Final Project on **Emotion Detector**

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In [1]:
```
from google.colab import files
files.upload()   # upload kaggle.json from your computer
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving kaggle.json to kaggle.json
```

Out[1]:
```
{'kaggle.json': b'{"username":"bushrakhatoon","key":"17a83efd40bfd25d5e5f5157cbde8078"}'}
```

In [2]:
```
!mkdir -p ~/.kaggle
!mv kaggle.json ~/.kaggle/
!chmod 600 ~/.kaggle/kaggle.json
```

In [3]:
```
!pip -q install kaggle
import kaggle
!kaggle --version
```

```
Kaggle API 1.7.4.5
```

In [10]:
```
# Download the file from Kaggle link
# Use the dataset slug from your link
slug = "ananthu017/emotion-detection-fer"

# Choose a target folder
DATA_DIR = "/content/data/emotion_fer"
!mkdir -p "$DATA_DIR"

# Download and unzip (if --unzip fails on some setups, we unzip manually below)
!kaggle datasets download -d $slug -p "$DATA_DIR" --unzip
```

```
Dataset URL: https://www.kaggle.com/datasets/ananthu017/emotion-detection-fer
License(s): CC0-1.0
Downloading emotion-detection-fer.zip to /content/data/emotion_fer
  0% 0.00/65.2M [00:00<?, ?B/s]
100% 65.2M/65.2M [00:00<00:00, 1.21GB/s]
```

In [22]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import os
import glob
import cv2
from PIL import Image
from sklearn.model_selection import train_test_split
import tensorflow as tf
from tensorflow import keras
from keras import Sequential
from keras.layers import Dense, Conv2D, MaxPooling2D, Flatten, Activation, BatchNormalization, Drop
from tensorflow.keras import models, layers
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from sklearn.utils import class_weight
import warnings
warnings.filterwarnings('ignore')
```

In [6]:
```
# Inspect the directory structure
for dirpath, dirnames, filenames in os.walk("/content/data"):
    print(f"Directory: {dirpath}, Files: {len(filenames)}")
```

```
Directory: /content/data, Files: 0
Directory: /content/data/emotion_fer, Files: 0
Directory: /content/data/emotion_fer/test, Files: 0
Directory: /content/data/emotion_fer/test/surprised, Files: 831
Directory: /content/data/emotion_fer/test/disgusted, Files: 111
Directory: /content/data/emotion_fer/test/angry, Files: 958
Directory: /content/data/emotion_fer/test/sad, Files: 1247
Directory: /content/data/emotion_fer/test/fearful, Files: 1024
Directory: /content/data/emotion_fer/test/neutral, Files: 1233
Directory: /content/data/emotion_fer/test/happy, Files: 1774
Directory: /content/data/emotion_fer/train, Files: 0
Directory: /content/data/emotion_fer/train/surprised, Files: 3171
Directory: /content/data/emotion_fer/train/disgusted, Files: 436
Directory: /content/data/emotion_fer/train/angry, Files: 3995
Directory: /content/data/emotion_fer/train/sad, Files: 4830
Directory: /content/data/emotion_fer/train/fearful, Files: 4097
Directory: /content/data/emotion_fer/train/neutral, Files: 4965
Directory: /content/data/emotion_fer/train/happy, Files: 7215
```

In [17]:
```
# Total number of images in train and test folders
total_train_images = sum(train_counts.values())
total_test_images = sum(test_counts.values())

print(f"Total images in train folder: {total_train_images}")
print(f"Total images in test folder: {total_test_images}")
```

```
Total images in train folder: 28709
Total images in test folder: 7178
```

In [15]:
```
# Total number of images for all 7-categories in train and test directories.
train_counts = {}
test_counts = {}

train_dir = os.path.join(DATA_DIR, "train")
test_dir = os.path.join(DATA_DIR, "test")

if os.path.isdir(train_dir):
    for emotion_folder in os.listdir(train_dir):
        emotion_path = os.path.join(train_dir, emotion_folder)
        if os.path.isdir(emotion_path):
            train_counts[emotion_folder] = len(glob.glob(os.path.join(emotion_path, "*")))

if os.path.isdir(test_dir):
    for emotion_folder in os.listdir(test_dir):
        emotion_path = os.path.join(test_dir, emotion_folder)
        if os.path.isdir(emotion_path):
            test_counts[emotion_folder] = len(glob.glob(os.path.join(emotion_path, "*")))

print("Train counts:")
for emotion, count in train_counts.items():
    print(f"{emotion}: {count}")

print("\nTest counts:")
for emotion, count in test_counts.items():
    print(f"{emotion}: {count}")
```

```
Train counts:
surprised: 3171
disgusted: 436
angry: 3995
sad: 4830
fearful: 4097
neutral: 4965
happy: 7215

Test counts:
surprised: 831
disgusted: 111
angry: 958
sad: 1247
fearful: 1024
neutral: 1233
happy: 1774
```

In [13]:

```python
# ✅ Show random images from the emotion_fer dataset
import glob, random, math
from PIL import Image

# 👇 Change this if your dataset lives elsewhere
DATA_DIR = "/content/data/emotion_fer"   # e.g., where you unzipped ananthu017/emotion-detection-fe

# Pick a split folder if it exists; otherwise search the root
base = None
for split in ["train", "validation", "val", "test"]:
    p = os.path.join(DATA_DIR, split)
    if os.path.isdir(p):
        base = p
        break
if base is None:
    base = DATA_DIR  # fallback to root

# Collect image paths
exts = ("*.jpg", "*.jpeg", "*.png", "*.bmp", "*.tif", "*.tiff")
paths = []
# common structure: base/<class>/*.jpg
class_dirs = [d for d in os.listdir(base) if os.path.isdir(os.path.join(base, d))]
if class_dirs:
    for cls in sorted(class_dirs):
        for e in exts:
            paths.extend(glob.glob(os.path.join(base, cls, e)))
# fallback: recursive search (in case the structure is different)
if not paths:
    for e in exts:
        paths.extend(glob.glob(os.path.join(DATA_DIR, "**", e), recursive=True))

if not paths:
    raise FileNotFoundError(f"No images found under {DATA_DIR}. Check your dataset path/folders.")

# Show a class balance snapshot (top 10)
labels = [os.path.basename(os.path.dirname(p)) for p in paths]
class_counts = pd.Series(labels).value_counts().head(10)
display(class_counts.to_frame("images"))
```

	images
happy	7215
neutral	4965
sad	4830
fearful	4097
angry	3995
surprised	3171
disgusted	436

In [18]:
```
# Sample & plot
K = 16  # number of images to show
sample = random.sample(paths, min(K, len(paths)))

cols = 4
rows = math.ceil(len(sample) / cols)
plt.figure(figsize=(cols * 3, rows * 3))
for i, p in enumerate(sample, 1):
    with Image.open(p) as img:
        img = img.convert("RGB")
    plt.subplot(rows, cols, i)
    plt.imshow(img)
    title = os.path.basename(os.path.dirname(p))
    plt.title(title[:16])
    plt.axis("off")
plt.tight_layout()
plt.show()

print(f"Showing {len(sample)} random images from: {base}")
```


```
Showing 16 random images from: /content/data/emotion_fer/train
```

Data preparation for CNN model with Tensorflow

Data generation and data normalization

In [21]:
```
# Using IDG to load images from directory
train_idg = ImageDataGenerator(rescale=1./255, validation_split=0.25)
                                        # 25% validation split for taining
test_idg = ImageDataGenerator(rescale=1./255)

# Specify parameters for data generation
img_size = (100, 100)
batch_size = 64

arg_train = {'target_size': img_size,
             'color_mode': 'grayscale',
             'class_mode' : 'categorical',
             'batch_size': batch_size}
arg_test = {'target_size': img_size,
            'color_mode': 'grayscale',
```

```
            'class_mode' : 'categorical',
            'batch_size': batch_size,
            'shuffle': False}

train = train_idg.flow_from_directory(directory=train_dir, subset='training', **arg_train)
valid = train_idg.flow_from_directory(directory=train_dir, subset='validation', **arg_train)
test  = test_idg.flow_from_directory(directory=test_dir, **arg_test)
```

```
Found 21535 images belonging to 7 classes.
Found 7174 images belonging to 7 classes.
Found 7178 images belonging to 7 classes.
```

In [42]:
```
### Creat CNN Model
model=Sequential()
model.add(Conv2D(32,kernel_size=(3,3),padding='valid',activation='relu',input_shape=(100,100,1)))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,2),strides=2,padding='valid'))

model.add(Conv2D(64,kernel_size=(3,3),padding='valid',activation='relu'))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,2),strides=2,padding='valid'))

model.add(Conv2D(128,kernel_size=(3,3),padding='valid',activation='relu'))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,2),strides=2,padding='valid'))


model.add(Flatten())
```

In [43]:
```
model.add(Dense(128,activation='relu'))
model.add(Dropout(0.1))
model.add(Dense(64,activation='relu'))
model.add(Dropout(0.1))
model.add(Dense(7,activation='softmax')) # Changed activation to softmax
model.summary()
```

```
Model: "sequential_6"
```

Layer (type)	Output Shape	Param #
conv2d_19 (Conv2D)	(None, 98, 98, 32)	320
batch_normalization_19 (BatchNormalization)	(None, 98, 98, 32)	128
max_pooling2d_19 (MaxPooling2D)	(None, 49, 49, 32)	0
conv2d_20 (Conv2D)	(None, 47, 47, 64)	18,496
batch_normalization_20 (BatchNormalization)	(None, 47, 47, 64)	256
max_pooling2d_20 (MaxPooling2D)	(None, 23, 23, 64)	0
conv2d_21 (Conv2D)	(None, 21, 21, 128)	73,856
batch_normalization_21 (BatchNormalization)	(None, 21, 21, 128)	512
max_pooling2d_21 (MaxPooling2D)	(None, 10, 10, 128)	0
flatten_6 (Flatten)	(None, 12800)	0
dense_18 (Dense)	(None, 128)	1,638,528
dropout_12 (Dropout)	(None, 128)	0
dense_19 (Dense)	(None, 64)	8,256
dropout_13 (Dropout)	(None, 64)	0
dense_20 (Dense)	(None, 7)	455

Total params: 1,740,807 (6.64 MB)

Trainable params: 1,740,359 (6.64 MB)

Non-trainable params: 448 (1.75 KB)

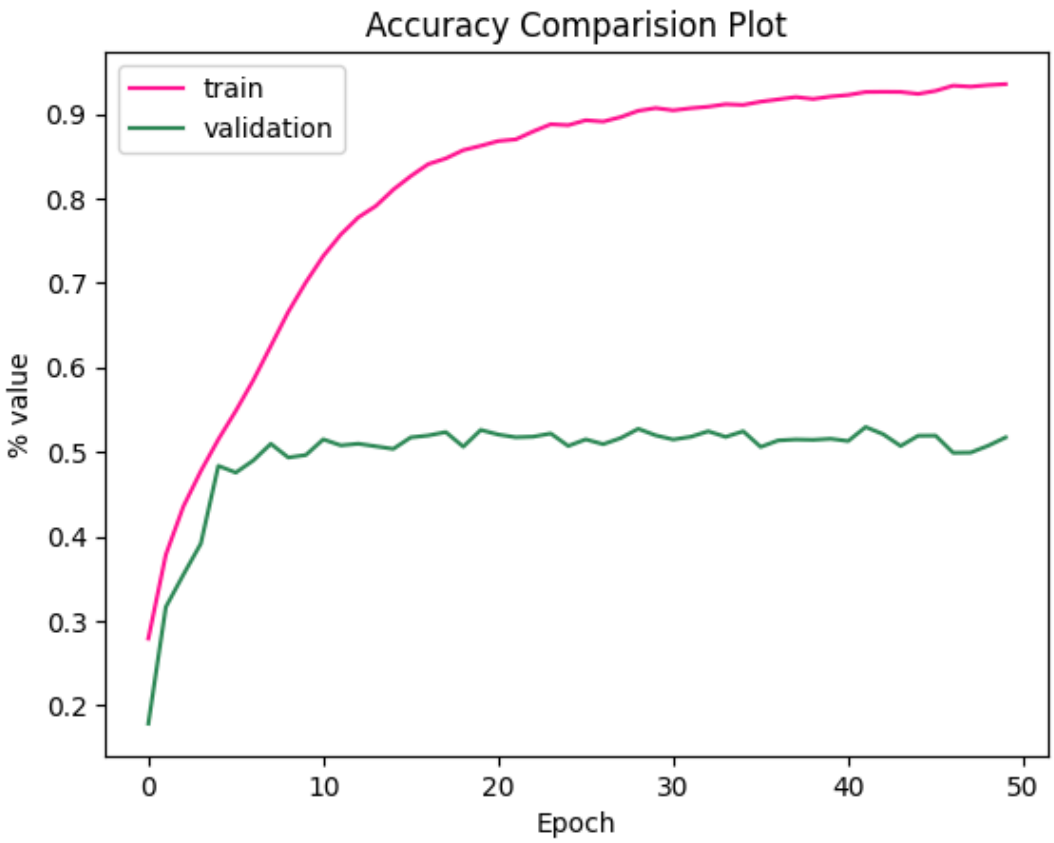
In [44]:
```
### To train the model
model.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])

history=model.fit(train,epochs=50,validation_data=valid)
```

```
Epoch 1/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 27s 58ms/step - accuracy: 0.2387 - loss: 2.1775 - val_accuracy: 0.1781
- val_loss: 4.8952
Epoch 2/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 42ms/step - accuracy: 0.3672 - loss: 1.5993 - val_accuracy: 0.3163
- val_loss: 1.6647
Epoch 3/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 45ms/step - accuracy: 0.4331 - loss: 1.4534 - val_accuracy: 0.3545
- val_loss: 1.6969
Epoch 4/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 49ms/step - accuracy: 0.4727 - loss: 1.3406 - val_accuracy: 0.3914
- val_loss: 1.5253
Epoch 5/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 44ms/step - accuracy: 0.5109 - loss: 1.2656 - val_accuracy: 0.4834
- val_loss: 1.3692
Epoch 6/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 54ms/step - accuracy: 0.5606 - loss: 1.1455 - val_accuracy: 0.4755
- val_loss: 1.3738
Epoch 7/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 42ms/step - accuracy: 0.5876 - loss: 1.0743 - val_accuracy: 0.4898
- val_loss: 1.3684
Epoch 8/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 50ms/step - accuracy: 0.6323 - loss: 0.9636 - val_accuracy: 0.5095
- val_loss: 1.3732
Epoch 9/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 42ms/step - accuracy: 0.6721 - loss: 0.8669 - val_accuracy: 0.4933
- val_loss: 1.4446
Epoch 10/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 54ms/step - accuracy: 0.7080 - loss: 0.7710 - val_accuracy: 0.4962
- val_loss: 1.4794
Epoch 11/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 49ms/step - accuracy: 0.7448 - loss: 0.6882 - val_accuracy: 0.5148
- val_loss: 1.5206
Epoch 12/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 43ms/step - accuracy: 0.7640 - loss: 0.6243 - val_accuracy: 0.5077
- val_loss: 1.5753
Epoch 13/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 21s 46ms/step - accuracy: 0.7833 - loss: 0.5811 - val_accuracy: 0.5096
- val_loss: 1.7648
Epoch 14/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 45ms/step - accuracy: 0.7972 - loss: 0.5419 - val_accuracy: 0.5066
- val_loss: 1.7592
Epoch 15/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 49ms/step - accuracy: 0.8140 - loss: 0.5063 - val_accuracy: 0.5035
- val_loss: 1.7623
Epoch 16/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 49ms/step - accuracy: 0.8330 - loss: 0.4551 - val_accuracy: 0.5171
- val_loss: 1.8615
Epoch 17/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 22s 66ms/step - accuracy: 0.8504 - loss: 0.4152 - val_accuracy: 0.5194
- val_loss: 1.8980
Epoch 18/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 52ms/step - accuracy: 0.8524 - loss: 0.4085 - val_accuracy: 0.5234
- val_loss: 1.9531
Epoch 19/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 19s 55ms/step - accuracy: 0.8634 - loss: 0.3752 - val_accuracy: 0.5061
- val_loss: 1.9956
Epoch 20/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 46ms/step - accuracy: 0.8658 - loss: 0.3751 - val_accuracy: 0.5259
- val_loss: 1.9560
Epoch 21/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 42ms/step - accuracy: 0.8767 - loss: 0.3456 - val_accuracy: 0.5205
- val_loss: 2.1393
Epoch 22/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 15s 45ms/step - accuracy: 0.8724 - loss: 0.3566 - val_accuracy: 0.5173
- val_loss: 2.1757
Epoch 23/50
```

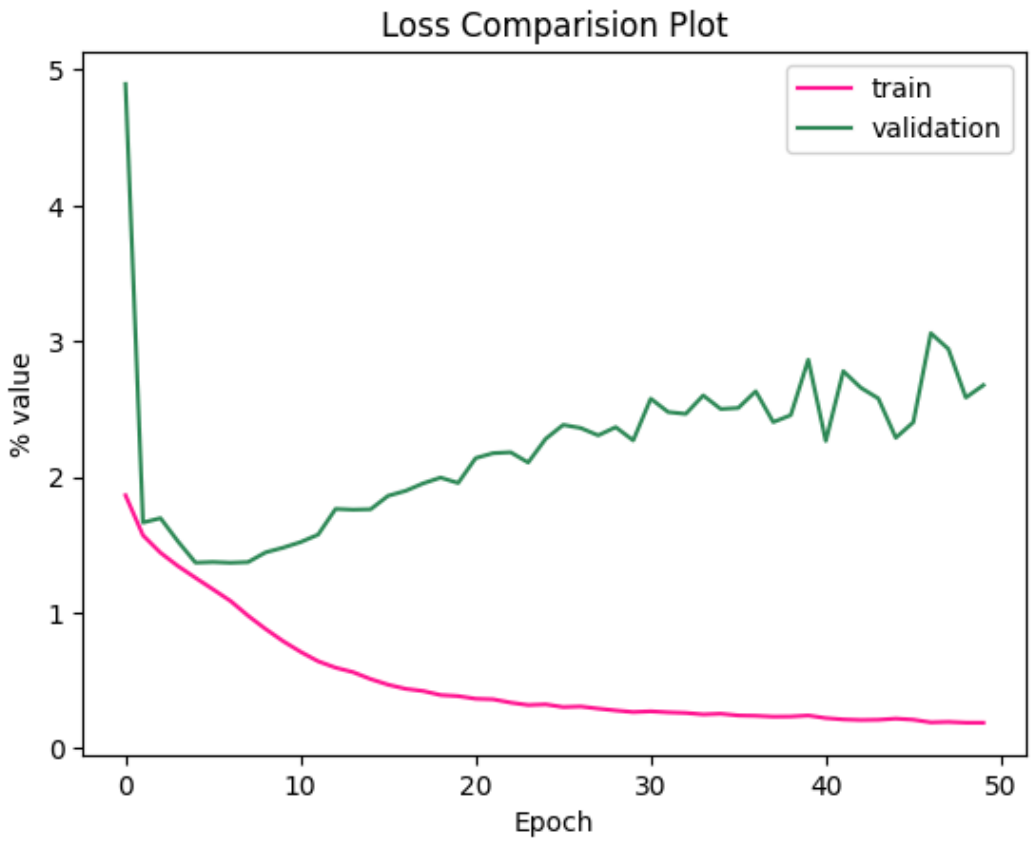
```
337/337 ━━━━━━━━━━━━━━━━━━━━ 20s 45ms/step - accuracy: 0.8789 - loss: 0.3385 - val_accuracy: 0.5180
- val_loss: 2.1820
Epoch 24/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 54ms/step - accuracy: 0.8892 - loss: 0.3176 - val_accuracy: 0.5217
- val_loss: 2.1070
Epoch 25/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 16s 48ms/step - accuracy: 0.8954 - loss: 0.3084 - val_accuracy: 0.5070
- val_loss: 2.2813
Epoch 26/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 21s 63ms/step - accuracy: 0.8944 - loss: 0.3048 - val_accuracy: 0.5148
- val_loss: 2.3842
Epoch 27/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 49ms/step - accuracy: 0.8924 - loss: 0.3041 - val_accuracy: 0.5091
- val_loss: 2.3611
Epoch 28/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 53ms/step - accuracy: 0.8979 - loss: 0.2827 - val_accuracy: 0.5163
- val_loss: 2.3067
Epoch 29/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 53ms/step - accuracy: 0.9057 - loss: 0.2754 - val_accuracy: 0.5273
- val_loss: 2.3673
Epoch 30/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 50ms/step - accuracy: 0.9082 - loss: 0.2697 - val_accuracy: 0.5195
- val_loss: 2.2697
Epoch 31/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 19s 57ms/step - accuracy: 0.9058 - loss: 0.2664 - val_accuracy: 0.5146
- val_loss: 2.5771
Epoch 32/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 16s 49ms/step - accuracy: 0.9105 - loss: 0.2596 - val_accuracy: 0.5178
- val_loss: 2.4784
Epoch 33/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 19s 55ms/step - accuracy: 0.9093 - loss: 0.2615 - val_accuracy: 0.5244
- val_loss: 2.4651
Epoch 34/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 19s 50ms/step - accuracy: 0.9141 - loss: 0.2460 - val_accuracy: 0.5177
- val_loss: 2.6008
Epoch 35/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 53ms/step - accuracy: 0.9153 - loss: 0.2445 - val_accuracy: 0.5244
- val_loss: 2.5011
Epoch 36/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 52ms/step - accuracy: 0.9190 - loss: 0.2270 - val_accuracy: 0.5059
- val_loss: 2.5088
Epoch 37/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 16s 48ms/step - accuracy: 0.9216 - loss: 0.2332 - val_accuracy: 0.5135
- val_loss: 2.6316
Epoch 38/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 19s 55ms/step - accuracy: 0.9207 - loss: 0.2367 - val_accuracy: 0.5146
- val_loss: 2.4045
Epoch 39/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 50ms/step - accuracy: 0.9182 - loss: 0.2387 - val_accuracy: 0.5142
- val_loss: 2.4557
Epoch 40/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 51ms/step - accuracy: 0.9210 - loss: 0.2424 - val_accuracy: 0.5155
- val_loss: 2.8644
Epoch 41/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 53ms/step - accuracy: 0.9260 - loss: 0.2145 - val_accuracy: 0.5128
- val_loss: 2.2657
Epoch 42/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 52ms/step - accuracy: 0.9243 - loss: 0.2157 - val_accuracy: 0.5294
- val_loss: 2.7794
Epoch 43/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 20s 59ms/step - accuracy: 0.9280 - loss: 0.2054 - val_accuracy: 0.5209
- val_loss: 2.6579
Epoch 44/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 51ms/step - accuracy: 0.9261 - loss: 0.2087 - val_accuracy: 0.5070
- val_loss: 2.5789
Epoch 45/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 16s 48ms/step - accuracy: 0.9293 - loss: 0.2076 - val_accuracy: 0.5191
```

```
- val_loss: 2.2895
Epoch 46/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 18s 54ms/step - accuracy: 0.9295 - loss: 0.2159 - val_accuracy: 0.5192
- val_loss: 2.4035
Epoch 47/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 17s 50ms/step - accuracy: 0.9336 - loss: 0.1988 - val_accuracy: 0.4989
- val_loss: 3.0592
Epoch 48/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 43ms/step - accuracy: 0.9360 - loss: 0.1870 - val_accuracy: 0.4992
- val_loss: 2.9436
Epoch 49/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 42ms/step - accuracy: 0.9330 - loss: 0.1968 - val_accuracy: 0.5072
- val_loss: 2.5851
Epoch 50/50
337/337 ━━━━━━━━━━━━━━━━━━━━ 14s 43ms/step - accuracy: 0.9388 - loss: 0.1843 - val_accuracy: 0.5171
- val_loss: 2.6766
```

In [51]:
```
# Accuracy comparison chart
plt.plot(history.history['accuracy'],color='deeppink',label='train')
plt.plot(history.history['val_accuracy'],color='seagreen',label='validation')
plt.title('Accuracy Comparision Plot')
plt.ylabel('% value')
plt.xlabel('Epoch')
plt.legend()
plt.show()
```

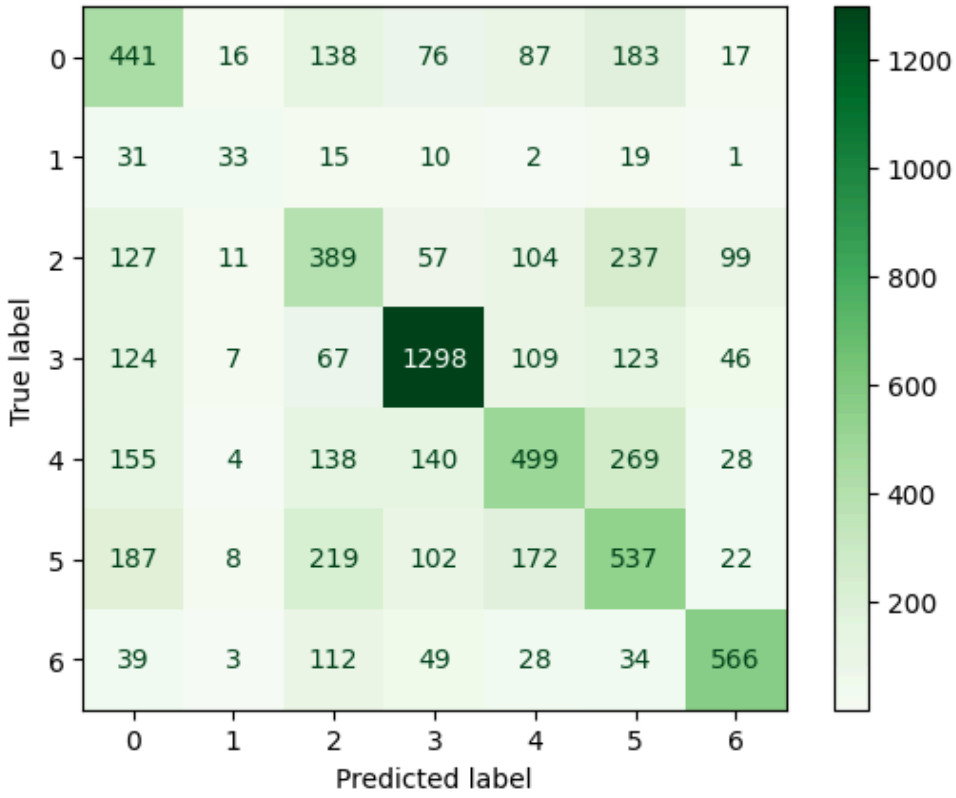


In [52]:
```
# Loss comparison chart
plt.plot(history.history['loss'],color='deeppink',label='train')
plt.plot(history.history['val_loss'],color='seagreen',label='validation')
plt.title('Loss Comparision Plot')
plt.ylabel('% value')
plt.xlabel('Epoch')
plt.legend()
plt.show()
```



In [56]:
```
# Testing and evaluation
from sklearn import metrics # Import metrics module

y_pred = model.predict(test)
y_pred_labels = []
for i in y_pred:
    y_pred_labels.append(np.argmax(i))
y_actual = test.classes[test.index_array]

cm = metrics.confusion_matrix(y_actual, y_pred_labels)
disp = metrics.ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot(cmap=plt.cm.Greens)
plt.show()
```

```
113/113 ━━━━━━━━━━━━━━━━━━━━ 5s 47ms/step
```



In [58]:
```
from sklearn.metrics import classification_report # Import classification_report

print(classification_report(y_actual, y_pred_labels, digits=4))
```

```
              precision    recall  f1-score   support

           0     0.3995    0.4603    0.4277       958
           1     0.4024    0.2973    0.3420       111
           2     0.3609    0.3799    0.3701      1024
           3     0.7494    0.7317    0.7404      1774
           4     0.4985    0.4047    0.4467      1233
           5     0.3830    0.4306    0.4054      1247
           6     0.7266    0.6811    0.7031       831

    accuracy                         0.5242      7178
   macro avg     0.5029    0.4837    0.4908      7178
weighted avg     0.5325    0.5242    0.5267      7178
```

In [152…
```
### Category recognition
train_gen = train_idg.flow_from_directory(
    '/content/data/emotion_fer/train',
    target_size=(100,100),
    batch_size=32,
    class_mode='categorical'
)

print(train_gen.class_indices)
```

```
Found 28709 images belonging to 7 classes.
{'angry': 0, 'disgusted': 1, 'fearful': 2, 'happy': 3, 'neutral': 4, 'sad': 5, 'surprised': 6}
```

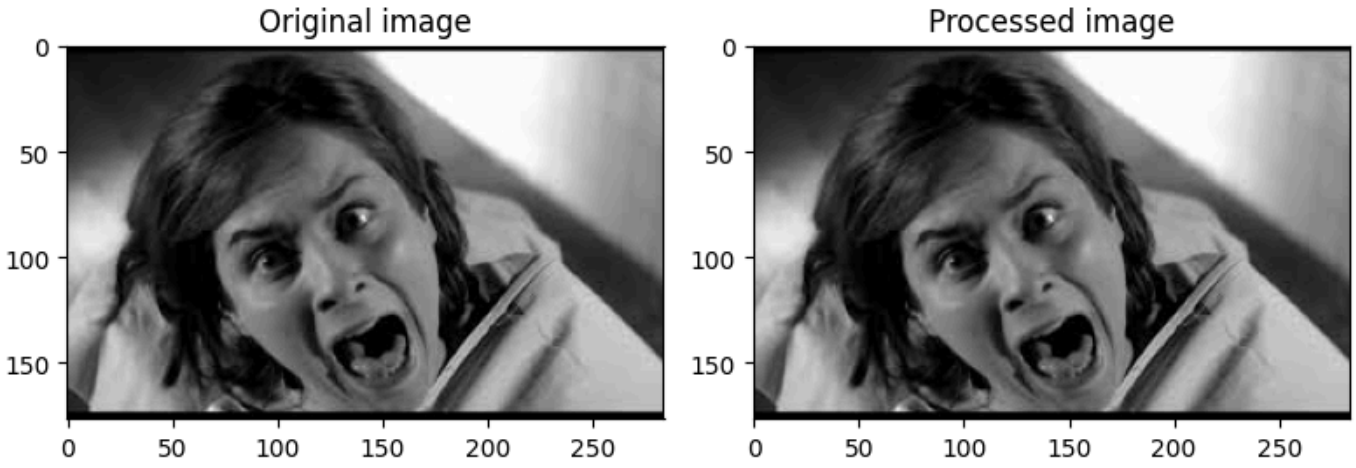
Found 28709 images belonging to 7 classes.

{'angry': 0, 'disgusted': 1, 'fearful': 2, 'happy': 3, 'neutral': 4, 'sad': 5, 'surprised': 6}

Prediction-1

In [162…
```
import cv2
from matplotlib import pyplot as plt
```

In [84]:
```
#reading the original image
test_img2 = cv2.imread('/content/2_fearful_face.jpeg')
#converting the image into grayscale
grey_img2  = rgb2gray(test_img2)
fig, axes = plt.subplots(1, 2, figsize=(8, 4))
ax = axes.ravel()
#setting the axes of the image
ax[0].imshow(test_img2) # Use test_img1 for the original image
ax[0].set_title("Original image")
ax[1].imshow(grey_img2, cmap=plt.cm.gray) # Use grey_img1 for the grayscale image
ax[1].set_title("Processed image")
#display the processed image
fig.tight_layout()
plt.show()
```



In [85]:
```
grey_img2_resized = cv2.resize(grey_img2, (100, 100))
test_input2 = grey_img2_resized.reshape(1, 100, 100, 1)
test_input2.shape
```

Out[85]: (1, 100, 100, 1)

In [86]:
```
model.predict(test_input2)
```

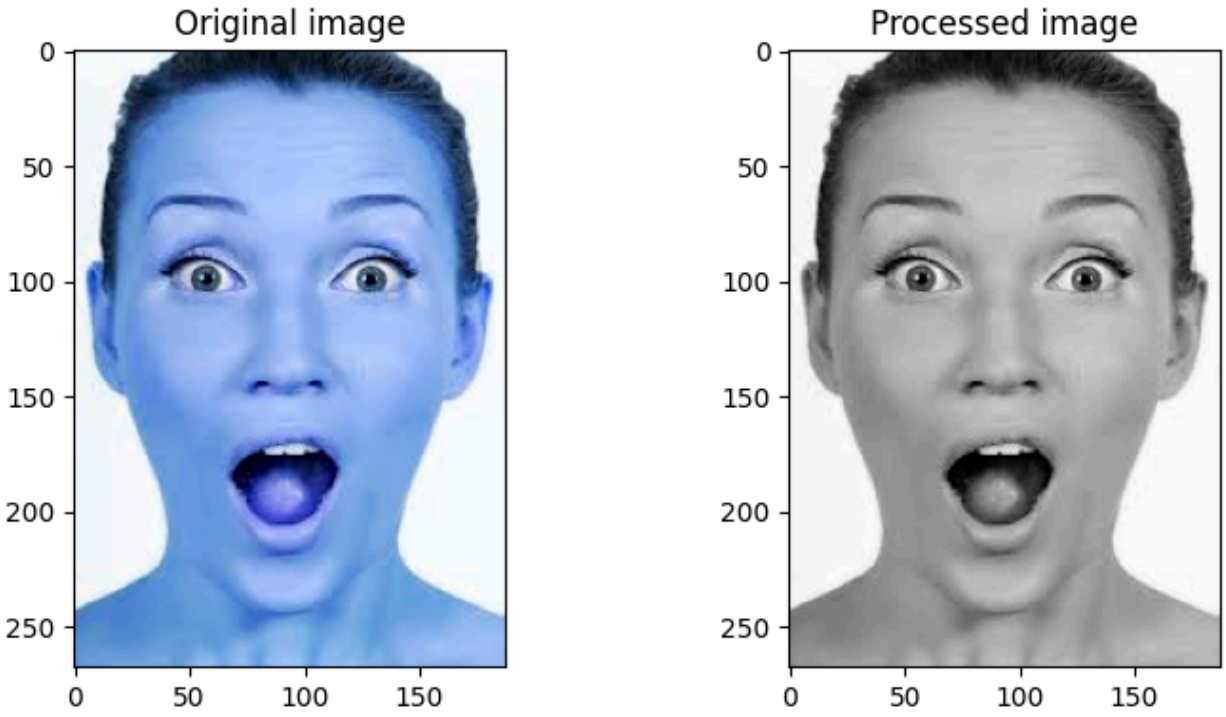
```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 34ms/step
```

Out[86]:
```
array([[0.12131992, 0.13538785, 0.6299236 , 0.04644792, 0.00874567,
        0.04605708, 0.01211797]], dtype=float32)
```

Prediction-2

In [175…
```
#reading the original image
test_img02 = cv2.imread('/content/surprised_face2.jpeg')
#converting the image into grayscale
grey_img02  = rgb2gray(test_img02)
fig, axes = plt.subplots(1, 2, figsize=(8, 4))
ax = axes.ravel()
#setting the axes of the image
ax[0].imshow(test_img02) # Use test_img1 for the original image
ax[0].set_title("Original image")
ax[1].imshow(grey_img02, cmap=plt.cm.gray) # Use grey_img1 for the grayscale image
ax[1].set_title("Processed image")
#display the processed image
```

```
fig.tight_layout()
plt.show()
```



In [176…
```
grey_img02_resized = cv2.resize(grey_img02, (100, 100))
test_input02 = grey_img02_resized.reshape(1, 100, 100, 1)
test_input02.shape
```

Out[176… (1, 100, 100, 1)

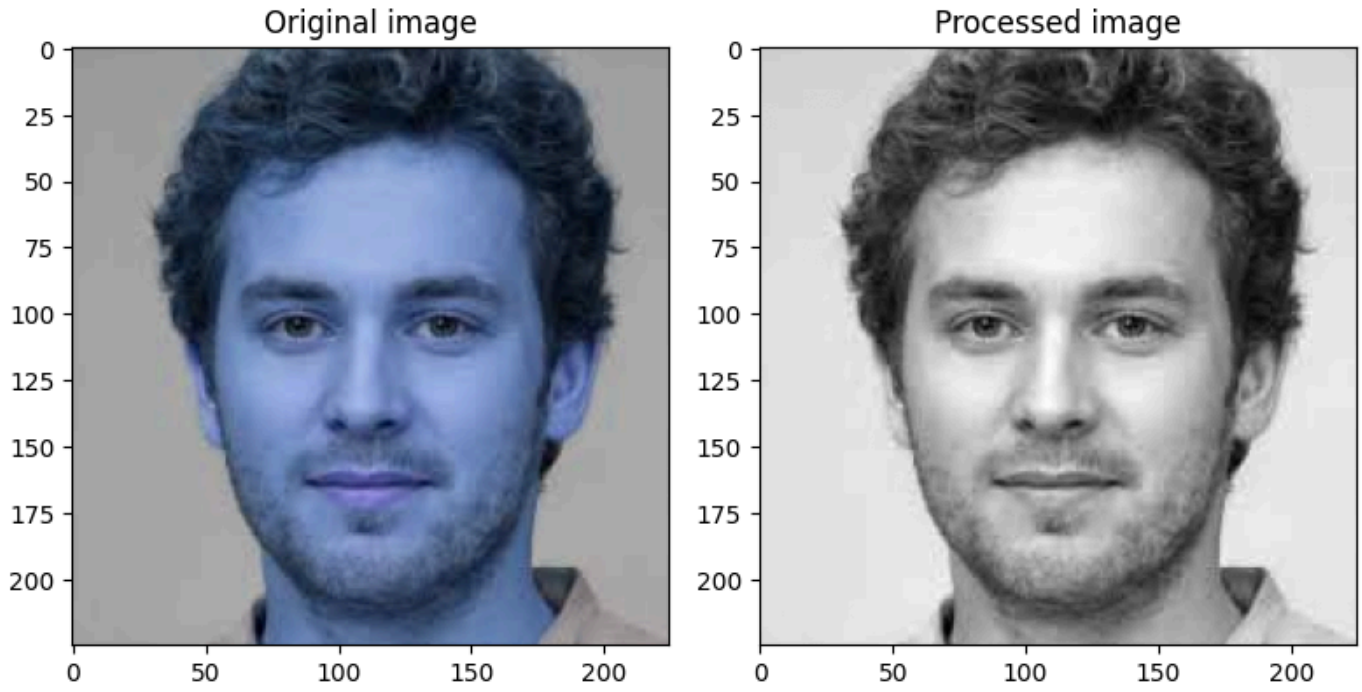
In [177…
```
model.predict(test_input02)
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 34ms/step
```

Out[177…
```
array([[5.4477328e-01, 5.7460260e-02, 3.7919796e-01, 1.7362081e-02,
        1.5343505e-06, 1.6526741e-04, 1.0397012e-03]], dtype=float32)
```

Prediction-3

In [166…
```
#reading the original image
test_img4 = cv2.imread('/content/nuteral_face2.jpeg')
#converting the image into grayscale
grey_img4  = rgb2gray(test_img4)
fig, axes = plt.subplots(1, 2, figsize=(8, 4))
ax = axes.ravel()
#setting the axes of the image
ax[0].imshow(test_img4) # Use test_img1 for the original image
ax[0].set_title("Original image")
ax[1].imshow(grey_img4, cmap=plt.cm.gray) # Use grey_img1 for the grayscale image
ax[1].set_title("Processed image")
#display the processed image
fig.tight_layout()
plt.show()
```



In [169…
```
grey_img4_resized = cv2.resize(grey_img4, (100, 100))
test_input4 = grey_img4_resized.reshape(1, 100, 100, 1)
test_input4.shape
```

Out[169… (1, 100, 100, 1)

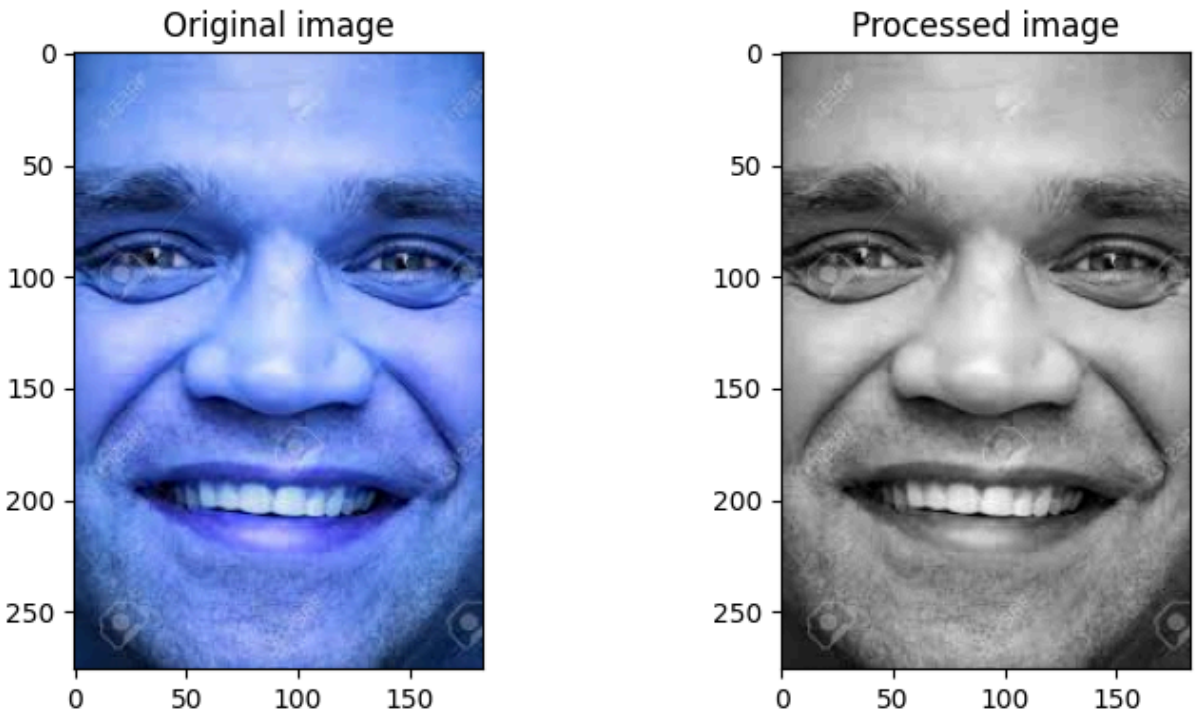
In [170…
```
model.predict(test_input4)
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 53ms/step
```

Out[170…
```
array([[6.9924456e-04, 2.5507687e-14, 6.6499088e-06, 5.0905120e-04,
        9.9419051e-01, 4.0052142e-03, 5.8924936e-04]], dtype=float32)
```

Prediction-4

In [178…
```
#reading the original image
test_img5 = cv2.imread('/content/happy_face4.jpeg')
#converting the image into grayscale
grey_img5  = rgb2gray(test_img5)
fig, axes = plt.subplots(1, 2, figsize=(8, 4))
ax = axes.ravel()
#setting the axes of the image
ax[0].imshow(test_img5) # Use test_img1 for the original image
ax[0].set_title("Original image")
ax[1].imshow(grey_img5, cmap=plt.cm.gray) # Use grey_img1 for the grayscale image
ax[1].set_title("Processed image")
#display the processed image
fig.tight_layout()
plt.show()
```



In [179…
```
grey_img5_resized = cv2.resize(grey_img5, (100, 100))
test_input5 = grey_img5_resized.reshape(1, 100, 100, 1)
test_input5.shape
```

Out[179…
```
(1, 100, 100, 1)
```

In [180…
```
model.predict(test_input5)
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 36ms/step
```

Out[180…
```
array([[7.3643422e-01, 5.7453119e-11, 1.4249649e-06, 4.0472839e-02,
        6.7381113e-04, 2.2227617e-01, 1.4158608e-04]], dtype=float32)
```