Paper Details

Title: Extended deep neural network for facial emotion recognition

Authors: Deepak Kumar Jaina, Pourya Shamsolmoali, Paramjit Sehdevc

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https://www.sciencedirect.com/science/article/pii/S016786551930008X?via%3Dihub

Research Problem

This paper discusses a deep neural network that identifies human emotion through facial expressions. This is extremely interesting because facial recognition from machines is a very useful tool and to be able to identify the emotions of people even for humans can be a hard thing to do, making a computer vision implementation similarly hard.

Data Source

This paper uses the datasets Extended Cohn–Kanade (CK+) and Japanese Female Facial Expression (JAFFE) Dataset, both of which are publicly available.

Method Overview

The method used in this network are as follows. First, the input images were cropped to remove all non-expression features, things like hair and the background. This also ensures that all input images are the same size (128x96). The images were then normalized and then fed into a Deep Convolutional Neural Network. The Deep Convolutional Nerual Network contains 6 convolution layers, 2 deep residual blocks, 3 max-pooling layers, 2 fully connected layers, and 1 classification layer. This outputs one of 6 possible expression classes.

Assumptions

Outline any assumptions made in the paper.

This paper assumes that the most valuable parts of the face for recognition are the forehead, eyebrows, eyes, cheeks, and mouth areas. They also assume that all emotions can be condensed into 6 distinct emotions.

Advantages

Summarize the approach's contributions and strengths.

The performance achieved by the author's model was 95%, which was higher than any previous paper. They found that their approach made the computer model much more likely to learn "subtle features", or features that are hard to spot, or very minor.

Limitations

Describe any shortcomings and proposed future improvements.

This paper is inherently limited by a niche and limited dataset that doesn't fully encompass real world scenarios. Additionally the small datasets from only 10 people introduce bias, where the model performs well on those people and people who look similar to the people who were used in the dataset.

Evaluation

Explain how the authors evaluated their results.

The authors evaluated their results by comparing what the program predicted the emotion to be with the tag that the emotion has. They plotted accuracy and error rates over training epochs. These accuracy and error rates were then compared to other studies that had attempted similar things.

Your Approach

We will begin by attempting to recreate the paper's model and method. Then, we will incorporate a simple attention mechanism to let the network focus on expressive facial regions (eye, mouth, eyebrows). Daniel will try to expand on the paper by using the JAFFE and CK+ datasets and trying to transform them to increase accuracy of emotion detection, in particular testing against an image of himself. Jaron will try to implement a high resolution image training set, to see if it offers and advantage when compared to the other

dataset Daniel is using. He will also test against the same final images as Daniel to see which is better.

Evaluation Metrics

We will evaluate our results using the same metric as the original paper. We will plot accuracy and error rates over training epochs. We will then compare these accuracy and error rates to the same studies that the original paper compares to. We will use a confusion matrix to evaluate accuracy.

Timeline

Provide a weekly schedule:
• Week 1: November 15 – November 21

Recreate Study:

Daniel- Work on expanding the CK+ and JAFFE datsets and creating a CNN.

Jaron- Work on finding a high-resolution dataset and creating a CNN to accept them.

• Week 2: November 22 – November 28

Implement New Method

Daniel- Work on an algorithm to isolate different parts of the face, distort them and train on them.

Jaron- Write a program to take the high-resolution faces, cut out the eyes and mouth and then train the model on those “Frankenstein” images.

• Week 3: November 29 – December 5

Bug fixes and finish working on and improving the code. Create a final presentation.

Daniel- Finish debugging low image resolution model. Compare results with Jaron on similar images to see which model performs better on real world images. Begin working on presentation (focusing on low-resolution images CNN)

Jaron- Finish debugging high image resolution model. Compare results with Daniel on similar images to see which model performs better on real world images. Begin working on presentation (focusing on high-resolution images CNN)

• Wrap up: December 6 – December 7

Finish any last minute errors or issues that arise and present

Daniel- Fix any errors as they arise. Present.

Jaron- Fix any errors as they arise. Present.

Additional Notes

Share any other relevant information.