

EXPLORING EMOTION DETECTION: A BRANCH OF AI

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Abstract: A machine that can think like humans is called AI. The term AI may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving. Emotion AI is a branch of AI that has been rapidly growing, allowing for the program to determine whether or not someone is feeling enthusiastic, upset or otherwise based on their nonverbal cues - such as tone of voice and facial expressions.

Keywords: Artificial Intelligence, Emotion Detection

1. INTRODUCTION

AI emotional recognition is a significant field of computer vision research that involves facial emotion detection and the automatic assessment of sentiment from visual data. Human-machine interaction is an important area for research in artificially intelligent systems with visual perception, who aim to understand human interactions. [1]

It is important to analyze a human's emotions, and Emotion AI is one of the AI's that is allowing computers to do this. Using visual gestures and voice tones, an individual's emotion status can be determined through facial expression, gestures, and tone. [1]

Computer programs have trouble recognizing sentiments, but their ability to understand human emotions is critical in developing strong artificial intelligence. Visual Emotion Analysis is one of the most challenging tasks for current computers, and as a result, shallow machine learning methods are still being researched for use in some cases. The rapid development of neural networks has led to deep learning becoming the new method of choice for emotion analysis tasks. [1]

The technology of facial emotion recognition software has grown and evolved over the past years. Currently, this type of software is used to decipher the expressions on a human face. This program functions like a human brain by analyzing expression and features. [2]

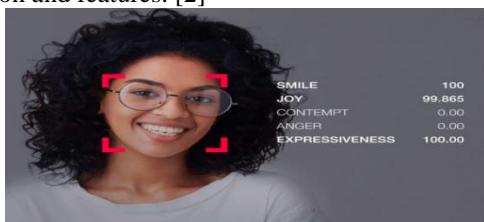


Fig 1. Emotion Detection

Artificial Intelligence (AI) has been designed to detect different facial expressions, which are then used with additional information for a variety of purposes such as investigation and interviews. It is therefore important for authorities to detect the emotion of a person via technology. [2]

Emotion can be defined as a strong feeling about a situation and is expressed with facial expressions. Different emotions are divided into six types: Love, Joy, Anger, Sadness, Fear, and Surprise. [2]

Human emotion recognition is artificial intelligence related to facial recognition that attempts to identify how a human subject is feeling. Facial expressions, heart rate, and brain activity are all indicators. [2]

2. GROWTH IN FIELD OF EMOTION DETECTION

The interest in facial emotion recognition is on the rise, with new methods and algorithms being introduced. Recent breakthroughs have brought new machine learning advances, resulting in more accurate systems. [3]

In the past different methods have been developed to help deal with this problem. Early traditional methods targeted a solution by designing hand-crafted features manually which, were generated based on psychological and neurological theories. Features included color, texture, emphasis, balance and more. [3]

The early technologies were limited in the type of data that could be processed. They could not process emotional factors and couldn't handle large-scale datasets. With deep learning, the technology is better than traditional computer vision methods. [3]

Deep learning algorithms use neural network models where data is analyzed in the context of functional hierarchy. They are mainly used for image processing tasks and are generally made up of multiple hidden layers. CNNs or convolutional neural networks are the most popular form of artificial neural networks for image processing tasks. [3]

CNN backbones such as AlexNet, VGG-16, and ResNet50 are used to recognize emotions on CNNs. These models were initialized with the parameters on ImageNet and finetuned on FI in order to show good results. [4]

Deep neural networks are now actively being used for visual emotion analysis. Convolutional neural networks are typically used in sentiment detection methods, but other visual elements such as the location and context of the image can also affect how a person feels. [4]

The WSCNet and MldrNet are networks for visual emotion analysis, both based on CNN backbones. The state-of-the-art WSCNet approach uses weak annotations given by global image labels to improve text classification. Sentiment analysis is performed using a sentiment-specific map that couples deep features with the semantic vector classification branch. It outperforms the strides made during this era in text classification. [4]

3. PROCESS OF EMOTION DETECTION

An emotion application or vision system can include the following steps: [5]

Step 1: Get the image frame from a camera feed

Step 2: Image Crop and Resize.

Step 3: Analyze the Emotion using Model or Approach.

Step 4: Categorize emotions

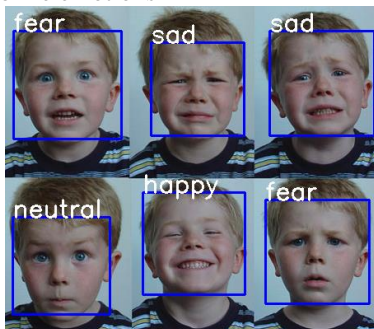


Fig 2. Types of Emotions

The steps in turn involves the following processes:

When using a face detection algorithm, there are different steps. First, the camera is used to detect the human face. The bounding box coordinates indicate the exact face location in real-time. A difficulty with this detection is that not all faces will be detected in a given input image. This can be due to difficult lighting conditions, head poses varying in distance and faces being occluded from the camera. [5]

The data is processed to optimize detection accuracy before it is fed into the emotion classifier. Steps on image preprocessing are often implemented to reduce noise, smoothen the image, and more. [5]

After detection, the machine will extract the relevant facial features. There are a range of different facial features that can be detected, including AU, distances between landmarks, and more. The AI and emotion recognition is usually done through Support Machine Vectors or Convolutional Neural Networks or any other approach. Finally, the classification of human

emotion is assigned by assigning a defined class (label) such as "happy" or "neutral." [6]

It is important to note that most 2D emotion databases cannot handle a non-frontal face. AI trained on those databases show poor performance when varying the head pose. [6]

4. APPLICATIONS OF EMOTION DETECTION

Emotion recognition is an AI technology that can analyze facial expressions to detect what emotion the person is experiencing. This enables deep learning AI algorithms to determine which emotion they are feeling based on how it causes their face muscles to move and contract. Artificial Intelligence can read emotions to help businesses understand what the customer wants or likes. For example, with AI you can tell if your advertising is working or adjust the location experience to better suit the mood of a customer. [7]

There are many ways that emotion recognition can be applied to different situations. For example, it can help you gauge customer mood and ensure growth for your business. This technology can also be used in digital advertising. [7]

- Online Admissions and Interviews: You can measure how candidates react during interviews and optimize the interview structure based on what they like and don't like. The Sightcorps technology can also be used to measure your attention by looking at your orientation and pose. [7]
- Campaign testing: Emotion analysis technology is used to ensure marketing campaigns evoke the desired reaction from viewers. The DeepSight facial recognition software provides insights on ads that receive high engagement and positive emotional responses, thus ensuring only those tweets with a strong impact reach the market. [8]
- Online Education: You can use anonymous emotion detection for adding artificial intelligence to your online education program. You would be able to see how your students react as they go through each module and you could use this feedback to make improvements on your course materials, teaching styles, structure and layout.
- Health Care: With AI-powered recognition software, "health care" can help diagnose patients and prescribe medicine in order to assess emotional responses through clinical trials. It also "helps physicians in deciding how to best triage their patients." [8]
- Video Game Testing: Feedback from users is collected during the testing phase to create a final product that targets desired outcomes. Recognizing emotions in real time with facial emotion recognition may give those using the game a better understanding of their feelings while playing. [9]
- Automotive Industry: Facial emotion detection helps car manufactures develop cars that are safer and more personalized by understanding drivers' emotions. [9]
- General Business: For businesses, Facial Emotion Recognition makes life better by monitoring video feeds and automating video analytics. Deep learning algorithms have shown great promise in this technology, which allows for emotions to be detected with the use of an algorithm.[9]

5. BENEFITS OF EMOTION DETECTION

- Emotion-sensing technology is inherently limited and can only be used in certain applications, like in the medical field. However, it is still a powerful tool - particularly for early detection of conditions such as autism and depression. [10]
- Emotion-sensing technologies can help employees make better decisions, improve their focus and performance, reduce stress, and adopt healthier habits. [10]
- Voice based emotion analysis can help businesses, in particular by listening to the emotions of a customer and adapting according to their emotional state. Voice analysis can also be helpful in analysing and managing stress levels within a company. [10]
- Data from emotion sensors can help companies understand what factors affect their employees and redesign their processes accordingly, so that employees are better engaged in their work.
- The use of wearables can help monitor your mental health by gauging your mood. Sensors in the device measure intent, heart rate and other emotions over time, providing insights on the user's wellbeing. [10]

6. CONCLUSION

This technology will be used in various fields such as medicine, advertising, robotics and virtual reality. Smart devices will use sensors to detect emotion and convert this into data and facts to analyze situations. Every year there are new mood sensor technologies being invented that enable humans to understand their emotions, speech and deep learning.

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