sna-project

May 23, 2023

1 Image labeling on social network metadata

Package import

[ ]:
```
import tensorflow as tf
from tensorflow.keras import Sequential
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.preprocessing import image
from tensorflow.keras.layers import Flatten, Dense, Dropout,␣
↪BatchNormalization, Conv2D, MaxPool2D
print(tf.__version__)
```

```
2.12.0
```

[ ]:
```
import numpy as np
import pandas as pd
from tqdm import tqdm
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
```

Dataset import

[ ]:
```
data = pd.read_csv('/content/drive/MyDrive/Movies-Poster_Dataset-master/train.
↪csv')
data.shape
```

[ ]:
```
(10, 27)
```

Tags overview

[ ]:
```
data.head()
```

[ ]:

	Id	Genre	Action	Adventure	\
0	tt0086425	['Comedy', 'Drama']	0	0	
1	tt0085549	['Drama', 'Romance', 'Music']	0	0	
2	tt0086465	['Comedy']	0	0	
3	tt0086567	['Sci-Fi', 'Thriller']	0	0	
4	tt0086034	['Action', 'Adventure', 'Thriller']	1	1	

```
   Animation  Biography  Comedy  Crime  Documentary  Drama  …  N/A  News  \
0          0          0       1      0            0      1  …    0     0
1          0          0       0      0            0      1  …    0     0
2          0          0       1      0            0      0  …    0     0
3          0          0       0      0            0      0  …    0     0
4          0          0       0      0            0      0  …    0     0

   Reality-TV  Romance  Sci-Fi  Short  Sport  Thriller  War  Western
0           0        0       0      0      0         0    0        0
1           0        1       0      0      0         0    0        0
2           0        0       0      0      0         0    0        0
3           0        0       1      0      0         1    0        0
4           0        0       0      0      0         1    0        0

[5 rows x 27 columns]
```

Processing images in batch

[ ]:
```
img_width = 350
img_height = 350

X = []

for i in tqdm(range(data.shape[0])):
  path = '/content/drive/MyDrive/Movies-Poster_Dataset-master/Images/' +␣
 ↪data['Id'][i] + '.jpg'
  img = image.load_img(path, target_size=(img_width, img_height, 3))
  img = image.img_to_array(img)
  img = img/255.0
  X.append(img)

X = np.array(X)
```

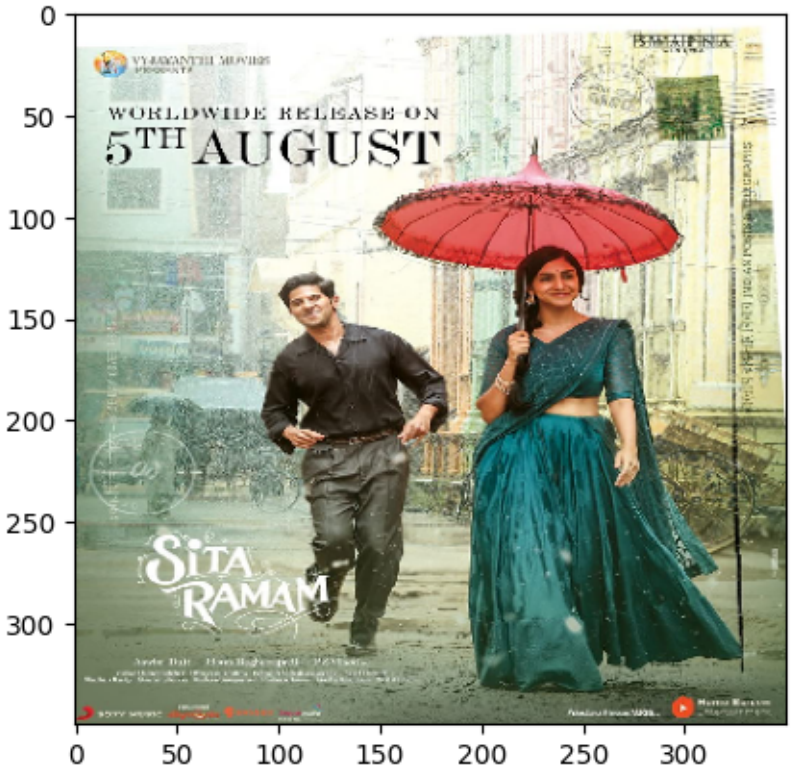
```
100%|      | 10/10 [00:04<00:00,  2.38it/s]
```

[ ]:
```
X.shape
```

[ ]:
```
(10, 350, 350, 3)
```

[ ]:
```
plt.imshow(X[1])
```

[ ]:
```
<matplotlib.image.AxesImage at 0x7f2f56b3fdf0>
```



Labelling image

```
[ ]: data['Genre'][1]
```

```
[ ]: "['Drama', 'Romance', 'Music']"
```

```
[ ]: y = data.drop(['Id', 'Genre'], axis = 1)
     y = y.to_numpy()
     y.shape
```

```
[ ]: (10, 25)
```

Splitting dataset

```
[ ]: X_train, X_test, y_train, y_test = train_test_split(X, y, random_state = 0,␣
      ↪test_size = 0.15)
```

```
[ ]: X_train[0].shape
```

```
[ ]: (350, 350, 3)
```

Building CNN network

[ ]:
```
model = Sequential()
model.add(Conv2D(16, (3,3), activation='relu', input_shape = X_train[0].shape))
model.add(BatchNormalization())
model.add(MaxPool2D(2,2))
model.add(Dropout(0.3))

model.add(Conv2D(32, (3,3), activation='relu'))
model.add(BatchNormalization())
model.add(MaxPool2D(2,2))
model.add(Dropout(0.3))

model.add(Conv2D(64, (3,3), activation='relu'))
model.add(BatchNormalization())
model.add(MaxPool2D(2,2))
model.add(Dropout(0.4))

model.add(Conv2D(128, (3,3), activation='relu'))
model.add(BatchNormalization())
model.add(MaxPool2D(2,2))
model.add(Dropout(0.5))

model.add(Flatten())

model.add(Dense(128, activation='relu'))
model.add(BatchNormalization())
model.add(Dropout(0.5))


model.add(Dense(128, activation='relu'))
model.add(BatchNormalization())
model.add(Dropout(0.5))


model.add(Dense(25, activation='sigmoid'))
```

Parameter summary

[ ]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 348, 348, 16)      448

 batch_normalization (BatchN  (None, 348, 348, 16)     64
 ormalization)
```

```
max_pooling2d (MaxPooling2D  (None, 174, 174, 16)     0
)

dropout (Dropout)           (None, 174, 174, 16)      0

conv2d_1 (Conv2D)           (None, 172, 172, 32)      4640

batch_normalization_1 (Batc  (None, 172, 172, 32)     128
hNormalization)

max_pooling2d_1 (MaxPooling  (None, 86, 86, 32)       0
2D)

dropout_1 (Dropout)         (None, 86, 86, 32)        0

conv2d_2 (Conv2D)           (None, 84, 84, 64)        18496

batch_normalization_2 (Batc  (None, 84, 84, 64)       256
hNormalization)

max_pooling2d_2 (MaxPooling  (None, 42, 42, 64)       0
2D)

dropout_2 (Dropout)         (None, 42, 42, 64)        0

conv2d_3 (Conv2D)           (None, 40, 40, 128)       73856

batch_normalization_3 (Batc  (None, 40, 40, 128)      512
hNormalization)

max_pooling2d_3 (MaxPooling  (None, 20, 20, 128)      0
2D)

dropout_3 (Dropout)         (None, 20, 20, 128)       0

flatten (Flatten)           (None, 51200)             0

dense (Dense)               (None, 128)               6553728

batch_normalization_4 (Batc  (None, 128)              512
hNormalization)

dropout_4 (Dropout)         (None, 128)               0

dense_1 (Dense)             (None, 128)               16512

batch_normalization_5 (Batc  (None, 128)              512
hNormalization)
```

```
 dropout_5 (Dropout)         (None, 128)               0

 dense_2 (Dense)             (None, 25)                3225

=================================================================
Total params: 6,672,889
Trainable params: 6,671,897
Non-trainable params: 992
_________________________________________________________________
```

Training dataset

[ ]:
```
model.compile(optimizer='adam', loss = 'binary_crossentropy',␣
 ↪metrics=['accuracy'])
```

[ ]:
```
history = model.fit(X_train, y_train, epochs=5, validation_data=(X_test,␣
 ↪y_test))
```

```
Epoch 1/5
1/1 [==============================] - 6s 6s/step - loss: 0.8828 - accuracy:
0.0000e+00 - val_loss: 0.6933 - val_accuracy: 0.0000e+00
Epoch 2/5
1/1 [==============================] - 3s 3s/step - loss: 1.0501 - accuracy:
0.0000e+00 - val_loss: 0.6877 - val_accuracy: 0.0000e+00
Epoch 3/5
1/1 [==============================] - 3s 3s/step - loss: 0.9229 - accuracy:
0.0000e+00 - val_loss: 0.6806 - val_accuracy: 0.0000e+00
Epoch 4/5
1/1 [==============================] - 2s 2s/step - loss: 0.9467 - accuracy:
0.0000e+00 - val_loss: 0.6739 - val_accuracy: 0.0000e+00
Epoch 5/5
1/1 [==============================] - 2s 2s/step - loss: 0.8569 - accuracy:
0.1250 - val_loss: 0.6709 - val_accuracy: 0.0000e+00
```

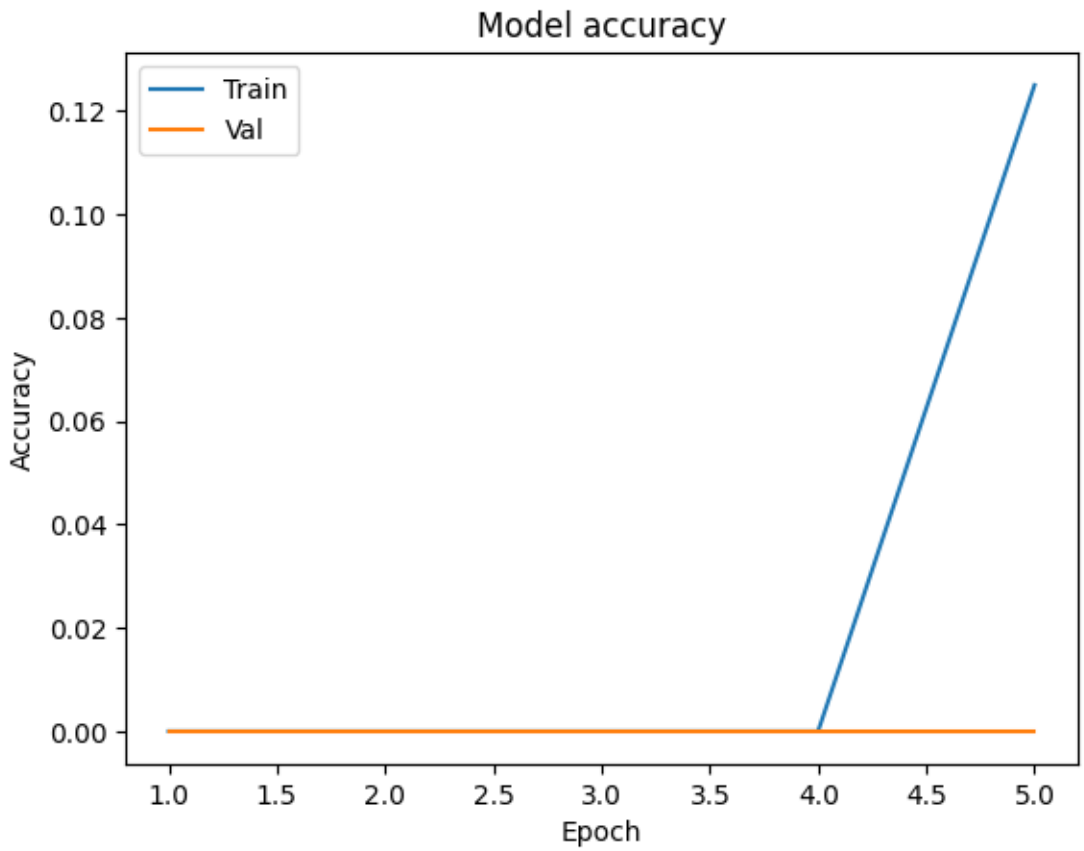
Plot for training and validation loss

[ ]:
```
def plot_learningCurve(history, epoch):
  epoch_range = range(1, epoch+1)
  plt.plot(epoch_range, history.history['accuracy'])
  plt.plot(epoch_range, history.history['val_accuracy'])
  plt.title('Model accuracy')
  plt.ylabel('Accuracy')
  plt.xlabel('Epoch')
  plt.legend(['Train', 'Val'], loc='upper left')
  plt.show()

  plt.plot(epoch_range, history.history['loss'])
  plt.plot(epoch_range, history.history['val_loss'])
```

```
  plt.title('Model loss')
  plt.ylabel('Loss')
  plt.xlabel('Epoch')
  plt.legend(['Train', 'Val'], loc='upper left')
  plt.show()

plot_learningCurve(history, 5)
```



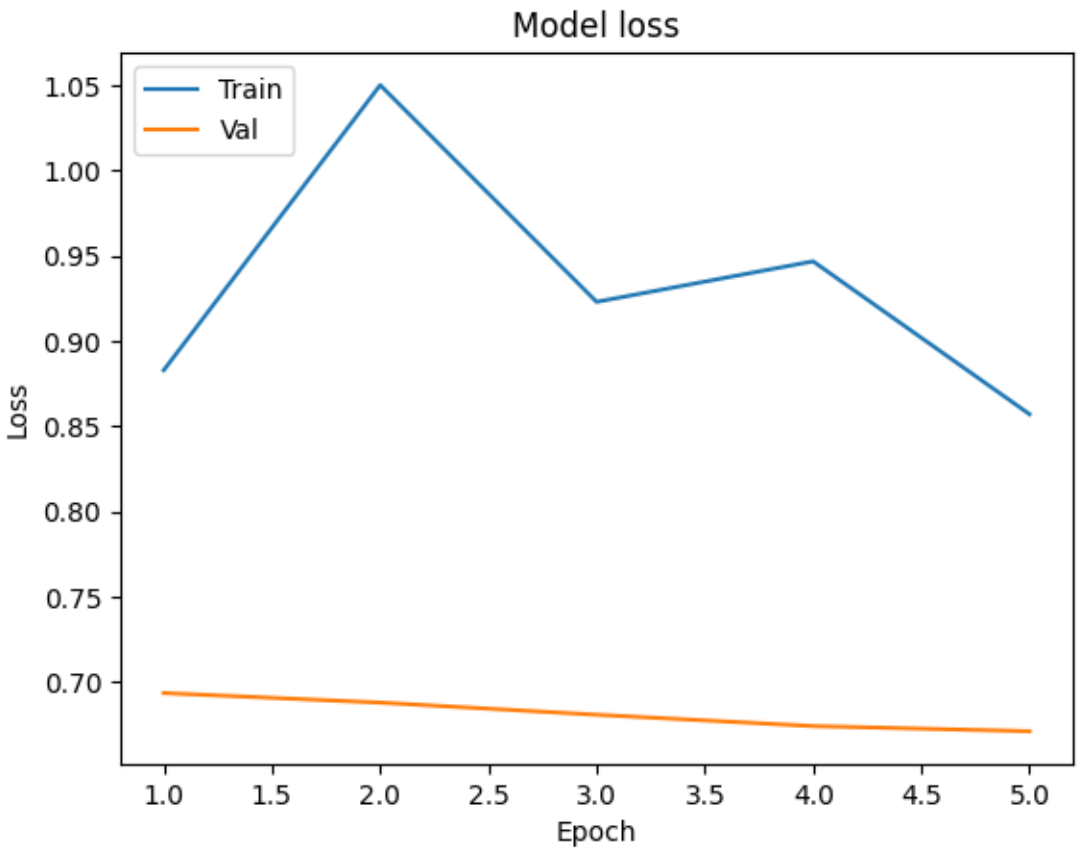


Image labelling on sample movie poster

[ ]:
```
img = image.load_img('IB71.jpg', target_size=(img_width, img_height, 3))
plt.imshow(img)
img = image.img_to_array(img)
img = img/255.0

img = img.reshape(1, img_width, img_height, 3)

classes = data.columns[2:]
print(classes)
y_prob = model.predict(img)
top3 = np.argsort(y_prob[0])[:-4:-1]

for i in range(3):
  print(classes[top3[i]])
```

```
Index(['Action', 'Adventure', 'Animation', 'Biography', 'Comedy', 'Crime',
       'Documentary', 'Drama', 'Family', 'Fantasy', 'History', 'Horror',
       'Music', 'Musical', 'Mystery', 'N/A', 'News', 'Reality-TV', 'Romance',
```

```
       'Sci-Fi', 'Short', 'Sport', 'Thriller', 'War', 'Western'],
      dtype='object')
1/1 [==============================] - 0s 72ms/step
Horror
Musical
Sci-Fi
```