Ethics & Bias in AI Coursework

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I. Introduction

In this report, focus on a machine learning task for emotion recognition on human face images. Whilst the concept may not be novel, it is a task which is useful in a variety of applications, such as in marketing, human-robot interactions, healthcare, as well as security [1].

This is a classification task which involves predicting the emotion of a person from an image of their face, and outputting the emotion(s) associated with said image. The range of possible emotions is typically decided by a dataset, and the model is trained to recognize these emotions. We aim to pick a dataset which contains the basic emotions according to Plutchik's wheel of emotions (see Figure 1), which are: joy, trust, fear, surprise, sadness, disgust, anger, and anticipation

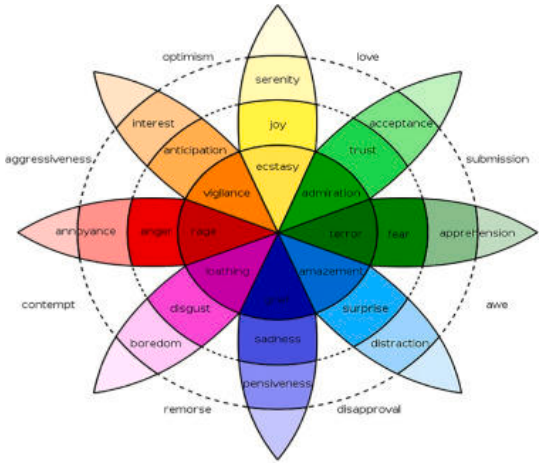

Figure 1: Plutchik's wheel of emotions [2]

Figure 1 contains the aforementioned emotions, as well as their amplified/attenuated versions. We do not use this full range of emotions as it is not practical to train a model to recognize all of them, and because the base emotions are sufficient for most applications.

Once we have decided on the classes, we need to decide on the output format of the model. We will use a softmax layer, which outputs a probability distribution over the classes. This has the benefit of giving more information than a single class output, can be used to calculate a confidence score, and is easily transformed into a positive/negative/neutral output. By choosing this output format, we allow for flexibility in the use of the model, which is crucial for a model that is to be deployed by various organization and/or be made available through open sourcing.

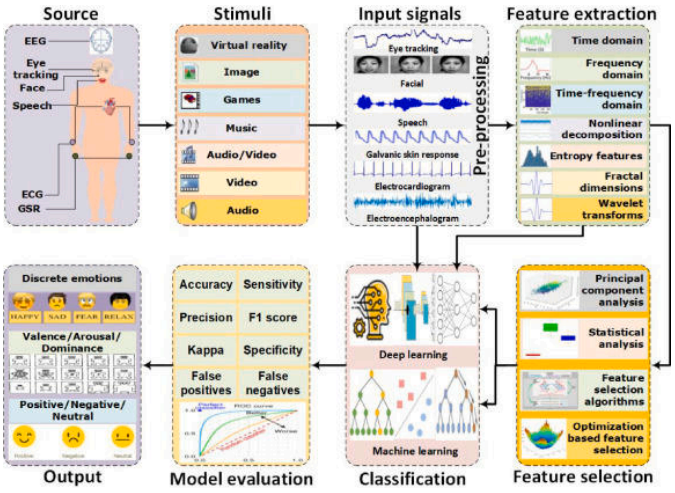

Figure 2: Process of training an emotion recognition model [1]

A potential use case of this model is in a medical clinic where it can be used as a healthcare surveillance system to monitor the mental health of patients. Specifically, the model could be used to detect signs of depression or anxiety in patients, and alert the clinic to administer medicine or provide support. Compared to traditional methods, such as observation from a nurse or doctor, the model could be more accurate, less prone to human error and be more available to patients. Developments in this area can be seen in Marwan Dhuheir's works [3].

II. Paper

Emotions	Counts	% of total

Table 1: Counts of emotions after cleaning

III. Methods

References

[1] S. K. Khare, V. Blanes-Vidal, E. S. Nadimi, and U. R. Acharya, "Emotion recognition and artificial intelligence: A systematic review (2014–2023) and research recommendations". 2024. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1566253523003354

[2] R. Plutchik and H. Kellerman, *Theories of Emotion, Vol. 1*. 2013. [Online]. Available: https://books.google.co.uk/books?id=Ie1GBQAAQBAJ&lpg=PP1&ots=MA0_sk5AGf&lr&pg=PP1#v=onepage&q&f=false

[3] M. Dhuheir, A. Albaseer, E. Baccour, A. Erbad, M. Abdallah, and M. Hamdi, “Emotion Recognition for Healthcare Surveillance Systems Using Neural Networks: A Survey”. 2021. [Online]. Available: https://arxiv.org/abs/2107.05989