Développement d'un système de reconnaissance des expressions faciales

Réalisé par : ALLAL Yahia , AIT ICHOU Mustapha , AMMOURI Yassire

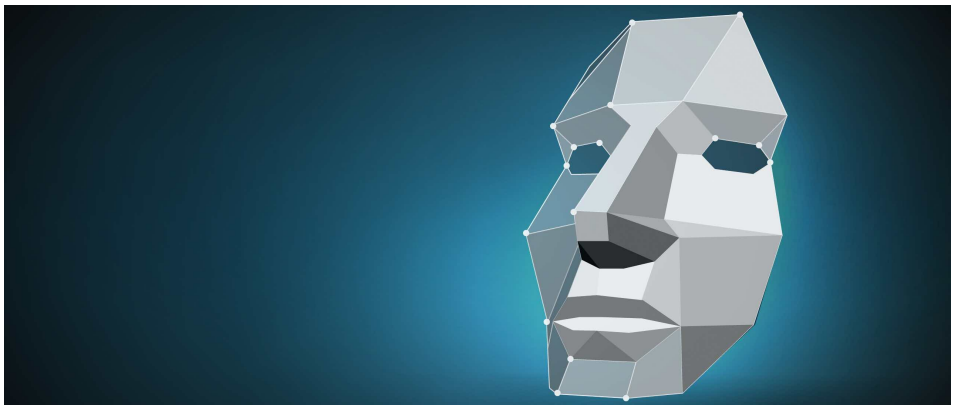
Faculté des Sciences de Rabat

16 Juillet 2024

Plan

Problématique

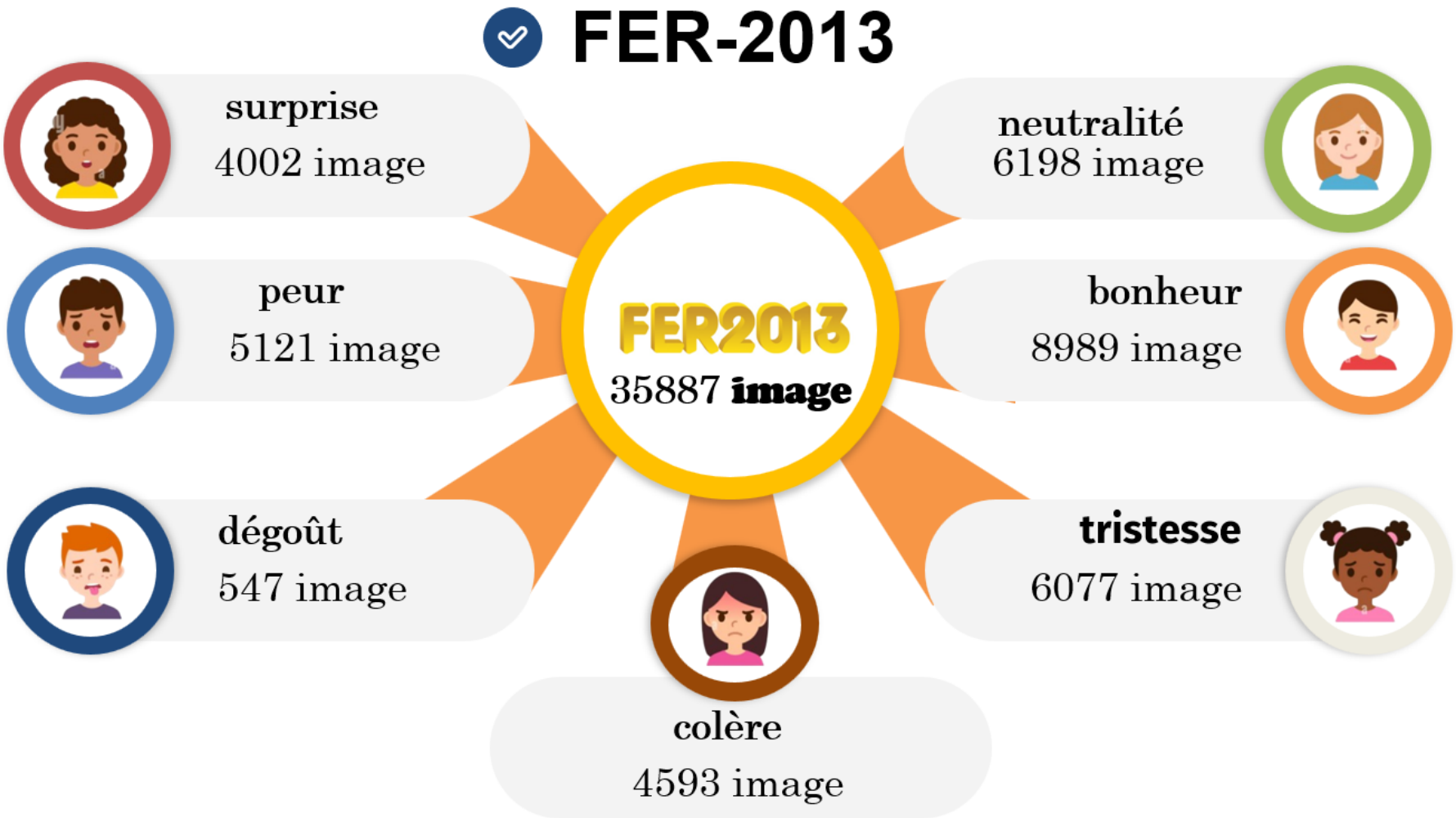
Problématique



1. La reconnaissance des expressions faciales est essentielle dans différents domaines, notamment les interactions homme-machine, la surveillance et la médecine.
2. Certaines expressions ne sont pas détectées par l'humain de façon optimale, ce qui présente des limitations en termes de précision et d'efficacité.
3. Comment nous pouvons améliorer la détection des expressions faciales à l' aide de techniques avancées comme les réseaux de neurones convolutifs ?

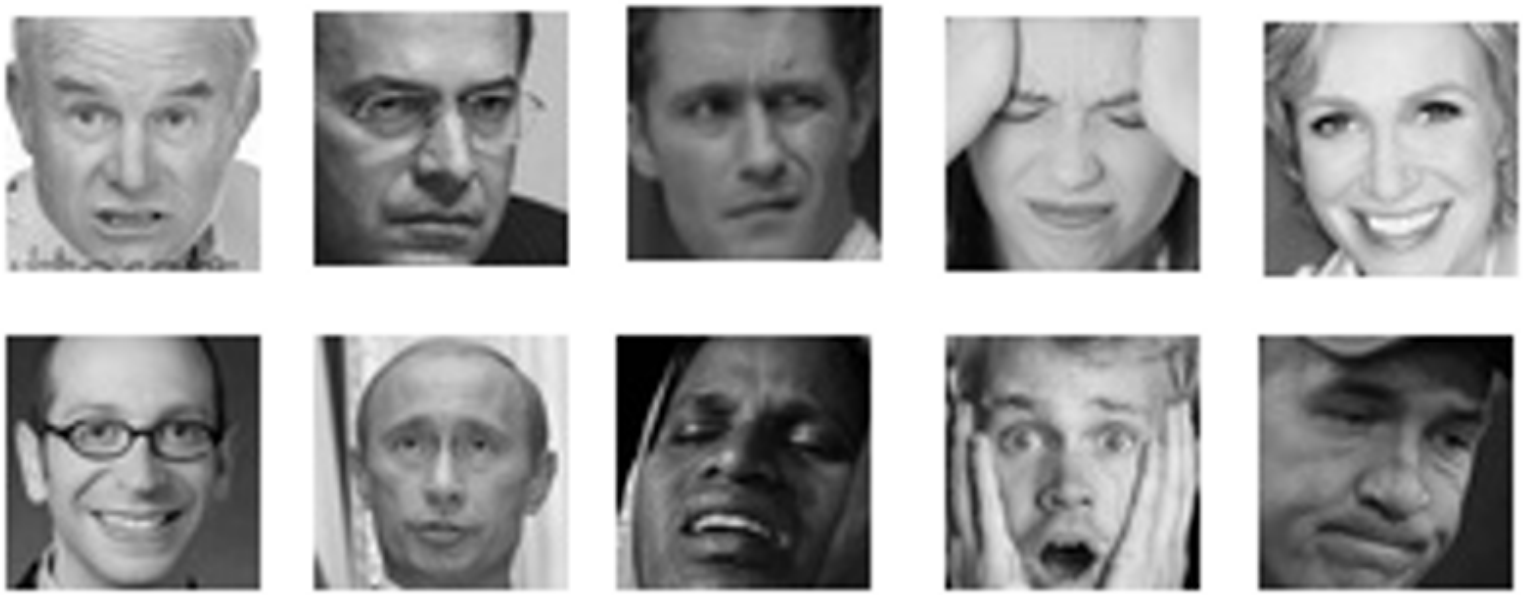
La base de données FER-2013

La base de données FER-2013



La base de données FER-2013

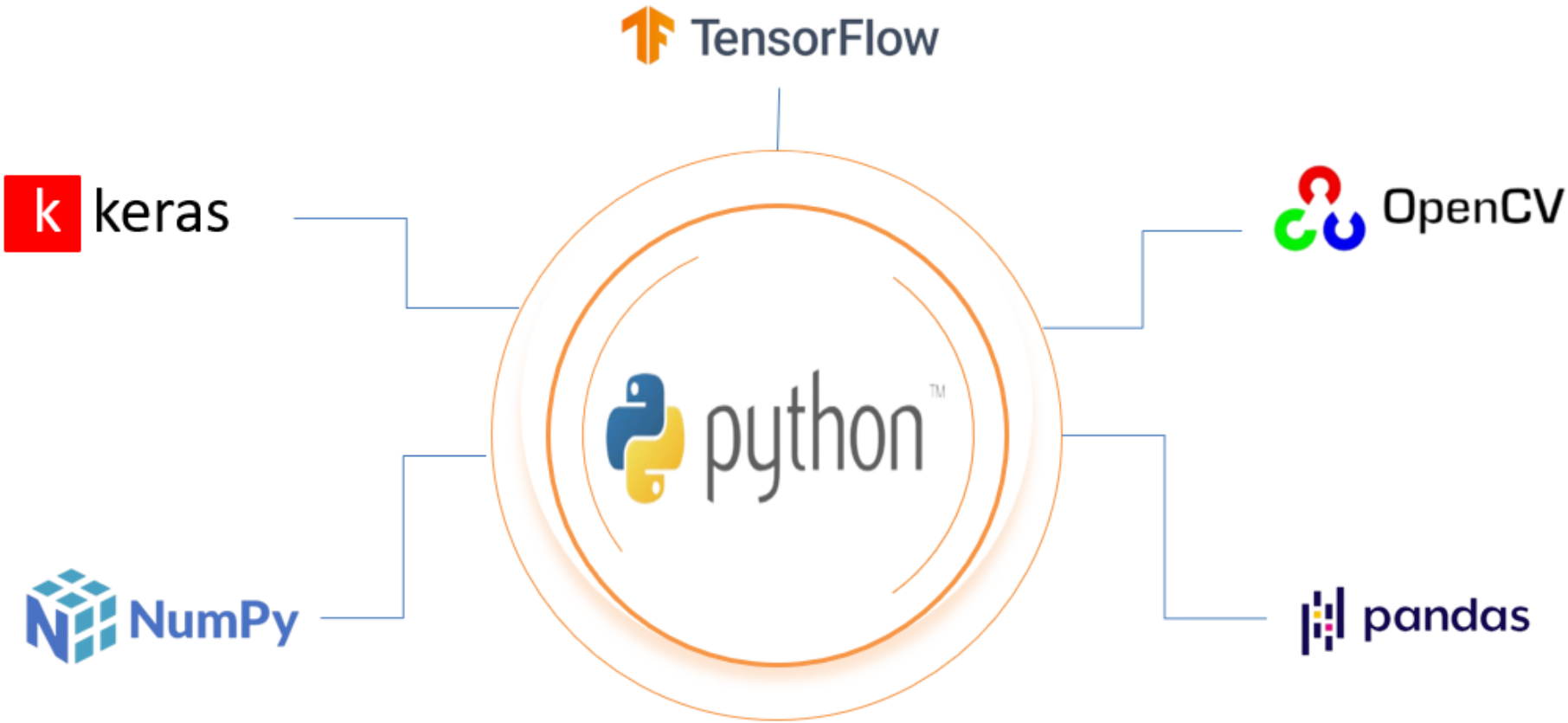
Exemples d'images du dataset



Les outils utilisés & L'environnement

Les outils utilisés & L'environnement

les logiciels & les bibliothèques informatiques



Les outils utilisés & L'environnement

le materiél

processeur :
intel core i7 8 éme

carte graphique :
intel (R) Graphics 650

mémoire vive : 16 Go

systéme d'éxploition:
Windows 11

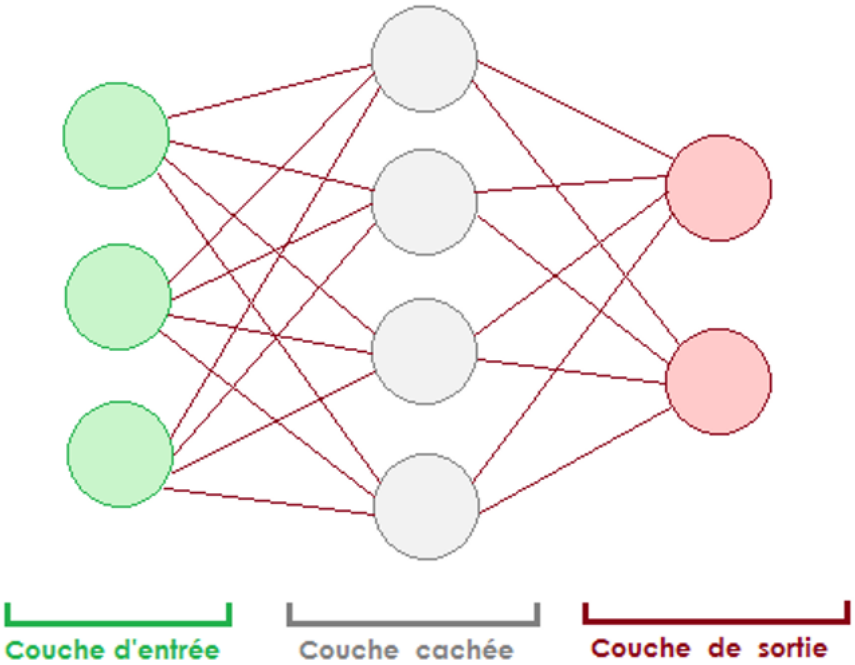
Pré-traitement

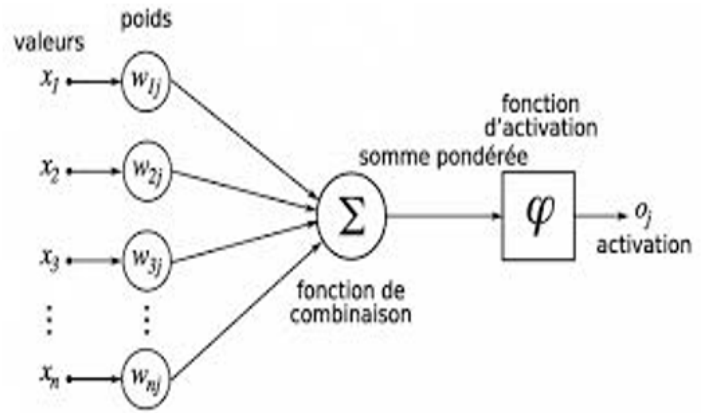
```
train_datagen = ImageDataGenerator(
                    rescale=1./255,
                    rotation_range=30,
                    shear_range=0.3,
                    zoom_range=0.3,
                    horizontal_flip=True,
                    fill_mode='nearest')

validation_datagen = ImageDataGenerator(rescale=1./255)

train_generator = train_datagen.flow_from_directory(
                    train_data_dir,
                    color_mode='grayscale',
                    target_size=(48, 48),
                    batch_size=32,
                    class_mode='categorical',
                    shuffle=True)

validation_generator = validation_datagen.flow_from_directory(
                            validation_data_dir,
                            color_mode='grayscale',
                            target_size=(48, 48),
                            batch_size=32,
                            class_mode='categorical',
                            shuffle=True)
```

Architecture de CNN et Resulat

Architecture de ANN

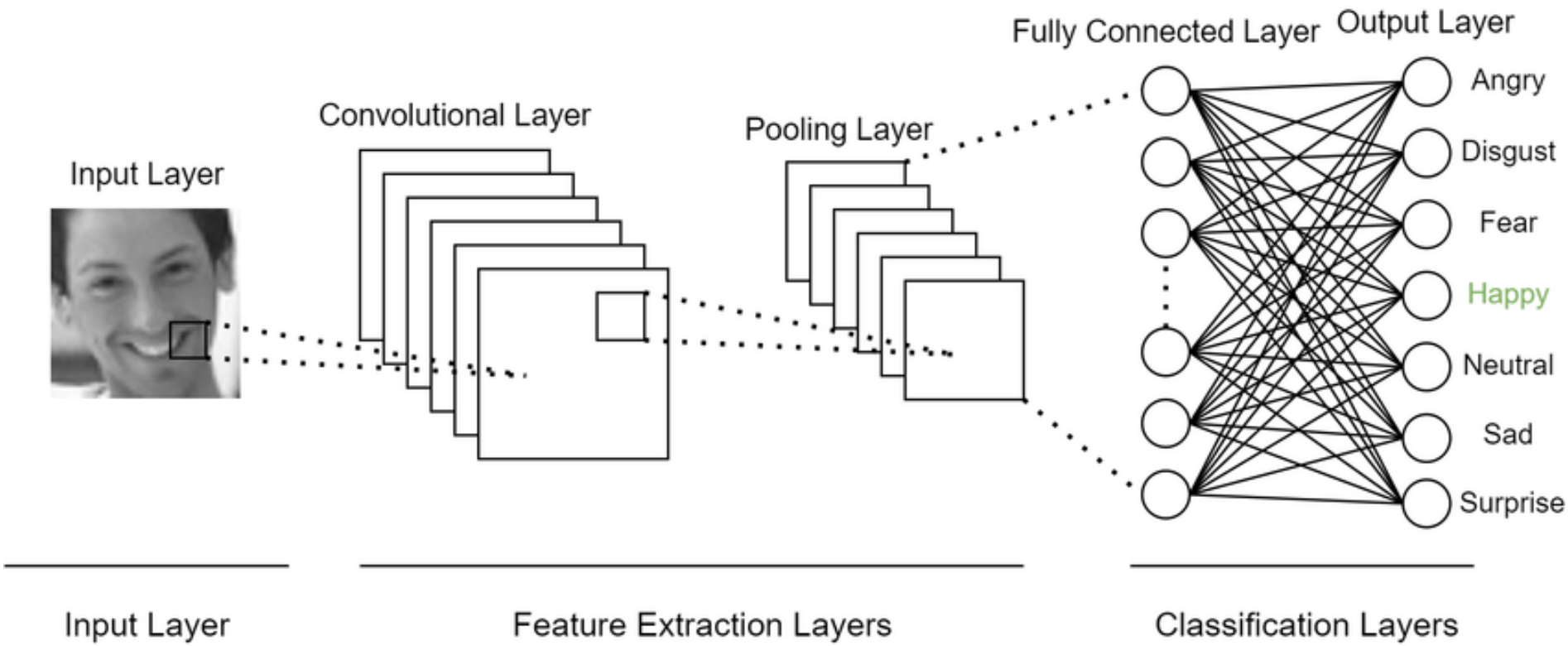
réseau de neurone





Neurone artificiel

Architecture de CNN



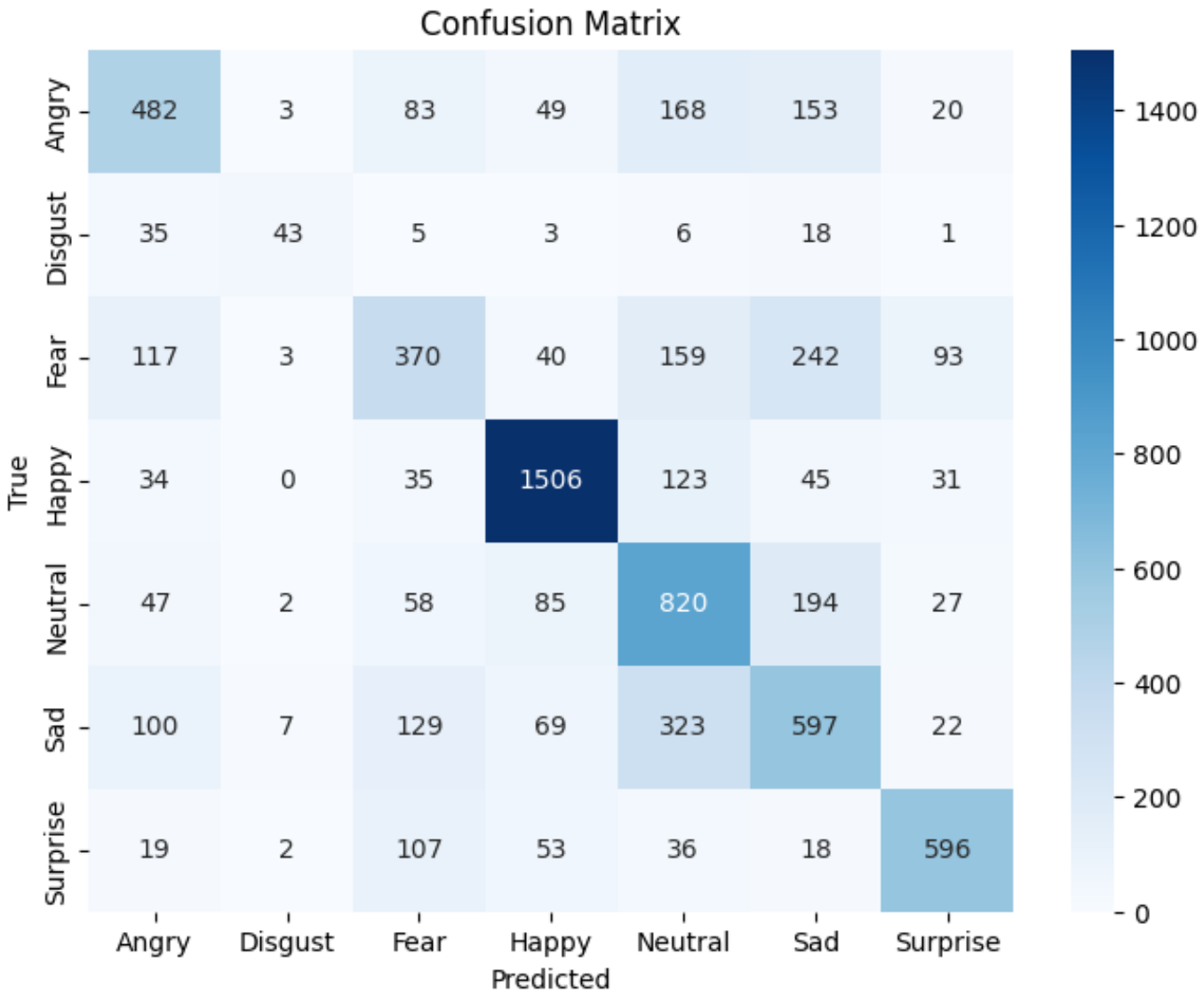
Script du model

```
model = Sequential()
model.add(Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(48,48,1)))

model.add(Conv2D(64, kernel_size=(3, 3), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.1))

model.add(Conv2D(128, kernel_size=(3, 3), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.1))

model.add(Conv2D(256, kernel_size=(3, 3), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Dropout(0.1))

model.add(Flatten())
model.add(Dense(512, activation='relu'))
model.add(Dropout(0.2))

model.add(Dense(7, activation='softmax'))
model.compile(optimizer = 'adam', loss='categorical_crossentropy', metrics=['accuracy'])
```

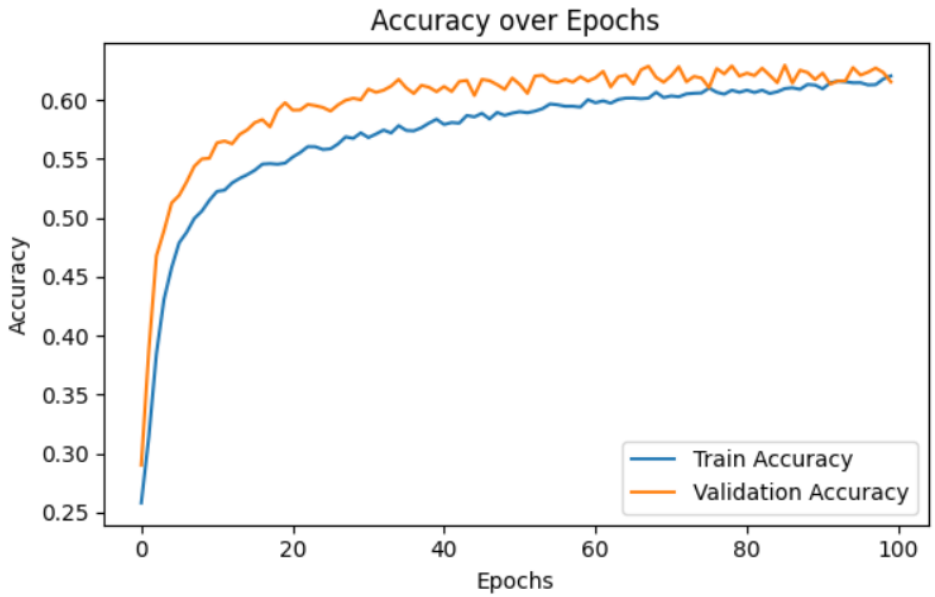
Model Summary

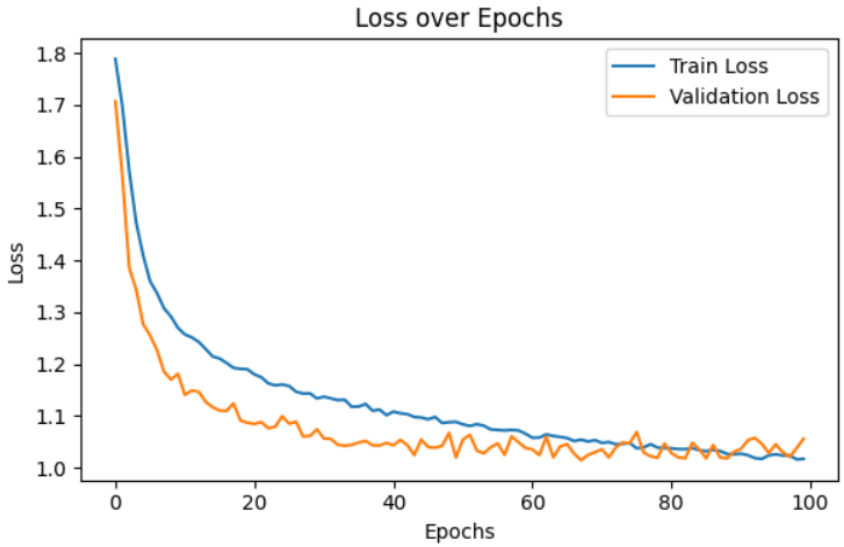
```
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_8 (Conv2D)           (None, 46, 46, 32)        320

 conv2d_9 (Conv2D)           (None, 44, 44, 64)        18496

 max_pooling2d_6 (MaxPoolin  (None, 22, 22, 64)        0
 g2D)

 dropout_8 (Dropout)         (None, 22, 22, 64)        0

 conv2d_10 (Conv2D)          (None, 20, 20, 128)       73856

 max_pooling2d_7 (MaxPoolin  (None, 10, 10, 128)       0
 g2D)

 dropout_9 (Dropout)         (None, 10, 10, 128)       0

 conv2d_11 (Conv2D)          (None, 8, 8, 256)         295168

 max_pooling2d_8 (MaxPoolin  (None, 4, 4, 256)         0
...
Epoch 99/100
897/897 [==============================] - 34s 38ms/step - loss: 1.0163 - accuracy: 0.6176 - val_loss: 1.0378 - val_accuracy: 0.6232
Epoch 100/100
897/897 [==============================] - 37s 41ms/step - loss: 1.0172 - accuracy: 0.6203 - val_loss: 1.0560 - val_accuracy: 0.6152
```

Confusion matrix



The metrics results





Transfer Learning

```python
from keras.applications import VGG16

# Load the VGG16 model with pretrained weights
base_model = VGG16(weights='imagenet', include_top=False, input_shape=(48, 48, 3))

# Freeze the layers of the base model
for layer in base_model.layers:
    layer.trainable = False

# Build the model
model = Sequential()
model.add(base_model)
```

```
Epoch 97/100
897/897 [==============================] - 33s 37ms/step - loss: 1.4383 - accuracy: 0.4381 - val_loss: 1.4726 - val_accuracy: 0.4413
Epoch 98/100
897/897 [==============================] - 33s 37ms/step - loss: 1.4453 - accuracy: 0.4424 - val_loss: 1.4916 - val_accuracy: 0.4321
Epoch 99/100
897/897 [==============================] - 34s 38ms/step - loss: 1.4399 - accuracy: 0.4412 - val_loss: 1.4886 - val_accuracy: 0.4329
Epoch 100/100
897/897 [==============================] - 33s 36ms/step - loss: 1.4340 - accuracy: 0.4442 - val_loss: 1.4670 - val_accuracy: 0.4503
```

Démonstration

Conslusion

Conslusion

1. Bien que nous augmentions le nombre d'époques, l'accuracy reste insuffisante.
2. Le model performe bien sur les data réel.
3. Complexité des Émotions.
4. Performance en Temps Réel.
5. Variabilité des Conditions d' Éclairage et d'Angles de Vue.

Merci pour votre attention !