

# Mapping of human facial expressions to emojis using Deep learning

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**Abstract** - A convolutional neural network (CNN) is used to classify emotion and map emoji to the classified emotion. In this project, I will validate the models by growing a real-time vision machine that accomplishes the responsibilities of face detection, emotion classification, and emoji mapping simultaneously in a single mixed step using the proposed CNN architecture. After presenting the information on the training procedure setup I will maintain to evaluate on standard benchmark sets. I argue that the careful implementation of cutting-edge CNN architectures, using the cutting-edge regularization strategies, and the visualization of previously hidden features are important to reduce the space between slow performances and real-time architectures.

## 1. INTRODUCTION

Nonverbal behavior passes on complete feelings and passionate data, to impart thoughts, oversee connections, and disambiguate importance to enhance the effectiveness of discussions. One method to illustrate nonverbal activities is through sending emoticons, which are practical symbols (e.g.) oversight through the Unicode Consortium which might be distinguished through Unicode characters and introduced through a systems font bundle.

Dwelling inside the era of AI, the entire globe is glad approximately the ability of device mastering (ML) and deep learning (DL). The computer vision (CV) discipline is currently embracing ML and DL strategies. kinds of ML architectures and algorithms had been proposed for addressing a range of CV tasks, like face recognition, object detection, and picture classification then on. Deep learning can be a spinoff of the device getting to know, which applies special architectures of neural networks to supply various missions. There are 3 fundamental classes of mastering: supervised, unsupervised, and reinforcement learning. exclusive genres of getting to know are used for obligations with wonderful objectives, every learning class has its very own applications. In fashionable, supervised gaining knowledge is employed for class and regression associated tasks. On the alternative hand, clustering and dimensionality reduction are two usually used situations. specifically, deep mastering currently is a nation of the art approach for face recognition and item detection<sup>[1]</sup>. Face popularity may be a biometric method that has extensive applications. It quantifies images first, then compares the capabilities of those photograph information attained from pictures to the records saved in the database. The maximum software of this system is facing expression type. To categorize a character's expression, the preliminary painting needed is to search out the face in a complete picture, which utilizes the face reputation or detection techniques<sup>[2]</sup>. This project objectives to construct a deep learning model to categorize facial expressions from the images. Then we are able to map the labeled emotion to an emoji or an avatar.

## 2. LITERATURE SURVEY

Today, the most well-known method of communicate amongst people is digital structures, regardless of whether or not utilizing the internet or phones<sup>[9]</sup>. Online programs and degrees to impart and exchange discussions are utilized by this age. But supplying feelings is tough. accordingly, little and smooth pix, additionally referred to as emoticon characters, are applied to boost emotions when using composed language<sup>[10]</sup>. They want first-rate semantic and passionate highlights, but on the opposite hand are firmly identified with advertising and marketing, regulation, treatment, and numerous exclusive zones. The examination of emoticons has emerged as a noteworthy problem inside the scholastic field, so some and greater researchers from the fields of computing, conversation, advertising and marketing, behavioral technological know-how, and so on. are thinking about them<sup>[3]</sup>. Emoticon characters are springing up to be increasingly promoted hence the range of these characters has extended. Be that due to the fact it is able to, the existing emoticon characters are restricted to predetermined characters. additionally, those characters require intricacy and range. To personalize emoticon characters, this examination investigated strategies for customers to "emojify " their snapshots. This has a look at no longer simply permitting individuals to shape altered and terrific techniques of imparting emotions, yet moreover makes the justification for extra improvements of emoticon characters. it's roused by discoveries from the literature: that a necessary potential of emoticons is to talk emotions, which maximum emoticons applied are face emoticons. Cramer tracked down that 60% of their dissected messages via US participants had been emoticons applied for speaking feelings. In an Instagram emoticon take a look at, faces represented 6 of the maximum 10 emoticons utilized, giving additional evidence that people as regularly as feasible use emoticons to speak feelings. moreover, as indicated by a 2015

SwiftKey record, faces represented close to 60% of emoticon use in their examination of billions of messages. At last, in a completely subjective document from Lee on emoji decal usage, they tracked down that those stickers had been utilized essentially for speaking feelings.

### 3. PROPOSED SYSTEM

#### 3.1 Details of Hardware & Software

Hardware Requirements:

Laptop (32-bit or 64-bit architecture, 2+ GHz CPU, 4 GB RAM.), Camera (8MP & above)

Software Requirements:

- Operating System: Windows 7/8/8.1/10, Linux
- Tools and Framework: OpenCV, Tensor flow
- Language Requirement: Python

Technology Used:

Image pre-processing, TensorFlow, Keras, OpenCV and Google Collab, Deep Learning, Image Processing.

#### 3.2 Analysis/Framework/Algorithm

Tensorflow

TensorFlow can be a combination of free and open-source learning software. It should be applied to all various responsibilities yet include selective learning recognition and supervision of deep neural networks. TensorFlow may be a mathematical library-based entirely on data flow and segmentation. It is the fastest way and the only way to try to create a reputation for your computer or laptop without a GPU because it is just an API and your CPU is good enough for this. TensorFlow offers the opportunity to convert a pre-skilled version to new record-breaking training.

Create Training Data

In preparation for school information we visit take video with a web camera with the use of an anaconda and OpenCV and imutils and force the HAAR cascade classifier and create a set of photographic data with the help of using shooting emotional frames as a facial expression. . Another opportunity to download photos from Kaggle that have already described the emotional

database, including the FER2013 data set.

OpenCV

OpenCV(Open Source Computer Vision Library) is a thought-provoking and knowledgeable computer source and software that travels to integrate software integration. OpenCV is designed to provide a common infrastructure environment for intelligent and intelligent computer programs and to spice up the use of system vision in business products<sup>[7]</sup>. As a certified BSD product, OpenCV makes it smooth for organizations to make use of and edit code. Supports C ++, Python, Java, Android SDK, etc. The library has more than 2500 advanced algorithms, containing a set of all the traditional and modern laptops as well as a science and program that accesses algorithms.

### 3.3 Design Details

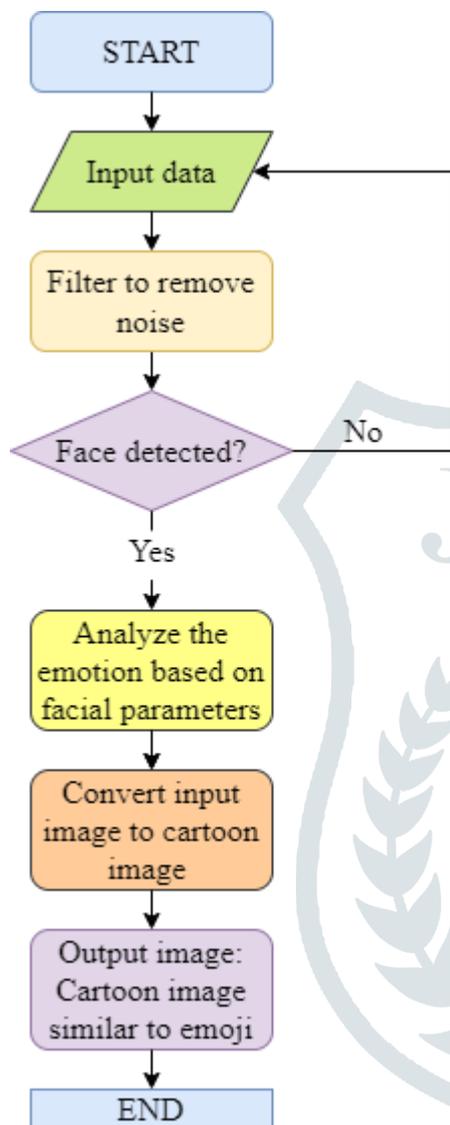


Fig -1: Flowchart

### 3.4 Steps followed by the proposed system

Step 1: Input the dataset

Below are sample images from the FER 2013 dataset that are used to classify emotions. These Images are categorized based on the emotion shown in the facial expressions such as happiness, neutral, sadness, anger, surprise, disgust, fear.



Fig -2: Sample dataset of emotion "happy"

Step 2: Data pre-processing and applying augmentation Strategies.

Image data augmentation is used to expand the training dataset in order to improve the performance and ability of the model to generalize. Images are rescaled from  $[0,255]$  to  $[0,1]$  using the ImageDataGenerator python module. Benefits of this are:

- It treats all images in the same manner: some images are high pixel range while some are low pixel range. The images are all sharing the same model, weights and learning rate. The high range image tends to create stronger loss while low range creates weak loss and the sum of

them will all contribute to the back propagation update.

- Using typical learning rate: When we reference the learning rate from other's work, we can reference their learning rate directly if both works do the scaling preprocessing over images data set. Otherwise, higher pixel range image results in higher loss and should use a smaller learning rate, lower pixel range image will need a larger learning rate.

Step 3: Neural Network architecture.

After pre-processing the database, the next step is to build a convolutional neural network. The convolution layer consists of input layers, hidden layers, and output layers. Depending on the structure of the neural network add convolutional layers with filters [8].

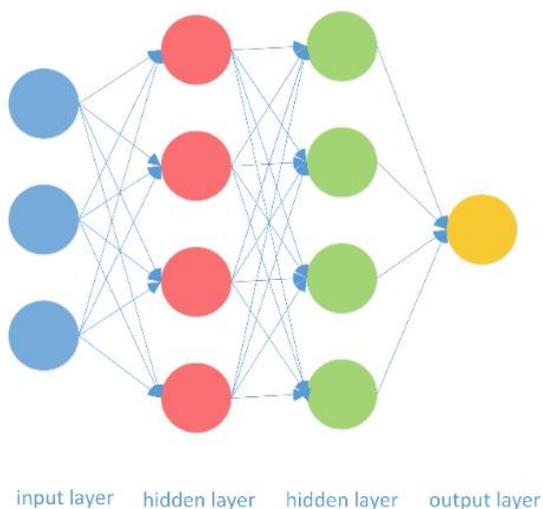


Fig -3: Convolutional Neural Network.

### 3.5 Output of the Implemented Model.

Below is the real time result of the implemented model. Model classifies the emotion based on facial expression and maps the emotion to the emoji or avatar.

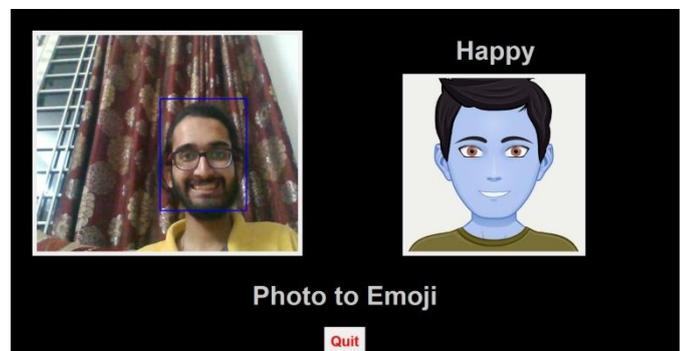


Fig -4: Real-time result of emotion classification.

### 3.6 Future Implementation.

In this project, I was able to detect the emotions and map them to their corresponding emoji. The only limitation which occurred in this project was that the model could not detect the emotions perfectly for the people who have a thick beard or mustache, while it detects perfectly for people without a mustache or a beard. So this is one aspect or area where the model can be improved by using more and more images in the datasets of people having beards.

## 4. CONCLUSION

Emoji are a way of showing meaningless symbols. These symbols have become an integral part of online chat, product reviews, logo ideas, and much more. It also led to the growth of information technology courses dedicated to story-driven emoji. I have built a neural social conviction structure and taught a translation of the database to capture the emotions in images in addition to the development of computer vision and in-depth reading, it is very possible to meet human emotions in images. In this project, I was able to distinguish the face of a person to remove and map the corresponding emoji and achieve a 60-65% accuracy.

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