MACS 31300

AI in Social Sciences Applications

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Project Sketch

Background:

Although facial expression recognition algorithms have reached high accuracy in the laboratory setting, applying FER technology in a real-world setting is challenging. FER algorithms are constrained by three challenges: illumination variation (different light), head pose (angle of head), and subject independence (different people; Samadiani et al., 2019; Valstar, 2011). Many algorithms only use frontal face images or static face images, which is non-applicable in a real-world setting because of dynamically changing head pose. In Shan et al.'s study (2009), they train the Boosted- Local Binary Patterns (LBP) based SVM model by the Cohn-Kanade database and test it in different databases. The model only achieves around 50% accuracy when testing in different databases, indicating that FER technology is vulnerable to subject independence.

Research Question:

This project aims to classify images into seven categories: anger, disgust, fear, happiness, sadness, surprise and neutral, and test the performance of the trained model to see whether the facial expression recognition algorithms are heavily subject dependent.

Data Source:

The facial expression recognition will be built based on the convolutional neural network (CNN) and trained on 35,887 gray-scale facial expression observations ([dataset link](https://www.kaggle.com/datasets/debanga/facial-expression-recognition-challenge)). The majority of facial expression observations are front-facing static images, and every image is labeled as one of the seven emotional categories. To test the model performance on different dataset, we intend to use facial expression dataset that has more instances and variations. The two public available dataset we can test on is [Extended Cohn-Kanade Dataset (CK+)](https://paperswithcode.com/dataset/ck) and [Google Facial Expression Comparison Dataset](https://research.google/tools/datasets/google-facial-expression/).

Methodological approach:

This project aims to use deep learning, specifically the convolutional neural network (CNN) to train and tune the facial expression recognition model. Compared to traditional machine learning algorithm, we believe the convolutional neural network has better capacity at classifying facial images.

Anticipated results:

We anticipate that our model will have good performance when testing on instances from the same dataset. However, we do anticipate that the accuracy will decrease when testing on different dataset because the differences in resolution (low resolution in training instances vs. high resolution in testing instances) and shot angle (big headshots in training instances vs. portrait photos in testing instances).