TUGAS KLASIFIKASI IMAGE PROCESSING

Study Case : Menetukan Jalan Begus dan Jalan Yang Rusak (Jelek)

Kelompok 7 :

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Objektif Notebook

membuat classification problems dengan Python dan library tensorflow untuk memprediksi apakah gambar jalan yang diinput tergolong jalan bagus atau jalan rusak(jelek)

```
# Mount Google Drive
from google.colab import drive
drive.mount('/content/drive')
# Lihat isi direktori
!ls "/content/drive/My Drive/Jalan"
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
bahan  latih  validasi
```

Menimpor salah satu model python yaitu os

```
import os
base_dir = '/content/drive/My Drive/Jalan'
bahan_dir = os.path.join(base_dir, 'bahan')
train_dir = os.path.join(base_dir, 'latih')
validation_dir = os.path.join(base_dir, 'validasi')
```

Menggabungkan jalur bahan dengan bagus dan jelek, lalu di sini kita akan melihat jumlah data dari kelas bagus dan jelek, dan dapat terlihat masing masing data nya ada 245

```
bagus_dir = os.path.join(bahan_dir, 'bagus')
jelek_dir = os.path.join(bahan_dir, 'jelek')

print("Jumlah data kelas")
print("Jumlah jalan bagus:", len(os.listdir(bagus_dir)))
print("Jumlah jalan jelek:", len(os.listdir(jelek_dir)))
```

```
Jumlah data kelas
Jumlah jalan bagus: 300
Jumlah jalan jelek: 250
```

Selanjutnya kita akan menyeragamkan ukuran image yaitu dengan tinggi 180 dan lebar 180

```
batch_size = 32
img_height = 180
img_width = 180
```

Menggabungkan jalur untuk validasi dan juga train untuk melatih data

```
train_bagus = os.path.join(train_dir, 'bagus')
train_jelek = os.path.join(train_dir, 'jelek')

validation_bagus = os.path.join(validation_dir, 'bagus')
validation_jelek = os.path.join(validation_dir, 'jelek')
```

Membagi dataset dan mencopy nya untuk validasi dan juga train, untuk ratio pembaiannya di sini adalah 90% untuk data train dan sisanya validasi

```
import random
import os
from shutil import copyfile

def train_val_split(source, train, val, train_ratio):
    total_size = len(os.listdir(source))
    train_size = int(train_ratio * total_size)
    val_size = total_size - train_size

    randomized = random.sample(os.listdir(source), total_size)
    train_files = randomized[0:train_size]
    val_files = randomized[train_size:total_size]

    for i in train_files:
        i_file = os.path.join(source, i)
        destination = os.path.join(train, i)

        # Pastikan direktori tujuan sudah ada
        if not os.path.exists(train):
            os.makedirs(train)

        copyfile(i_file, destination)

    for i in val_files:
        i_file = os.path.join(source, i)
        destination = os.path.join(val, i)

        # Pastikan direktori tujuan sudah ada
        if not os.path.exists(val):
            os.makedirs(val)

        copyfile(i_file, destination)

# Contoh pemanggilan fungsi untuk satu kelas (aspal)
train_ratio = 0.9

source_00 = bagus_dir
train_00 = train_bagus
val_00 = validation_bagus
train_val_split(source_00, train_00, val_00, train_ratio)

source_01 = jelek_dir
train_01 = train_jelek
val_01 = validation_jelek
train_val_split(source_01, train_01, val_01, train_ratio)
```

Melihat dataset yang udah dibagi, di sini contoh kita menampilkan untuk kelas aspal dengan train 270 dan validasi 30

```
print('Jumlah All bagus   :', len(os.listdir(bagus_dir)))
print('Jumlah Train bagus   :', len(os.listdir(train_bagus)))
print('Jumlah Val bagus   :', len(os.listdir(validation_bagus)))
```

```
Jumlah All bagus   : 300
Jumlah Train bagus   : 270
Jumlah Val bagus   : 30
```

Mengimport library tensor flow

```
import tensorflow as tf
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

Penanganan overfitting pada deep dengan augmentasi data training. Pada proses augmentasi data yang sama secara random posisinya sedikit diubah.

```
train_datagen = ImageDataGenerator(
                    rescale = 1./255,
                    rotation_range = 30,
                    horizontal_flip = True,
                    shear_range = 0.3,
                    fill_mode = 'nearest',
                    width_shift_range = 0.2,
                    height_shift_range = 0.2,
                    zoom_range = 0.1
)

val_datagen = ImageDataGenerator(
                    rescale = 1./255,
                    rotation_range = 30,
                    horizontal_flip = True,
                    shear_range = 0.3,
                    fill_mode = 'nearest',
                    width_shift_range = 0.2,
                    height_shift_range = 0.2,
                    zoom_range = 0.1
)


train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size = (150, 150),
    batch_size = 10,
    class_mode = 'categorical'
)

val_generator = val_datagen.flow_from_directory(
    validation_dir,
    target_size = (150, 150),
    batch_size = 10,
    class_mode = 'categorical'
)
```

```
Found 495 images belonging to 2 classes.
Found 55 images belonging to 2 classes.
```

```
class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self, epoch, logs = {}):
        if(logs.get('accuracy') > 0.99):
            print('\nAkurasi mencapai 99%')
            self.model.stop_training = True

callbacks = myCallback()
```

Membuat arsitektur depp learning dengan convolutional, maxpooling, flatten, dropout

```
model = tf.keras.models.Sequential([
        tf.keras.layers.Conv2D(16, (3, 3), activation = 'relu', input_shape = (150, 150, 3)),
        tf.keras.layers.MaxPooling2D(2, 2),
        tf.keras.layers.Conv2D(32, (3, 3), activation = 'relu'),
        tf.keras.layers.MaxPooling2D(2, 2),
        tf.keras.layers.Conv2D(64, (3, 3), activation = 'relu'),
        tf.keras.layers.MaxPooling2D(2, 2),
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(200, activation = 'relu'),
        tf.keras.layers.Dropout(0.3,seed=112),
        tf.keras.layers.Dense(500, activation = 'relu'),
        tf.keras.layers.Dropout(0.5,seed=112),
        tf.keras.layers.Dense(2, activation = 'sigmoid'),
])
```

```
model.summary()
```

```
Model: "sequential_6"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_15 (Conv2D)          (None, 148, 148, 16)      448

 max_pooling2d_15 (MaxPooli  (None, 74, 74, 16)        0
 ng2D)

 conv2d_16 (Conv2D)          (None, 72, 72, 32)        4640

 max_pooling2d_16 (MaxPooli  (None, 36, 36, 32)        0
 ng2D)
 conv2d_17 (Conv2D)          (None, 34, 34, 64)        18496

 max_pooling2d_17 (MaxPooli  (None, 17, 17, 64)        0
 ng2D)

 flatten_5 (Flatten)         (None, 18496)             0

 dense_15 (Dense)            (None, 200)               3699400

 dropout_10 (Dropout)        (None, 200)               0

 dense_16 (Dense)            (None, 500)               100500

 dropout_11 (Dropout)        (None, 500)               0

 dense_17 (Dense)            (None, 2)                 1002

=================================================================
Total params: 3824486 (14.59 MB)
Trainable params: 3824486 (14.59 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

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

Proses training dengan epoch 10 dan step setiap epoch 13

```
history = model.fit(
            train_generator,
            steps_per_epoch = 13,
            epochs = 10,
            validation_data = val_generator,
            validation_steps = 1,
            verbose = 1,
            callbacks= [callbacks]
)
```

```
Epoch 1/10
13/13 [==============================] - 9s 712ms/step - loss: 0.6086 - accuracy: 0.6692 - val_loss: 0.6561 - val_accuracy: 0.7000
Epoch 2/10
13/13 [==============================] - 6s 416ms/step - loss: 0.5967 - accuracy: 0.6640 - val_loss: 0.3553 - val_accuracy: 0.9000
Epoch 3/10
13/13 [==============================] - 8s 622ms/step - loss: 0.4115 - accuracy: 0.7923 - val_loss: 1.2719 - val_accuracy: 0.6000
Epoch 4/10
13/13 [==============================] - 6s 445ms/step - loss: 0.5792 - accuracy: 0.7154 - val_loss: 0.4643 - val_accuracy: 0.8000
Epoch 5/10
13/13 [==============================] - 9s 674ms/step - loss: 0.5048 - accuracy: 0.7923 - val_loss: 0.2789 - val_accuracy: 0.9000
Epoch 6/10
13/13 [==============================] - 6s 437ms/step - loss: 0.4312 - accuracy: 0.8080 - val_loss: 0.5660 - val_accuracy: 0.8000
Epoch 7/10
13/13 [==============================] - 8s 594ms/step - loss: 0.4950 - accuracy: 0.7923 - val_loss: 0.5556 - val_accuracy: 0.6000
Epoch 8/10
13/13 [==============================] - 7s 481ms/step - loss: 0.4304 - accuracy: 0.8000 - val_loss: 0.7015 - val_accuracy: 0.6000
Epoch 9/10
13/13 [==============================] - 9s 732ms/step - loss: 0.4188 - accuracy: 0.8077 - val_loss: 0.2848 - val_accuracy: 0.9000
Epoch 10/10
13/13 [==============================] - 5s 398ms/step - loss: 0.5939 - accuracy: 0.7200 - val_loss: 0.7172 - val_accuracy: 0.9000
```

Untuk melihat akurasi dan validasi dapat kita lihat untuk akurasi dan validasi nya di akhir terlalu jauh.

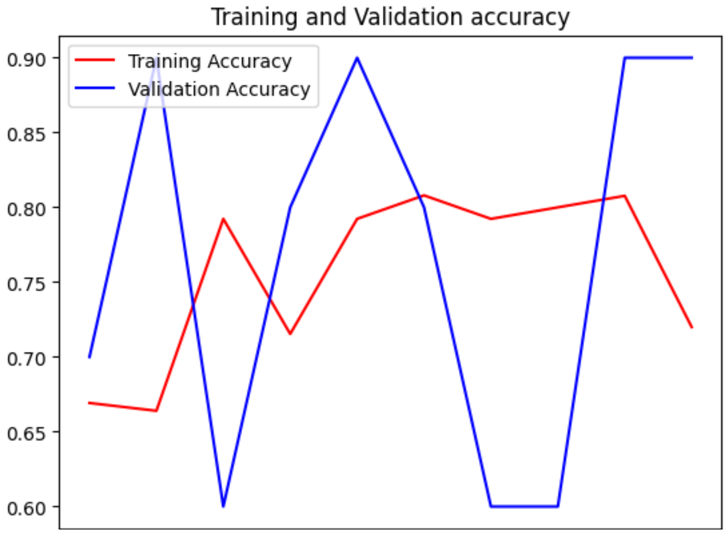
```
%matplotlib inline

import matplotlib.image as mpimg
import matplotlib.pyplot as plt

acc = history.history['accuracy']
val_acc = history.history['val_accuracy']
loss = history.history['loss']
val_loss = history.history['val_loss']

epochs = range(len(acc))

plt.plot(epochs, acc, 'r', label = 'Training Accuracy')
plt.plot(epochs, val_acc, 'b', label = 'Validation Accuracy')
plt.title('Training and Validation accuracy')
plt.legend(loc = 'best')
plt.show()
```



Membuat arsitektur deep learning lagi dengan convolutional 2 layer, dengan jumlah filter yang pertama 16 dan layer ke dua 32 filter, sisanya masih sama seperti arsitektur di atas.

```
model = tf.keras.models.Sequential([
        tf.keras.layers.Conv2D(16, (3, 3), activation = 'relu', input_shape = (150, 150, 3)),
        tf.keras.layers.MaxPooling2D(2, 2),
        tf.keras.layers.Conv2D(32, (3, 3), activation = 'relu'),
        tf.keras.layers.MaxPooling2D(2, 2),
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(200, activation = 'relu'),
        tf.keras.layers.Dropout(0.3,seed=112),
        tf.keras.layers.Dense(500, activation = 'relu'),
        tf.keras.layers.Dropout(0.5,seed=112),
        tf.keras.layers.Dense(2, activation = 'sigmoid'),
])
model.summary()
```

```
Model: "sequential_8"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 conv2d_20 (Conv2D)          (None, 148, 148, 16)      448       
                                                                 
 max_pooling2d_20 (MaxPooli  (None, 74, 74, 16)        0         
 ng2D)                                                           
                                                                 
 conv2d_21 (Conv2D)          (None, 72, 72, 32)        4640      
                                                                 
 max_pooling2d_21 (MaxPooli  (None, 36, 36, 32)        0         
 ng2D)                                                           
                                                                 
 flatten_7 (Flatten)         (None, 41472)             0         
                                                                 
 dense_21 (Dense)            (None, 200)               8294600   
                                                                 
 dropout_14 (Dropout)        (None, 200)               0         
                                                                 
 dense_22 (Dense)            (None, 500)               100500    
                                                                 
 dropout_15 (Dropout)        (None, 500)               0         
                                                                 
 dense_23 (Dense)            (None, 2)                 1002      
                                                                 
=================================================================
Total params: 8401190 (32.05 MB)
Trainable params: 8401190 (32.05 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

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

Proses training dengan epoch 10 dan step setiap epoch 13

```
history = model.fit(
            train_generator,
            steps_per_epoch = 13,
            epochs = 10,
            validation_data = val_generator,
            validation_steps = 1,
            verbose = 1,
            callbacks= [callbacks]
)
```

```
Epoch 1/10
13/13 [==============================] - 8s 494ms/step - loss: 0.9611 - accuracy: 0.5385 - val_loss: 0.3529 - val_accuracy: 0.9000
Epoch 2/10
13/13 [==============================] - 6s 456ms/step - loss: 0.6970 - accuracy: 0.5462 - val_loss: 0.6618 - val_accuracy: 0.6000
Epoch 3/10
13/13 [==============================] - 7s 545ms/step - loss: 0.6020 - accuracy: 0.7462 - val_loss: 0.8818 - val_accuracy: 0.6000
Epoch 4/10
13/13 [==============================] - 7s 548ms/step - loss: 0.5871 - accuracy: 0.7000 - val_loss: 0.5514 - val_accuracy: 0.6000
Epoch 5/10
13/13 [==============================] - 7s 559ms/step - loss: 0.6517 - accuracy: 0.6154 - val_loss: 0.6090 - val_accuracy: 0.8000
Epoch 6/10
13/13 [==============================] - 7s 536ms/step - loss: 0.6166 - accuracy: 0.7200 - val_loss: 0.3908 - val_accuracy: 0.9000
Epoch 7/10
13/13 [==============================] - 7s 573ms/step - loss: 0.6212 - accuracy: 0.6692 - val_loss: 0.5274 - val_accuracy: 0.7000
Epoch 8/10
13/13 [==============================] - 7s 548ms/step - loss: 0.5658 - accuracy: 0.7920 - val_loss: 0.3657 - val_accuracy: 0.8000
Epoch 9/10
13/13 [==============================] - 8s 611ms/step - loss: 0.4993 - accuracy: 0.7538 - val_loss: 0.9177 - val_accuracy: 0.6000
Epoch 10/10
13/13 [==============================] - 7s 495ms/step - loss: 0.5613 - accuracy: 0.7154 - val_loss: 0.3552 - val_accuracy: 0.8000
```

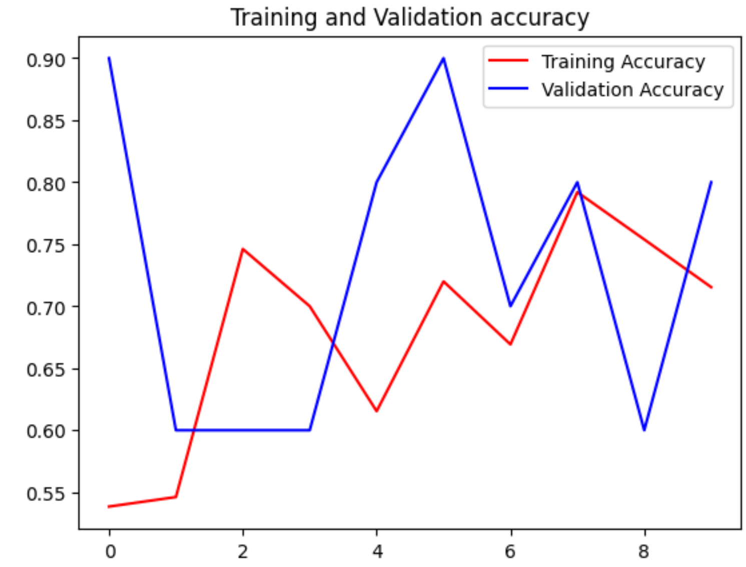
seperti kita lihat yang sekarang terlihat lebih baik dimana akurasi berada di sekitar 0.7 val akurasi 0.8 dan val loss nya 0.3

```
import matplotlib.image as mpimg
import matplotlib.pyplot as plt

acc = history.history['accuracy']
val_acc = history.history['val_accuracy']
loss = history.history['loss']
val_loss = history.history['val_loss']

epochs = range(len(acc))

plt.plot(epochs, acc, 'r', label = 'Training Accuracy')
plt.plot(epochs, val_acc, 'b', label = 'Validation Accuracy')
plt.title('Training and Validation accuracy')
plt.legend(loc = 'best')
plt.show()
```



Melakukan test dengan gambar dari internet dan menunjukan hasil nya tepat namun *percent confidence* nya hanya 73.11%

```
image_baru_url = "https://asset-2.tstatic.net/bangka/foto/bank/images/jalan-aspal-sepanjang-32-km-di-dusun-sungai-tebok-kecamatan-lubuk-b
image_baru_path = tf.keras.utils.get_file('jalan besar', origin=image_baru_url)
img = tf.keras.utils.load_img(
   image_baru_path, target_size=(150, 150)
)
plt.imshow(img)
plt.imshow(img)

img_array = tf.keras.utils.img_to_array(img)
img_array = tf.expand_dims(img_array, 0) # Create a batch


predictions = model.predict(img_array)
score = tf.nn.softmax(predictions[0])


print(score)
if np.argmax(score) == 0:
  print("This image most likely belongs to bagus with a {:.2f} percent confidence." .format(100 * np.max(score)))
else:
  print("This image most likely belongs to jelek with a {:.2f} percent confidence." .format(100 * np.max(score)))
```

```
Downloading data from https://asset-2.tstatic.net/bangka/foto/bank/images/jalan-aspal
41936/41936 [==============================] - 0s 0us/step
1/1 [==============================] - 0s 30ms/step
tf.Tensor([0.7310586  0.26894143], shape=(2,), dtype=float32)
This image most likely belongs to bagus with a 73.11 percent confidence.
```