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1 import tensorflow as tf
2 from tensorflow.keras.callbacks import
  LearningRateScheduler
3 from tensorflow.keras.layers import Dense, Conv2D,
  MaxPooling2D, Dropout, Flatten
4 from tensorflow.keras.optimizers import Adam, SGD,
  RMSprop
5 from tensorflow.keras.preprocessing.image import
  ImageDataGenerator
6 import numpy as np
7 import matplotlib.pyplot as plt
8 import os
9 import multiprocessing
10
11 def trainCNN( ):
12
13     tf.keras.backend.clear_session()
14
15     base_dir = 'G:\GIEyA\TFG\meteor_classification\
  labeledData\evenData'
16     train_dir = os.path.join(base_dir, 'train')
17     validation_dir = os.path.join(base_dir, 'valid')
18
19     train_meteors_dir = os.path.join(train_dir, '
  meteors')
20     train_non_meteors_dir = os.path.join(train_dir, '
  non_meteors')
21     validation_meteors_dir = os.path.join(
  validation_dir, 'meteors')
22     validation_non_meteors_dir = os.path.join(
  validation_dir, 'non_meteors')
23
24     print('total training meteors images: ', len(os.
  listdir(train_meteors_dir)))
25     print('total training non-meteors images: ', len(
  os.listdir(train_non_meteors_dir)))
26     print('total validation meteors images: ', len(os
  .listdir(validation_meteors_dir)))
27     print('total validation non-meteors images: ',
  len(os.listdir(validation_non_meteors_dir)))
28
29
30     #Rescale all images by 1./255
31
```

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32     train_datagen = ImageDataGenerator(rescale=1.0/
    255,
33                                     rotation_range
    =10, # Range from 0 to 180 degrees to randomly rotate
        images
34     width_shift_range=0.05,
35     height_shift_range=0.05,
36                                     shear_range=5
    , # Shear the image by 5 degrees
37                                     zoom_range=0.1
    ,
38     horizontal_flip=True,
39                                     vertical_flip=
    True,
40                                     fill_mode='
    nearest'
41                                     )
42
43     test_datagen = ImageDataGenerator(rescale=1.0/255
    .)
44
45     train_generator = train_datagen.
    flow_from_directory(train_dir,
46
        batch_size=16,
47
        class_mode='binary',
48
        color_mode='grayscale',
49
        target_size=(480, 480)) # 640x360 = 480x480. (640
    , 360)
50     validation_generator = test_datagen.
    flow_from_directory(validation_dir,
51
        batch_size=16,
52
        class_mode='binary',
53
        color_mode='grayscale',
54

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54         target_size=(480, 480))
55
56
57     model = tf.keras.models.Sequential([
58         Conv2D(32, (2, 2), activation='relu',
59         input_shape=(480, 480, 1)), MaxPooling2D(2,2), #
60         Dropout(0.05),
61         Conv2D(16, (2, 2), activation='relu'),
62         MaxPooling2D(2, 2), #Dropout(0.05),
63         Conv2D(16, (2, 2), activation='relu'),
64         MaxPooling2D(2, 2), #Dropout(0.05),
65         Conv2D(12, (2, 2), activation='relu'),
66         MaxPooling2D(2, 2), #Dropout(0.05),
67         Conv2D(12, (2, 2), activation='relu'),
68         MaxPooling2D(2, 2), #Dropout(0.05),
69         Conv2D(8, (2, 2), activation='relu'),
70         MaxPooling2D(2, 2), #Dropout(0.05),
71         Conv2D(4, (2, 2), activation='relu'),
72         Flatten(),
73         Dense(100, activation='relu'),
74         Dense(32, activation='relu'),
75         Dense(8, activation='relu'),
76         Dense(1, activation='sigmoid')
77     ])
78
79     print(model.summary())
80     optimizer = Adam(learning_rate=5e-3) #3e-3 # Try
81     with more and less learning rate
82     model.compile(optimizer=optimizer,
83                   loss='binary_crossentropy',
84                   metrics=['accuracy'])
85
86     #39.480 -> Training 39480 = 2 x 2 x 2 x 3 x 5 x 7
87     x 47
88     #9.872 -> Validation = 2 x 2 x 2 x 2 x 617
89
90     history = model.fit(train_generator,
91                         validation_data=
92                         validation_generator,
93                         steps_per_epoch=240, #2467
94                         epochs=40, #Later train with
95                         more epochs if neccessary
96                         validation_steps=60, #617
97                         verbose=1)

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87
88     acc      = history.history['accuracy']
89     val_acc   = history.history['val_accuracy']
90     loss      = history.history['loss']
91     val_loss  = history.history['val_loss']
92     epochs = range(len(acc)) #Get number of epochs
93
94     plt.plot(epochs, acc)
95     plt.plot(epochs, val_acc)
96     plt.title('Meteor detection training and
validation accuracy')
97
98     plt.figure()
99     plt.plot(epochs, loss)
100    plt.plot(epochs, val_loss)
101    plt.title('Meteor detection training and
validation loss')
102
103    plt.show()
104
105 if __name__ == '__main__':
106     p = multiprocessing.Process(target=trainCNN)
107     p.start()
108     p.join()
```