EMOTION RECOGNITION USING AI & THE CONCERNS REGARDING IT

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Abstract: Emotional artificial intelligence, or emotion AI, is a technology that is capable of reading, imitating, interpreting, and responding to human facial expressions and emotions.[1] Emotion recognition and differentiation has always been an innate capacity in humans. Facial emotions are caused by the movement of muscles in the face that link to the skin and fascia. Visual emotion analysis holds promise because understanding human emotions is a critical step toward powerful artificial intelligence. Despite the advantages of AI-assisted emotional recognition, there are significant drawbacks. The purpose of this research is to briefly explain how this emerging technology is affecting a variety of things in our lives and to discuss some concerns and regulations regarding its use and misuse.

Keywords: artificial intelligence, emotion

1. INTRODUCTION

Humans' emotions are incredibly significant in their daily existence. They are the most accurate measures of human socialization capacity. They have an impact on how we think, act, and communicate with others. Emotion recognition and differentiation has always been an innate capacity in humans.

Consider how much a person can communicate with just a face expression. A grin can be used to express acceptance or enjoyment. A frown can convey displeasure or dissatisfaction. Our facial expressions might sometimes convey our genuine sentiments about a subject. While you may claim that you are alright, the expression on your face may suggest otherwise.

The process of detecting human emotions from facial expressions is known as emotion recognition. The human brain perceives emotions instinctively, and many softwares that can recognize emotions have recently been developed. By learning what each facial expression signifies and applying that knowledge to fresh information, AI can recognize emotions. This technology is improving all the time, and it will soon be able to sense emotions as accurately as our brains.

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2. APPLICATIONS IN REAL WORLD

Emotion recognition is utilized for a variety of purposes in real world. For example, instead of filling out a long survey on how you feel at different points throughout an instructive film or advertising, you may agree to have a camera watch your face and listen to what you say, and mark when you display expressions like boredom, curiosity, perplexity, or smiling. (This does not imply that it can read your innermost thoughts; it just reads what you say out loud.)

A patent filed by Snapchat in 2015 describes a method of extracting data about crowds at public events by performing algorithmic emotion recognition on users' geotagged selfies.[2]

Emotient was a startup company which applied emotion recognition to reading frowns, smiles, and other expressions on faces, namely artificial intelligence to predict "attitudes and actions based on facial expressions". Apple bought Emotient in 2016 and uses emotion recognition technology to enhance the emotional intelligence of its products.[3]

Many products exist to aggregate information from online emotions, such as "like" button presses and counts of positive and negative phrases in text, and affect recognition is increasingly used in some types of games and virtual reality, both for educational purposes and to give players more natural control over their social avatars.

It has already begun to infiltrate public areas. Lincolnshire police in the United Kingdom have obtained funds to utilise emotion recognition technology to identify suspicious persons, and cameras were once installed in London's Piccadilly Circus to analyse people's emotional reactions to advertisements on enormous billboards.

3. THE BIOLOGY OF FACIAL EMOTIONS

The human face includes 43 muscles that allow it to extend, lift, and contort into a variety of expressions. Despite this wide range of motion, scientists have long believed that some facial expressions reflect distinct emotions.

One person who pushed this view was Charles Darwin. His 1859 book On the Origin of Species, the result of painstaking fieldwork, was a masterclass in observation. His second most influential work, The Expression of the Emotions in Man and Animals (1872), was more dogmatic.[4] Darwin observed that apes make facial movements that resemble human expressions of emotion, such as disgust or fear, and claimed that the expressions must serve some adaptive purpose.

Curling the lip, wrinkling the nose, and narrowing the eyes, for example, are all disgusting expressions that may have evolved to defend the individual from harmful germs. Only when social behaviours began to emerge did these facial expressions begin to take on a more communicative role.

Fig: Darwin's treatise on emotions featured plenty of posed expressions, such as these subjects doing their best to imitate grief.[4]

Human social communication relies heavily on facial expressions. They are caused by the movement of muscles in the face that link to the skin and fascia. These muscles move the skin, forming creases and folds and moving facial features like the mouth and brows.

The amygdala plays an important role in facial recognition. Functional imaging studies have found that when shown pictures of faces, there is a large increase in the activity of the amygdala. The amygdala receives visual information from the thalamus via the subcortical pathways.[5] The amygdala may also play an important role in recognizing fear and unpleasant emotions. The insula and basal ganglia are thought to be activated when the emotion disgust is detected. The occipitotemporal neocortex, orbitofrontal cortex, and right frontoparietal cortices may also be used in emotion recognition.

HOW AI ANALYSIS WORKS

Emotion recognition is the process of machines analyzing, interpreting, and classifying human emotion based on face traits.

Visual Emotion Analysis (VEA) is one of the most difficult high-level vision tasks because of the affective gap between low-level pixels and high-level emotions. Despite the odds, visual emotion analysis holds promise because understanding human emotions is a critical step toward powerful artificial intelligence. Deep learning became the new method of choice for emotion analysis tasks after the rapid development of Convolutional Neural Networks (CNNs).

What is AI-Emotion Analysis and how does it work?

An AI emotion application or vision system contains the following processes at a high level:

Step 1: Take a picture frame from a live camera feed (IP, CCTV, USB camera).

Step 2: Pre-processing of the image is the second step (cropping, resizing, rotating, colour correction).

Step 3: Using a CNN model, extract the key features.

Step 4: Analyze your emotions and classify them.

The three successive phases that AI uses to recognise emotions are as follows:

1. Image and Video Frame Face Detection

The video from a camera is used to detect and locate the human face in the first stage. In real-time, the bounding box coordinate is utilised to identify the actual face location. Face detection is still a difficult operation, and it's not guaranteed that all faces in a given input image will be detected, especially in uncontrolled contexts with difficult lighting conditions, diverse head postures, huge distances, or occlusion.

2. Image Preparation

The image data is optimised once the faces are discovered before being sent into the emotion classifier. This step enhances the detection accuracy significantly. Image preprocessing typically contains many substeps to normalise the image for changes in lighting, decrease noise, smooth the image, correct image rotation, resize the image, and crop the image.

3. AI Model for Emotion Classification

The relevant features are extracted from the pre-processed data including the detected faces after pre-processing. There are a variety of methods for detecting a variety of face traits. For instance, Action Units (AU), facial landmark movements, distances between landmarks, gradient characteristics, facial texture, and so on. Support Machine Vectors (SVM) or Convolutional Neural Networks are the most common classifiers used in AI emotion recognition (CNN). Finally, a pre-defined class (label) such as "glad" or "neutral" is assigned to the detected human face based on facial expression.

Stimuli-aware emotion detection surpasses state-of-the-art algorithms on visual emotion datasets, according to the most recent Visual Emotion Analysis research from 2021. The approach recognises a wide range of emotional cues (such as colour, object, and face) that can elicit a variety of feelings (positive or negative).

While the approach is similar to the WSCNet in terms of complexity and CPU resources, it yields somewhat higher accuracy on the FI dataset (72 percent accuracy). The method analyses colour, recognised objects, and face emotion in photos using psychology theory to detect external elements and inputs. As a result, an effective image is assessed as a collection of emotional inputs that can then be utilised to anticipate emotions.[6]

4. DRAWBACKS OF AI-ASSISTED EMOTION RECOGNITION

Despite the advantages of AI-assisted emotional recognition, there are significant drawbacks

Face recognition isn't the only way for tech corporations to identify you; they also want to use AI to sense your

emotions. Many scientists, however, believe that claims about computers' ability to grasp emotion are fundamentally wrong, and a little in-browser web game developed by University of Cambridge researchers seeks to demonstrate why.

You can see how your emotions are "read" by your computer via your camera at emojify.info[7]. The game will ask you to express six different emotions (joy, sadness, fear, surprise, disgust, and rage), which the AI will try to recognise. However, you'll undoubtedly discover that the software's readings are inaccurate, with even exaggerated expressions being misinterpreted as "neutral." Even if you do manage to fool your computer into thinking you're pleased, you'll realise it's all a ruse.

According to Alexa Hagerty[7], founder of the site and a researcher at the University of Cambridge's Leverhulme Centre for the Future of Intelligence and the Centre for the Study of Existential Risk: to show that the core concept of much emotion identification technology, that facial movements are inextricably related to changes in emotions, is faulty.These technologies are based on the idea that our faces and bodies can be tracked.

" The Verge quotes Hagerty. "I'm delighted if I grin." I'm upset if I frown. However, in 2019, the American Psychological Association conducted a large evaluation of the material and concluded that "people's emotional space cannot be easily deduced from their facial movements." "You have a chance to move your face quickly to imitate six various emotions in the game," Hagerty explains, "but the key is you didn't inwardly feel six distinct things one after the other in a sequence."

Despite these issues, firms are proposing that emotion recognition technology may be used to screen job prospects (giving them a "employability score"), detect would-be terrorists, and determine whether commercial drivers are sleepy or drowsy.

CONCERNS REGARDING THE MISUSE OF THE TECHNOLOGY

During the pandemic, tech companies promoted their emotion-recognition software as a way to remotely monitor workers and even children. Take, for example, the 4 Little Trees system.[4] The application, which was created in Hong Kong, purports to analyse children's emotions while they work in class. It categorises each pupil's emotional state based on facial traits, such as happiness, sadness, rage, disgust, surprise, and fear. It also predicts grades and measures'motivation.' Similar systems have been advertised to help distant workers with surveillance. By 2026, the emotion-recognition sector is expected to be worth US$37 billion, according to one estimate.[4]

The usage and misuse of these technologies is causing increasing scientific concern. Rosalind Picard, who co-founded the Boston-based artificial intelligence (AI) start-up Affectiva and leads the Massachusetts Institute of Technology's Affective Computing Research Group,[4] said last year that she supported regulation. Scholars have advocated for a comprehensive audit of all AI technologies used in recruiting, as well as public publication of the results. An independent, legal authority should oversee the development and implementation of biometric technology, according to a citizen's panel organised by the Ada Lovelace Institute in London in March (see go.nature.com/3cejmtk). Such oversight is necessary to defend against systems motivated by the phrenological urge, which involves making erroneous assumptions about a person's internal states and capabilities based on their exterior appearances in order to learn more about them than they choose to reveal.

Around the world, laws are in place to ensure scientific rigour in the development of medications that treat the human body. At the very least, tools that make claims about our thinking should be given the same level of protection. Scholars have long advocated for federal agencies to oversee robotics and facial recognition, and this should include emotion recognition as well. National regulatory bodies must be vigilant about unproven apps, particularly those aimed at children and other vulnerable groups.

Clinical trial lessons demonstrate the importance of regulation. Many more clinical-trial data are now available to the public and subject to rigorous verification thanks to federal requirements and subsequent advocacy. Better policymaking and public trust are built on this foundation. Affective technology regulation would provide equal benefits and accountability. It could also aid in the establishment of rules to prevent corporate and government overreach.

INEFFECTIVENESS

Of doubt, humans make mistakes when reading people's emotions on their faces, but delegating this task to machines has its own set of drawbacks. For one thing, machines can't interpret other social cues as well as humans can (as the wink/blink dichotomy demonstrates). Machines can also make automated choices that people cannot contest, and they can conduct mass monitoring without our knowledge. Emotion detection AI, like facial recognition algorithms, is sometimes racially biassed, judging the faces of Black people as expressing negative emotions more frequently, for example.[7] All of these issues combine to make AI emotion recognition far more problematic than humans' capacity to read others' emotions.

"There are numerous dangers," Hagerty warns. "When it comes to human miscommunication, we have a lot of alternatives for dealing with it. Those alternatives are gone if you automate something or the reading is done without your knowledge or extent."[7]

5. CONCLUSION

In today's world, Instead of interacting face to face, we send chat and messages or arrange video calls. But what if the technology that sometimes hampers our communication could actually help to optimize it?

Emotion AI, according to futurologists and trend analysts, will be able to accomplish just that in the future.[8]

The purpose of this research was to show emotion AI will affect a variety of things in the future in various ways. Based on the analysis conveyed, it can be concluded that there are multiple features and enhancements that need to be

implemented in emotion AI detection in order to overcome some of its shortcomings.

Sentiment analysis and emotion detection are critical tasks in the development of empathic systems and human-computer interactions that are based on user emotion. Real-time inference of emotion detection systems, on the other hand, permits large-scale solutions to be implemented.[6]

Emotion AI is therefore, one such emerging field in technological world that has changed a number of things such as Chatbots, Video gaming, Education, Detecting mental stress, etc.

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