David Esteban Mendoza

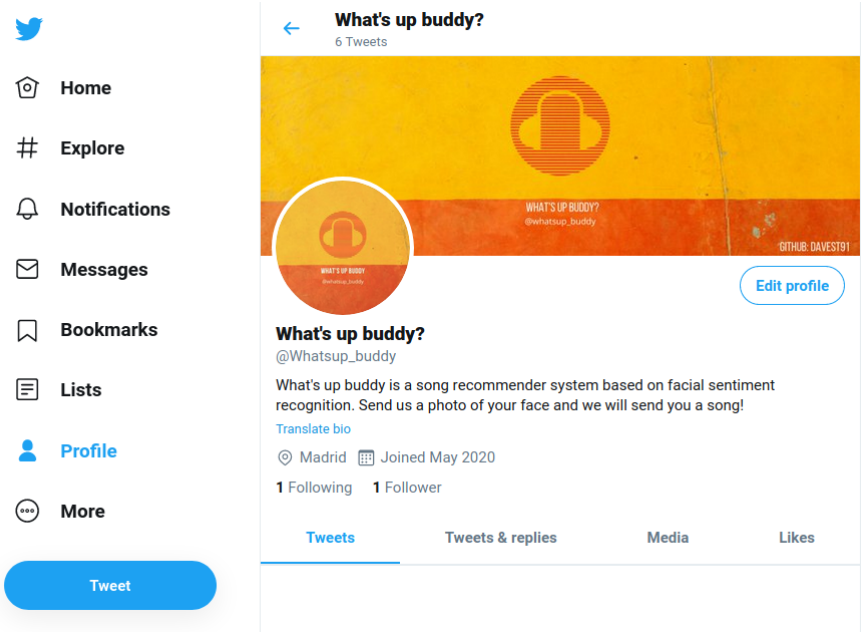
# WHAT'S UP BUDDY?

**A song recommender system based on facial sentiment recognition for Twitter.**

**Upload your pictures mentioning us on @whatsup_buddy !!!**

# What's up buddy?

- Have you ever feel desperated for a song that goes with your mood?
- Are you bored of always listening to the same songs?
- What's up buddy? is a song recommender based on facial sentiment analysis recognition for Twitter



# Toolbox

## Dataset

- FER2013 is an open source dataset shared publicly for a Kaggle competition. This dataset consists of 35.887 grayscale, 48x48 sized face images with various emotions (7 emotions, all labeled).

## Software

- Neural Networks: Keras API for Tensorflow (v 2.3.0).
- Face detection: OpenCV deep learning module (v 4.2.0).
- Song recomendations: Spotipy (Python library for Spotify API) (v 2.20.0).
- Twitter: Tweepy (Python library for Twitter API) (v 3.1.0).

## Hardware

- In cloud computing has been used for faster and higher performance.
- NVIDIA Tesla V100 GPU model was used in Google Cloud.

# Convolutional Neural Networks

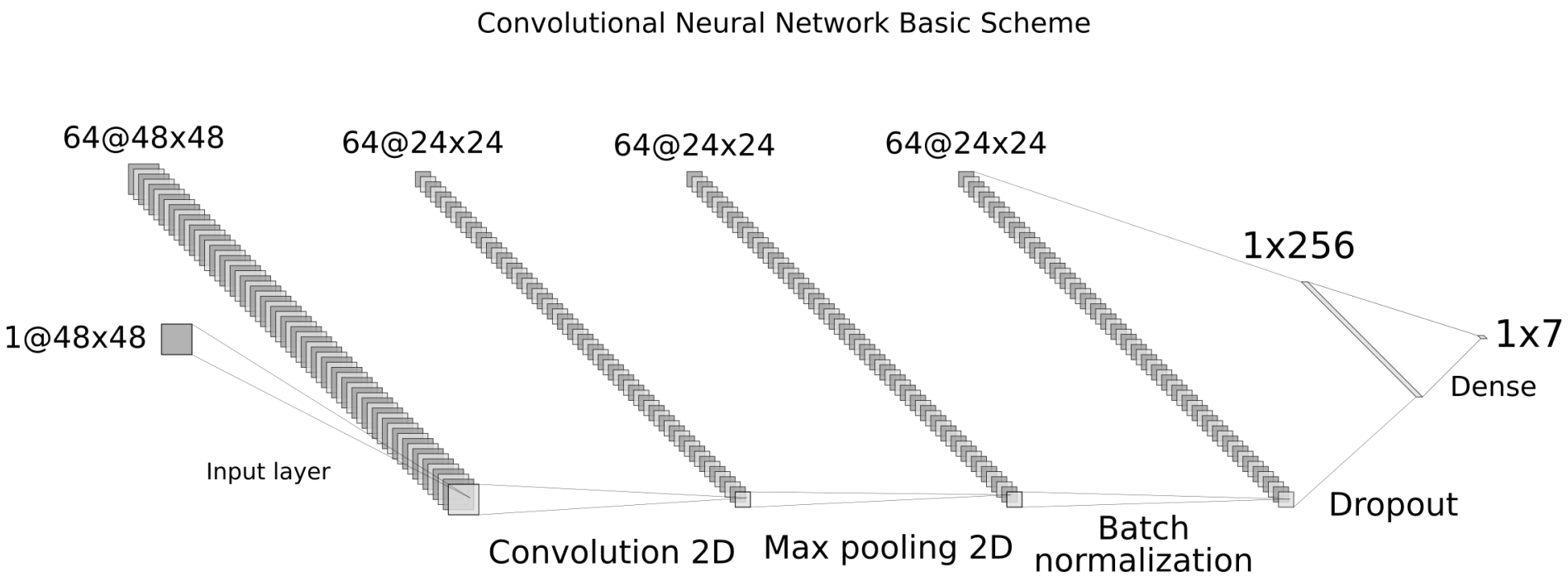
## Definition

- Convolutional Neural Networks are a class of deep neural networks that use convolution instead of standard matrix multiplication in a least one of its layers.
- Convolution is a mathematical operation on two functions (f and g) that produces a third function expressing how the shape of one is modified by the other. It is denoted with the symbol *.

$$(f * g)(t) = \int_{-\infty}^{\infty} f(\tau) g(t - \tau)\, d\tau$$

- Max pooling 2D layers: Downsample the layers by taking the maximum value in the defined pool size window. for each point.
- Batch normalization: Standarize the input for activation functions.
- Dropout: Randomly sets input to 0 with a frequency of the rate parameter at each step of training, which helps prevent overfitting.

# Convolutional Neural Networks




- Final model follows the same scheme of Conv2D layer, MaxPooling and Batch Normalization, but scales the dimensionality space of the convolution up to 1024.

# Data augmentation

- Data augmentation is a technique to artificially create new training data from existing training data. This is done by applying domain-specific techniques to examples from the training data that create new and different training examples.
- Transforms include a range of operations from the field of image manipulation, such as shifts, flips, zooms, and much more.

Figure: Random sample of FER2013 dataset

FER2013 dataset gains lots of variability by applying data augmentation techniques.

# Performance of the model

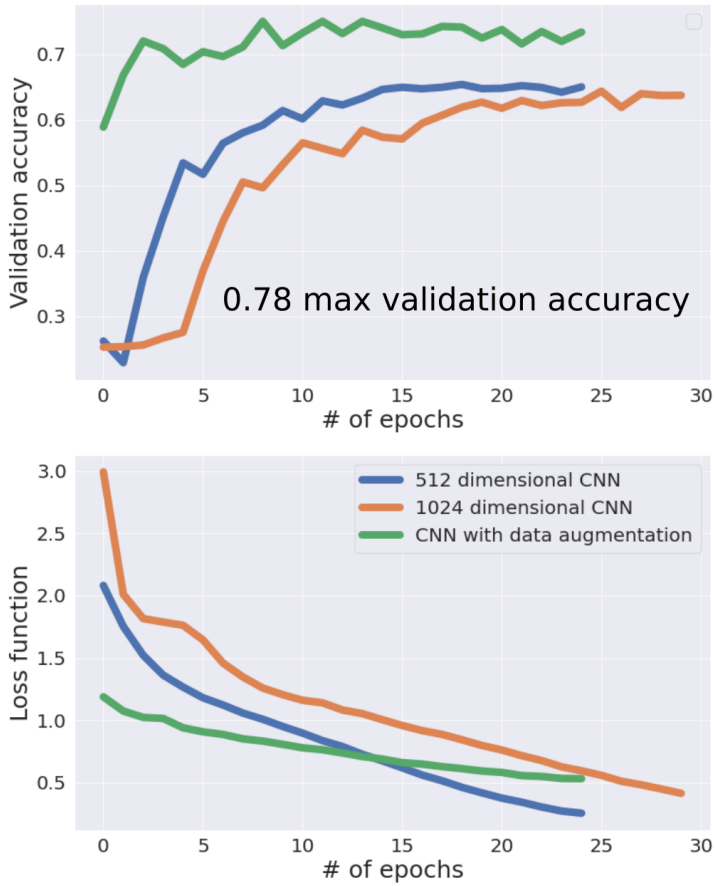



Figure: Performance of different models

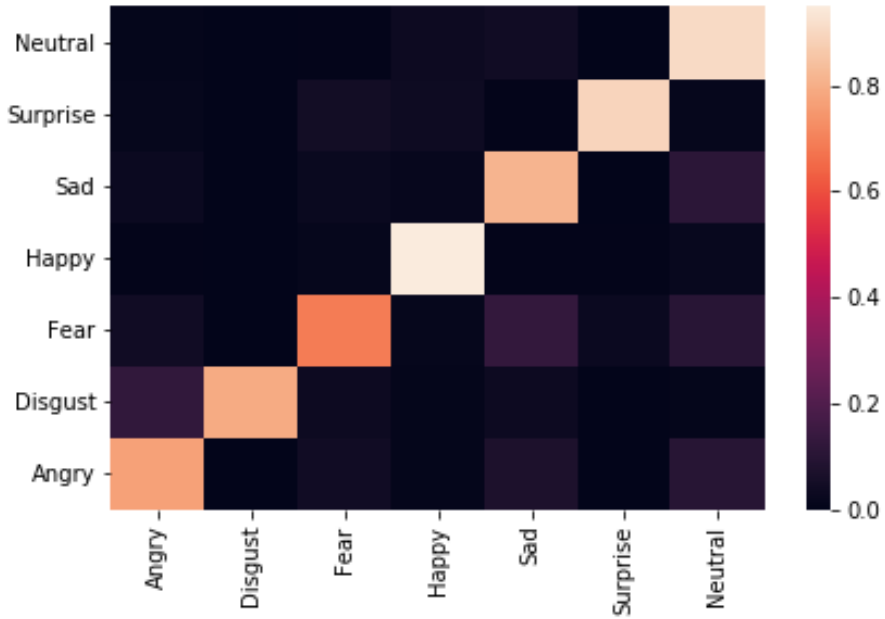



Figure: Confusion matrix of the 1024-dimensional matrix with data augmentation.