208006739616394
y: 0.4478938579559326
z: -0.038247816264629364

397 214
x: 0.6181972622871399
y: 0.41777968406677246
z: -0.00892439391463995

395 200
x: 0.5476052165031433
y: 0.4277660548686981
z: 0.01229078322649002

These are the Example of the dataset collected from the landmarks from the faces the AI has been trained from. This is how the data looks like the "391 211" labeling the landmark and the xyz marking the landmarks' coordinates [16].

VI. Future Enhancements

In future the system can be improved by using the audio of the interrogation recording to determine the emotions in it and use to further identify the emotions and distinguish the criminality in the person. When both the Video and Audio are used to make decision the probability of getting a near to accurate result [23- 25]. Deploying systems to recognize criminal intent based on facial expressions raises numerous legal and privacy concerns. It touches on issues of personal freedom, surveillance, and the presumption of innocence until proven guilty. There would likely be considerable legal and ethical hurdles to overcome before implementing such a system in a real-world setting [34-36].

VII. Conclusion

Ever wondered how our phones differentiate between different radios waves it's been bombarded with? How they find the difference between Wifi signal and other signals. This made possible by Fast Fourier Transform. It was published by James Cooley and John Turkey in the year 1965 but FFT can be traced back to the year 1805, Carl Friedrich Gauss's unpublished work. He was trying to interpolate the orbits of two asteroids so he developed this method.

The Famous Naive Bayes Algorithm. Naive Bayes never knew his algorithm would have the ability to make a revolution in the Field of Probabilistic Reasoning. The algorithm was hidden way in his book. He thought it was a unnecessary invention and he never took the initiative to publish it. His friend after his death went through his books and found out the Naïve Bayes Algorithm and publishes it.

We'll never know when what can change and what can be used. As of now even the proof developed by the polygraph (Lie Detector) is used only in certain countries in the process of investigation. Everything in the judiciary wing comes under the concept of human ethics.

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