Ukol 1: klasifikace osob na fotce

18.6. Matyas Vondra

In [2]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [3]:
```
import os
os.chdir('/content/drive/MyDrive/Colab Notebooks/Workshop/')
print("Current working directory: {0}".format(os.getcwd()))
```

```
Current working directory: /content/drive/MyDrive/Colab Notebooks/Workshop
```

In [4]:
```
!pip install split-folders
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting split-folders
  Downloading split_folders-0.5.1-py3-none-any.whl (8.4 kB)
Installing collected packages: split-folders
Successfully installed split-folders-0.5.1
```

In [5]:
```
import splitfolders
import pathlib
```

In [6]:
```
import tensorflow as tf
from tensorflow.keras import datasets, layers, models
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
from keras.preprocessing.image import ImageDataGenerator
```

In [7]:
```
the_labels = {
    0: "Angelina Jolie",
    1: "Brad Pitt",
    2: "Denzel Washington",
    3: "Hugh Jackman",
    4: "Jennifer Lawrence",
    5: "Johnny Depp",
    6: "Kate Winslet",
    7: "Leonardo DiCaprio",
    8: "Megan Fox",
    9: "Natalie Portman",
    10: "Nicole Kidman",
    11: "Robert Downey Jr",
    12: "Sandra Bullock",
    13: "Scarlett Johansson",
    14: "Tom Cruise",
    15: "Tom Hanks",
    16: "Will Smith"
}
```

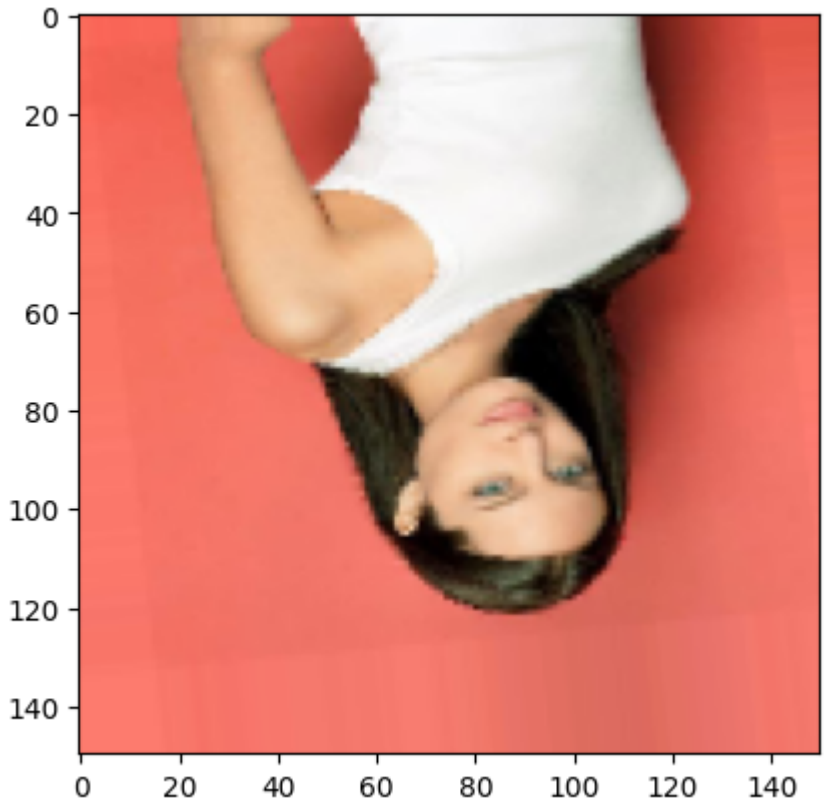
In [8]:
```
img_height, img_width = 150, 150
input_shape = (img_height, img_width, 3)
batch_size = 32

def create_data(data_path):
    data_path = pathlib.Path(data_path)
    # rozdeleni train test v pomeru 0.8 / 0.2
    splitfolders.ratio(data_path, output='Imgs/', seed=1, ratio=(0.8, 0.2),

    # generator train obrazku vcetne rescale a augumentace
    train_datagen = tf.keras.preprocessing.image.ImageDataGenerator(rescale
                                                                    width_shift_
                                                                    shear_range
                                                                    vertical_fli
    # generator test obrazku, pouze rescale
    test_datagen = tf.keras.preprocessing.image.ImageDataGenerator(rescale =

    train_images = train_datagen.flow_from_directory('Imgs/train/', target_s
                                                     class_mode='categorical', ba
    test_images = test_datagen.flow_from_directory('Imgs/val/', target_size=
                                                     class_mode='categorical', ba

    return train_images, test_images
```

In [9]:
```
train_images, test_images = create_data('/content/drive/MyDrive/Colab Notebo
```

```
Copying files: 1800 files [07:58,  3.76 files/s]
Found 1440 images belonging to 17 classes.
Found 360 images belonging to 17 classes.
```

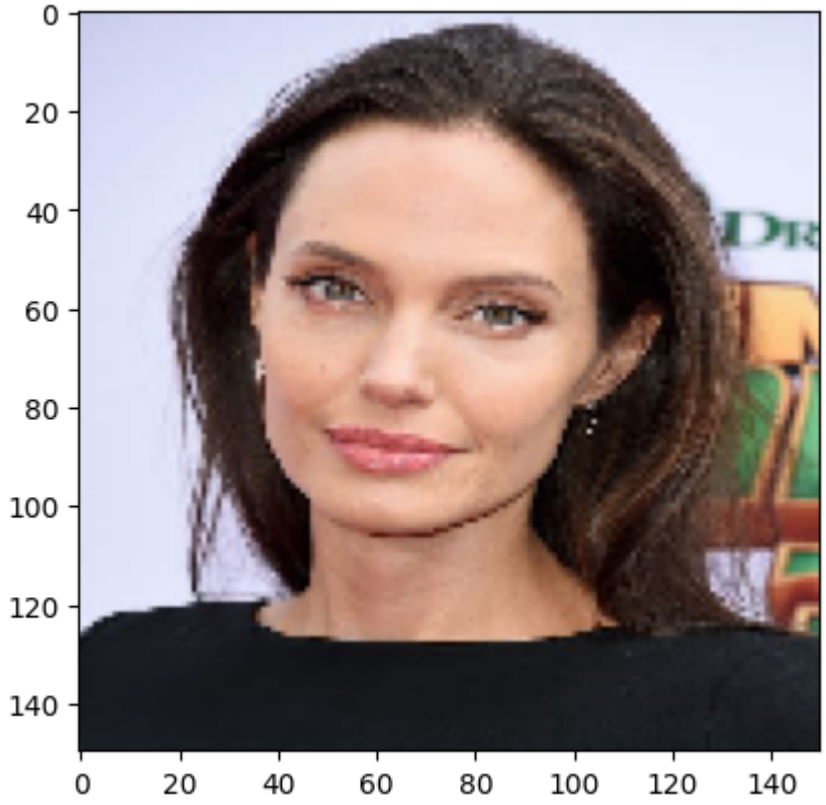
In [50]:
```
# kontrola augumentovaneho train obrazku s labelem
images, labels = next(train_images)
plt.imshow(images[0]) # display first image from batch
print(the_labels[np.where(labels[0] == 1)[0][0]])
```

```
Angelina Jolie
```



In [11]:
```
# kontrola test obrazku
images, labels = next(test_images)
plt.imshow(images[0]) # display first image from batch
print(the_labels[np.where(labels[0] == 1)[0][0]])
```

```
Angelina Jolie
```



Model je zbytecne komplexni. Nevim proc, ale predikuje vzasade pouze jednu hodnotu. Ze zoufalstvi jsem zkousel pridavat ruzne vrstvy i zkusil replikovat model, ktery byl k tomuto datasetu na kegglu dostupny. Presto jsem moc neuspel. Nakonec pomohlo az zmenseni velikosti batche, model jsem ale nechal, tak jak byl.

In [56]:
```
# model:
model = models.Sequential()
# obrazky 150x150 se 3 barvami RGB. Filtry konvoluce jsou porad 2D (15x15)
model.add(layers.Conv2D(64, (3, 3), activation='relu', input_shape=(150, 150
model.add(layers.BatchNormalization())
model.add(layers.MaxPooling2D((2, 2)))

model.add(layers.Conv2D(32, (3, 3), activation='relu'))
model.add(layers.BatchNormalization())
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Dropout(0.2))

model.add(layers.Conv2D(32, (3, 3), activation='relu'))
model.add(layers.BatchNormalization())
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Dropout(0.3))

model.add(layers.GlobalAveragePooling2D())

model.add(layers.Flatten())
model.add(layers.BatchNormalization())
model.add(layers.Dense(128, activation='relu'))
model.add(layers.Dropout(0.3))

model.add(layers.Dense(128, activation='relu'))
model.add(layers.Dense(128, activation='relu'))

model.add(layers.Dense(17, activation='softmax')) # 17 vystupnich kategorii


model.compile(optimizer='adam',
              loss='categorical_crossentropy',
              metrics=['accuracy'])

model.summary()
```

```
Model: "sequential_4"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_12 (Conv2D)          (None, 148, 148, 64)      1792

 batch_normalization (BatchN  (None, 148, 148, 64)     256
 ormalization)

 max_pooling2d_11 (MaxPoolin  (None, 74, 74, 64)       0
 g2D)

 conv2d_13 (Conv2D)          (None, 72, 72, 32)        18464

 batch_normalization_1 (Batc  (None, 72, 72, 32)       128
 hNormalization)

 max_pooling2d_12 (MaxPoolin  (None, 36, 36, 32)       0
 g2D)

 dropout_11 (Dropout)        (None, 36, 36, 32)        0

 conv2d_14 (Conv2D)          (None, 34, 34, 32)        9248

 batch_normalization_2 (Batc  (None, 34, 34, 32)       128
 hNormalization)

 max_pooling2d_13 (MaxPoolin  (None, 17, 17, 32)       0
 g2D)

 dropout_12 (Dropout)        (None, 17, 17, 32)        0

 global_average_pooling2d (G  (None, 32)               0
 lobalAveragePooling2D)

 flatten_4 (Flatten)         (None, 32)                0

 batch_normalization_3 (Batc  (None, 32)               128
 hNormalization)

 dense_9 (Dense)             (None, 128)               4224

 dropout_13 (Dropout)        (None, 128)               0

 dense_10 (Dense)            (None, 128)               16512

 dense_11 (Dense)            (None, 128)               16512

 dense_12 (Dense)            (None, 17)                2193

=================================================================
Total params: 69,585
Trainable params: 69,265
Non-trainable params: 320
_________________________________________________________________
```

In [65]:
```
history = model.fit(train_images, epochs = 30, batch_size = 12, validation_d
                    verbose = 1)
```

```
Epoch 1/30
45/45 [==============================] - 80s 2s/step - loss: 2.0181 - accur
acy: 0.3104 - val_loss: 2.2147 - val_accuracy: 0.2500
Epoch 2/30
45/45 [==============================] - 79s 2s/step - loss: 1.9998 - accur
acy: 0.3215 - val_loss: 4.0020 - val_accuracy: 0.1083
Epoch 3/30
45/45 [==============================] - 83s 2s/step - loss: 2.0272 - accur
acy: 0.3222 - val_loss: 3.3736 - val_accuracy: 0.1111
Epoch 4/30
45/45 [==============================] - 79s 2s/step - loss: 2.0109 - accur
acy: 0.2979 - val_loss: 2.4103 - val_accuracy: 0.2083
Epoch 5/30
45/45 [==============================] - 79s 2s/step - loss: 2.0010 - accur
acy: 0.3146 - val_loss: 3.0917 - val_accuracy: 0.1250
Epoch 6/30
45/45 [==============================] - 85s 2s/step - loss: 1.9840 - accur
acy: 0.3215 - val_loss: 2.3825 - val_accuracy: 0.2250
Epoch 7/30
45/45 [==============================] - 79s 2s/step - loss: 1.9675 - accur
acy: 0.3444 - val_loss: 3.2455 - val_accuracy: 0.1139
Epoch 8/30
45/45 [==============================] - 79s 2s/step - loss: 1.9566 - accur
acy: 0.3313 - val_loss: 2.3509 - val_accuracy: 0.2333
Epoch 9/30
45/45 [==============================] - 79s 2s/step - loss: 1.9076 - accur
acy: 0.3528 - val_loss: 2.7576 - val_accuracy: 0.2278
Epoch 10/30
45/45 [==============================] - 83s 2s/step - loss: 1.9030 - accur
acy: 0.3326 - val_loss: 2.4944 - val_accuracy: 0.1917
Epoch 11/30
45/45 [==============================] - 79s 2s/step - loss: 1.8674 - accur
acy: 0.3660 - val_loss: 2.8205 - val_accuracy: 0.2000
Epoch 12/30
45/45 [==============================] - 79s 2s/step - loss: 1.8563 - accur
acy: 0.3500 - val_loss: 3.1226 - val_accuracy: 0.1694
Epoch 13/30
45/45 [==============================] - 79s 2s/step - loss: 1.8704 - accur
acy: 0.3618 - val_loss: 2.3363 - val_accuracy: 0.2528
Epoch 14/30
45/45 [==============================] - 83s 2s/step - loss: 1.8271 - accur
acy: 0.3722 - val_loss: 2.5009 - val_accuracy: 0.2250
Epoch 15/30
45/45 [==============================] - 79s 2s/step - loss: 1.8173 - accur
acy: 0.3639 - val_loss: 2.9036 - val_accuracy: 0.2361
Epoch 16/30
45/45 [==============================] - 79s 2s/step - loss: 1.7900 - accur
acy: 0.3931 - val_loss: 3.3726 - val_accuracy: 0.1944
Epoch 17/30
45/45 [==============================] - 83s 2s/step - loss: 1.8167 - accur
acy: 0.3632 - val_loss: 2.4511 - val_accuracy: 0.2444
Epoch 18/30
45/45 [==============================] - 79s 2s/step - loss: 1.8262 - accur
acy: 0.3667 - val_loss: 3.0114 - val_accuracy: 0.1806
Epoch 19/30
45/45 [==============================] - 79s 2s/step - loss: 1.7581 - accur
```

```
acy: 0.4118 - val_loss: 2.3460 - val_accuracy: 0.2889
Epoch 20/30
45/45 [==============================] - 84s 2s/step - loss: 1.7528 - accur
acy: 0.3979 - val_loss: 2.5080 - val_accuracy: 0.2528
Epoch 21/30
45/45 [==============================] - 79s 2s/step - loss: 1.7184 - accur
acy: 0.4069 - val_loss: 3.7229 - val_accuracy: 0.1972
Epoch 22/30
45/45 [==============================] - 79s 2s/step - loss: 1.7242 - accur
acy: 0.4097 - val_loss: 3.1340 - val_accuracy: 0.2083
Epoch 23/30
45/45 [==============================] - 80s 2s/step - loss: 1.7484 - accur
acy: 0.4007 - val_loss: 3.1399 - val_accuracy: 0.2083
Epoch 24/30
45/45 [==============================] - 79s 2s/step - loss: 1.7387 - accur
acy: 0.4069 - val_loss: 2.3027 - val_accuracy: 0.2778
Epoch 25/30
45/45 [==============================] - 79s 2s/step - loss: 1.7551 - accur
acy: 0.3854 - val_loss: 3.1996 - val_accuracy: 0.2056
Epoch 26/30
45/45 [==============================] - 79s 2s/step - loss: 1.7326 - accur
acy: 0.4000 - val_loss: 2.5943 - val_accuracy: 0.2222
Epoch 27/30
45/45 [==============================] - 79s 2s/step - loss: 1.6578 - accur
acy: 0.4313 - val_loss: 4.5970 - val_accuracy: 0.1611
Epoch 28/30
45/45 [==============================] - 79s 2s/step - loss: 1.6861 - accur
acy: 0.4333 - val_loss: 3.3785 - val_accuracy: 0.1722
Epoch 29/30
45/45 [==============================] - 83s 2s/step - loss: 1.7023 - accur
acy: 0.4014 - val_loss: 3.2135 - val_accuracy: 0.1333
Epoch 30/30
45/45 [==============================] - 79s 2s/step - loss: 1.6900 - accur
acy: 0.4250 - val_loss: 2.7567 - val_accuracy: 0.2333
```

In [66]:
```
metrics = model.evaluate(test_images)
predictions = model.predict(test_images)
predictions = tf.argmax(predictions, axis=1)
print(f"Accuracy: {metrics[1]}")
```

```
12/12 [==============================] - 5s 409ms/step - loss: 2.7567 - acc
uracy: 0.2333
12/12 [==============================] - 6s 455ms/step
Accuracy: 0.23333333432674408
```

In [67]:
```
predictions
```

Out[67]:
```
<tf.Tensor: shape=(360,), dtype=int64, numpy=
array([12,  9,  0,  0, 12,  9,  0,  0,  8, 12,  0,  0, 12,  0,  0,  0,  0,
        0, 12, 12,  4, 13,  6,  4,  8, 12, 12,  4, 13,  7, 12,  2, 16,  5,
        4,  1,  1, 13, 16, 12,  5,  5,  5,  2,  7,  2,  6,  2,  6,  2, 16,
        2,  2,  5,  2, 11,  2,  2,  2,  2,  8,  4,  9,  1,  4,  7,  7,  1,
        7, 11, 16,  0,  1,  5,  0,  2, 14,  0,  5,  8, 13,  9,  4,  6, 13,
        6, 13,  6, 12, 16,  6,  9,  6,  0,  9, 12,  0, 13, 12, 12,  5, 12,
       12,  9,  8, 11,  4,  4,  9, 12,  8,  6, 12, 16,  5,  0,  4,  4,  6,
        4,  6, 13,  4,  9, 13, 13, 12, 13, 13, 12,  6, 13,  6, 13, 13,  6,
        9, 12,  9, 13,  6,  7,  1,  5,  0, 16,  3,  9, 12,  2,  1, 12,  9,
        1,  1, 12,  1, 13, 12,  7, 12,  8,  8,  8,  8,  8, 12,  8, 12, 12,
        8, 12,  0,  9,  9,  8,  8,  8, 12,  8, 12,  9,  8,  6, 13,  0, 12,
        0, 13, 11, 13,  0,  0,  0, 12,  0,  0, 12, 11,  0,  6, 13,  4, 13,
        9, 13,  6, 13,  4, 11,  6,  6, 12, 13,  6,  6, 13,  4,  4,  4,  5,
       13,  5, 12, 12, 16,  9,  5,  5,  6, 16, 11,  8, 11,  8,  0,  0, 16,
        6, 16, 12,  8, 11, 12, 12,  8,  0, 12,  8, 12,  0, 12, 12, 12, 12,
        0,  4,  8, 12, 12, 12, 13, 13, 13,  9, 13, 13, 13,  9, 13,  9,  0,
       13, 13, 12, 13, 13, 13, 12,  0, 13,  0, 13, 13,  9,  0,  4,  0,  9,
       12, 12,  9,  9,  4, 13, 13, 13, 13, 13,  0,  5,  8, 12, 13,  0,  9,
        4,  5, 16, 11,  0, 11, 12, 12,  4,  8,  5,  0, 13,  0, 13,  1,  9,
        1,  2, 13,  2,  5,  6, 10,  0, 15,  7, 16,  4,  9,  1,  9,  3,  9,
        5, 16, 16,  4, 11,  2, 12,  7,  0, 16,  0, 16, 16,  4, 12,  1,  2,
        2, 10,  2])>
```

In [68]:
```
test_images.labels
```

Out[68]:
```
array([ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        0,  0,  0,  1,  1,  1,  1,  1,  1,  1,  1,  1,  1,  1,  1,  1,  1,
        1,  1,  1,  1,  1,  1,  2,  2,  2,  2,  2,  2,  2,  2,  2,  2,  2,
        2,  2,  2,  2,  2,  2,  2,  2,  2,  3,  3,  3,  3,  3,  3,  3,  3,
        3,  3,  3,  3,  3,  3,  3,  3,  3,  3,  3,  3,  4,  4,  4,  4,  4,
        4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  4,  5,  5,
        5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,  5,
        5,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,  6,
        6,  6,  6,  6,  7,  7,  7,  7,  7,  7,  7,  7,  7,  7,  7,  7,  7,
        7,  7,  7,  7,  7,  7,  7,  8,  8,  8,  8,  8,  8,  8,  8,  8,  8,
        8,  8,  8,  8,  8,  8,  8,  8,  8,  8,  9,  9,  9,  9,  9,  9,  9,
        9,  9,  9,  9,  9,  9,  9,  9,  9,  9,  9,  9,  9, 10, 10, 10, 10,
       10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 11,
       11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11,
       11, 11, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12, 12,
       12, 12, 12, 12, 12, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13,
       13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13,
       13, 13, 13, 13, 13, 13, 13, 13, 13, 13, 14, 14, 14, 14, 14, 14, 14,
       14, 14, 14, 14, 14, 14, 14, 14, 14, 14, 14, 14, 14, 15, 15, 15, 15,
       15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15,
       16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16, 16,
       16, 16, 16], dtype=int32)
```

In [ ]:
```

```