Emotion recognition

Edoardo De Matteis

January 29, 2021

Contents

1 Task and motivations

The goal of this project is developing a facial emotion recognition system, facial emotion recognition [2] is the process of analyzing someone's human state from facial expressions. This is done automatically by the brain but software has been and is developed such that machine could recognize human emotions too. The technology is improving all the time and some are confident it will be able to read emotions as our brains do . Emotion AI has a wide range of uses from scanning for signs of terrorism [9] to emotion judgement for commercial purposes as *Disney* did or at least wanted to do for the release of *Toy Story 5* [5]. All that glitters is not gold and Emotion AI could be a threat to freedom and equality [3], in China *Hanwang Technology* deployed a system that tracks students' behaviour during lessons analyzing if they're keeping attention or their action (e.g. "Answering question") [4]. This software seems to be unefficient and based on pseudoscientific assumptions, these allegations didn't stop *Amazon*, *Microsoft* and *Google* from offering emotion recognition to their customers even though the first two companies claim that their product can't determine a person's internal emotional state from only facial expressions [7].

The ethical dilemma of these technologies can be reduced to the old saying *quis custodiet ipsos custodes?*.

2 Strategy

To recognize emotion first is needed to find a face in an image, at first I considered using LBP histograms but since I was interested only in facial expression's features seemed reasonable to use landmark points. Assuming that similiar expressions have a similiar position on different faces through an SVM classifier it could be possible to predict someone's "emotion" [1]. For our purposes not all points where considered but only ones representing eyes and the mouth, this means only the points from 37 to 68 in figure 2.1. In general to get good results is reccomended to use neural networks [1], anyway I was interested SVM classifiers and how one would perform.

The adopted dataset is the *First Affect-in-the-Wild* (affwild) [6], it consists of 298 videos of which 252 for training and 46 for testing. Only videos in the train set have responses associated to them so I ignored the test set, for each video in which is identified a bounding box are associated the responses. The emotion is definex as a point on a two dimensional cartesian plane where the x axis is the *valence*, it expresses if an emotion is positive or negative, and the y axis is the *arousal*, it discriminates animated emotions from languid ones as can be seen in figure 2.2 where are defined only 4 different emotions but is possible to define more. Considering I wanted to avoid classifying between too many classes - with the risk of performances reduction - and considering also that SVMs in their purest form are binary classifiers, it came natural to me to just consider only response between valence or arousal and I chose valence.

[1] As said earlier someone's emotions are more deep than just their facial expression.

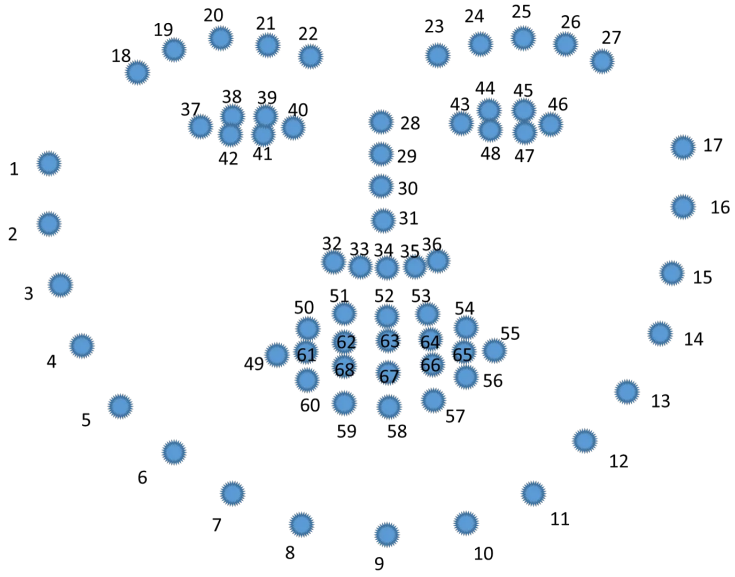

Figure 2.1: Face landmark points from [8].

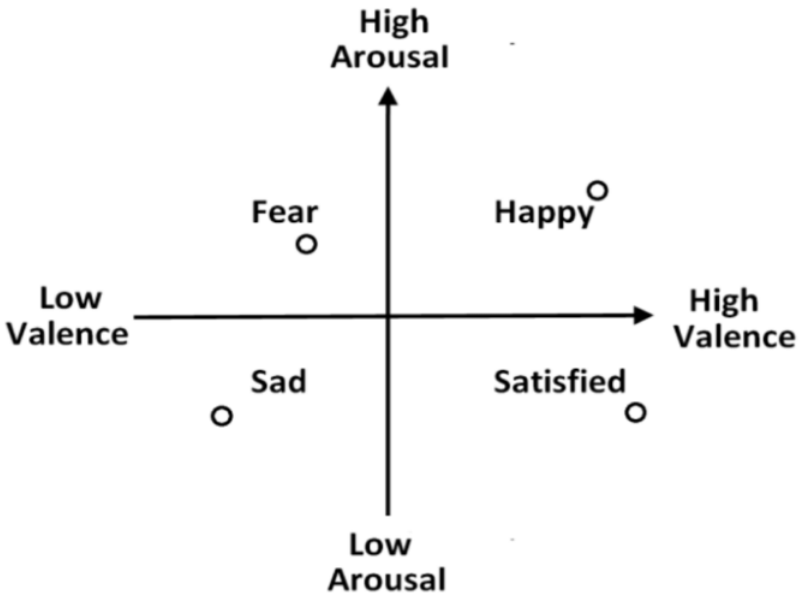

Figure 2.2: Emotion classification model from [10].

3 Design

3.1 Design choices

3.2 Architecture

3.3 External libraries

3.4 Original code

4 Performance evaluation

5 Conclusions

5.1 Future works

References

[1] Bleed AI. Emotion/facial expression recognition with opencv. https://bleedai.com/facial-expression-recognition-emotion-recognition-with-opencv/, 2020.

[2] Algorithmia. Introduction to facial emotion recognition. https://algorithmia.com/blog/introduction-to-emotion-recognition, February 2018.

[3] Article19. Emotion recognition technology: A threat to free speech, equality and privacy. https://www.article19.org/resources/emotion-recognition-technology/, January 2021.

[4] The Disconnect. Camera above the classroom. https://thedisconnect.co/three/camera-above-the-classroom/, 2019.

[5] Gizmodo. Disney is building facial recognition to figure out when you'll laugh during *Toy Story 5*. https://gizmodo.com/disney-is-building-facial-recognition-to-figure-out-whe-1797267294, July 2017.

[6] ibug: Intelligent Behaviour Understanding Group. First affect-in-the-wild challenge. https://ibug.doc.ic.ac.uk/resources/first-affect-wild-challenge/, 2017.

[7] Rest of World. China is home to a growing market for dubious "emotion recognition" technology. https://restofworld.org/2021/chinas-emotion-recognition-tech/, January 2021.

[8] Sefiks. Facial landmarks for face recognition with dlib. https://sefiks.com/2020/11/20/facial-landmarks-for-face-recognition-with-dlib/, November 2020.

[9] Ars Technica. The premature quest for ai-powered facial recognition to simplify screening. https://arstechnica.com/information-technology/2017/06/security-obsessed-wait-but-can-ai-learn-to-spot-the-face-of-a-liar/, February 2017.

[10] Şule Şahaboğlu. A research on the machine learning algorithms' applications on brain data analysis. 06 2019.