Desnet201_512_015.ipynb

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```
from google.colab import drive
drive.mount('/content/drive')
```

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

+ Code + Text

```
import os
os.chdir('/content/drive/MyDrive/Data_Ikan_Baru/train')
```

```
#bawal putih
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Bawal Putih')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#belato
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Belato')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#Cakalang
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Cakalang')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#gembolo
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Gembolo')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#gole-gole
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Gole Gole')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#kakap merah
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Kakap Merah')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#kembung
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Kembung')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#kerapu
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Kerapu')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#tenggiri
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Tenggiri')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

```
#tuna
import os
folder_path = ('/content/drive/MyDrive/Data_Ikan_Baru/train/Ikan Tuna')
test = os.listdir(folder_path)
for fichier in test:
    if not(fichier.endswith(".jpg")):
        os.remove(os.path.join(folder_path, fichier))
```

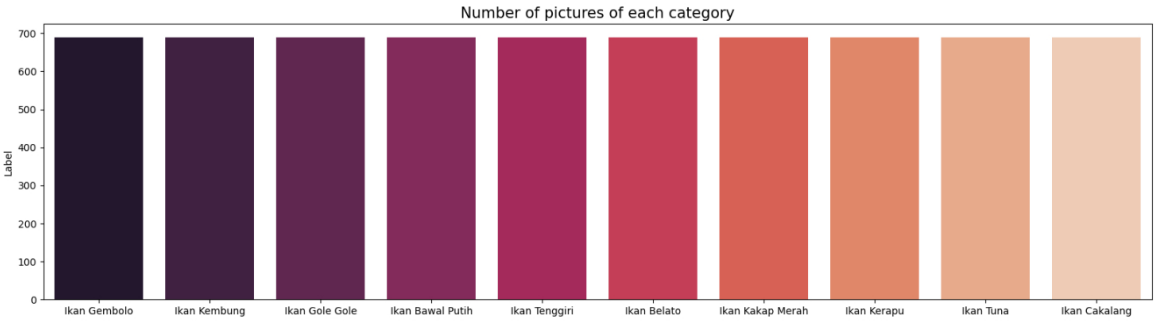
```
#cek label
from pathlib import Path
image_dir = Path('/content/drive/MyDrive/Data_Ikan_Baru/train')

# Get filepaths and labels
filepaths = list(image_dir.glob(r'**/*.jpg'))
labels = list(map(lambda x: os.path.split(os.path.split(x)[0])[1], filepaths))
```

```
import pandas as pd
filepaths = pd.Series(filepaths, name='Filepath').astype(str)
labels = pd.Series(labels, name='Label')

# Concatenate filepaths and labels
image_df = pd.concat([filepaths, labels], axis=1)

# Shuffle the DataFrame and reset index
image_df = image_df.sample(frac=1).reset_index(drop = True)

# Show the result
image_df.head(3)
```

	Filepath	Label
0	/content/drive/MyDrive/Data_Ikan_Baru/train/Ik...	Ikan Gembolo
1	/content/drive/MyDrive/Data_Ikan_Baru/train/Ik...	Ikan Kembung
2	/content/drive/MyDrive/Data_Ikan_Baru/train/Ik...	Ikan Gole Gole

```
# Display some pictures of the dataset with their labels
import matplotlib.pyplot as plt
fig, axes = plt.subplots(nrows=3, ncols=4, figsize=(10, 7),
                         subplot_kw={'xticks': [], 'yticks': []})

for i, ax in enumerate(axes.flat):
    ax.imshow(plt.imread(image_df.Filepath[i]))
    ax.set_title(image_df.Label[i])
plt.tight_layout()
plt.show()
```


```
[ ] # Display the number of pictures of each category
    import seaborn as sns
    vc = image_df['Label'].value_counts()
    plt.figure(figsize=(20,5))
    sns.barplot(x = vc.index, y = vc, palette = "rocket")
    plt.title("Number of pictures of each category", fontsize = 15)
    plt.show()
```




```
[ ] #Shuffle
    from sklearn.utils import shuffle
    from sklearn.model_selection import train_test_split
    # Separate in train and test data
    train_df, validasi_df = train_test_split(image_df, train_size=0.8, shuffle=True, random_state=1)
```

```
[ ] #data generator
    from keras.preprocessing.image import ImageDataGenerator
    train_datagen = ImageDataGenerator(
        rescale=1./255,
        rotation_range=20,
        width_shift_range=0.2,
        height_shift_range=0.2,
        shear_range=0.2,
        zoom_range=0.2,
        fill_mode='nearest',
        brightness_range=[0.8, 1.2],
        horizontal_flip=True)

    val_datagen = ImageDataGenerator(rescale=1./255)

    train_data = train_datagen.flow_from_dataframe(dataframe=train_df,
                                            x_col='Filepath',
                                            y_col='Label',
                                           seed=0,
                                           target_size=(416,416),
                                           batch_size=16,
                                           shuffle=True,
                                           class_mode = 'categorical',
                                          subset='training',
                                           )

    validasi_data = val_datagen.flow_from_dataframe(dataframe=validasi_df,
                                          x_col='Filepath',
                                          y_col='Label',
                                           seed=0,
                                           target_size=(416,416),
                                           batch_size=16,
                                           shuffle=False,
                                           class_mode = 'categorical',
                                           )
```

```
Found 5520 validated image filenames belonging to 10 classes.
Found 1380 validated image filenames belonging to 10 classes.
```

```
[ ] from keras import Model, Input
    input_shape = (416,416,3)
    model_input = Input(shape=input_shape)
```

```
[ ]
    from keras.applications.densenet import DenseNet201
    from keras import layers
    from keras import Model, Input
    from tensorflow.keras.optimizers import RMSprop

    from keras.callbacks import ReduceLROnPlateau, EarlyStopping

    import torchvision.models as models
    %matplotlib inline
    import matplotlib.pyplot as plt
```

```
[ ] denseNet = DenseNet201(input_shape=input_shape, input_tensor=model_input, include_top=False, weights="imagenet")

    Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet201_weights_tf_dim_ordering_tf_kernels_notop.h5
    74836368/74836368 [==============================] - 0s 0us/step
```

```
    for layer in denseNet.layers:
        layer.trainable = False
```

```
[ ] denseNet_last_layer = denseNet.get_layer('relu')
    print('last layer output shape:', denseNet_last_layer.output_shape)
    denseNet_last_output = denseNet_last_layer.output

    last layer output shape: (None, 13, 13, 1920)
```

```
[ ] # Flatten the output layer to 1 dimension
    x_denseNet = layers.GlobalMaxPooling2D()(denseNet_last_output)
    # Add a fully connected layer with 512 hidden units and ReLU activation
    x_denseNet = layers.Dense(512, activation='relu')(x_denseNet)
    # Add a dropout rate of 0.7
    x_denseNet = layers.Dropout(0.15)(x_denseNet)
    # Add a final sigmoid layer for classification
    x_denseNet = layers.Dense(10, activation='softmax')(x_denseNet)

    # Configure and compile the model

    denseNet_model = Model(model_input, x_denseNet)
    optimizer = RMSprop(learning_rate=0.0001)
    denseNet_model.compile(loss='categorical_crossentropy',
                  optimizer=optimizer,
                  metrics=['accuracy'])
```

```
[ ]
```

```
[ ] # denseNet_model.load_weights("DenseNetFull.h5")
    # denseNet_model.DenseNet201(pretrained=True)
    denseNet_model.summary()
```

```
Model: "model"
_________________________________________________________________________________________________
 Layer (type)                Output Shape              Param #     Connected to
=================================================================================================
 input_1 (InputLayer)        [(None, 416, 416, 3       0           []
                             )]

 zero_padding2d (ZeroPadding2D)  (None, 422, 422, 3)   0           ['input_1[0][0]']

 conv1/conv (Conv2D)         (None, 208, 208, 64       9408        ['zero_padding2d[0][0]']
                             )

 conv1/bn (BatchNormalization)  (None, 208, 208, 64    256         ['conv1/conv[0][0]']
                             )

 conv1/relu (Activation)     (None, 208, 208, 64       0           ['conv1/bn[0][0]']
                             )

 zero_padding2d_1 (ZeroPadding2  (None, 210, 210, 64   0          ['conv1/relu[0][0]']
 D)                          )

 pool1 (MaxPooling2D)        (None, 104, 104, 64       0           ['zero_padding2d_1[0][0]']
                             )

 conv2_block1_0_bn (BatchNormal  (None, 104, 104, 64   256         ['pool1[0][0]']
 ization)                    )

 conv2_block1_0_relu (Activatio  (None, 104, 104, 64   0          ['conv2_block1_0_bn[0][0]']
 n)                          )

 conv2_block1_1_conv (Conv2D)   (None, 104, 104, 12    8192        ['conv2_block1_0_relu[0][0]']
                             8)

 conv2_block1_1_bn (BatchNormal  (None, 104, 104, 12   512         ['conv2_block1_1_conv[0][0]']
 ization)                    8)

 conv2_block1_1_relu (Activatio  (None, 104, 104, 12   0          ['conv2_block1_1_bn[0][0]']
 n)                          8)

 conv2_block1_2_conv (Conv2D)   (None, 104, 104, 32    36864       ['conv2_block1_1_relu[0][0]']
                             )

 conv2_block1_concat (Concatena  (None, 104, 104, 96   0          ['pool1[0][0]',
 te)                         )                                    'conv2_block1_2_conv[0][0]']

 conv2_block2_0_bn (BatchNormal  (None, 104, 104, 96   384        ['conv2_block1_concat[0][0]']
 ization)                    )

 conv2_block2_0_relu (Activatio  (None, 104, 104, 96   0          ['conv2_block2_0_bn[0][0]']
 n)                          )

 conv2_block2_1_conv (Conv2D)   (None, 104, 104, 12    12288       ['conv2_block2_0_relu[0][0]']
                             8)

 conv2_block2_1_bn (BatchNormal  (None, 104, 104, 12   512         ['conv2_block2_1_conv[0][0]']
 ization)                    8)

 conv2_block2_1_relu (Activatio  (None, 104, 104, 12   0          ['conv2_block2_1_bn[0][0]']
```

```
import tensorflow as tf
class myCallback(tf.keras.callbacks.Callback):
  def on_epoch_end(self, epoch, logs={}):
    if(logs.get('loss') < 0.1 and logs.get('val_loss') < 0.1):
      print("\Stopped, Akurasi mencapai 98%")
      self.model.stop_training = True;
```

```
from tensorflow.keras.callbacks import ModelCheckpoint

# Tentukan path penyimpanan model
checkpoint_path = '/content/drive/MyDrive/Percobaan-Desnet201-1/Desnet201-512-015.h5'

# Buat callback ModelCheckpoint
checkpoint_callback = ModelCheckpoint(filepath=checkpoint_path,
                                      monitor='val_loss',  # Metrik yang akan dipantau
                                      save_best_only=True,  # Hanya menyimpan model terbaik
                                      save_weights_only=False,  # Menyimpan seluruh model
                                      mode='min',  # Mode pemantauan (misalnya, 'min', 'max', atau 'auto')
                                      verbose=1)  # Menampilkan pesan saat menyimpan
```

```
[ ] # desnet
    callbacks= myCallback()
    history_denseNet = denseNet_model.fit(
                    train_data,
                    validation_data=validasi_data,
                    steps_per_epoch=train_data.n/16,
                    validation_steps=validasi_data.n/16,
                    epochs=20,
                    callbacks=([callbacks],[checkpoint_callback]))
```

```
Epoch 1/20
345/345 [==============================] - ETA: 0s - loss: 0.1013 - accuracy: 0.9659
Epoch 1: loss improved from inf to 0.10132, saving model to /content/drive/MyDrive/Percobaan-Desnet201-1/Desnet201-512-015.h5
345/345 [==============================] - 4451s 13s/step - loss: 0.1013 - accuracy: 0.9659 - val_loss: 0.0620 - val_accuracy: 0.9790
Epoch 2/20
345/345 [==============================] - ETA: 0s - loss: 0.1123 - accuracy: 0.9583
Epoch 2: loss did not improve from 0.10132
345/345 [==============================] - 373s 1s/step - loss: 0.1123 - accuracy: 0.9583 - val_loss: 0.0696 - val_accuracy: 0.9783
Epoch 3/20
345/345 [==============================] - ETA: 0s - loss: 0.1171 - accuracy: 0.9621
Epoch 3: loss did not improve from 0.10132
345/345 [==============================] - 357s 1s/step - loss: 0.1171 - accuracy: 0.9621 - val_loss: 0.1236 - val_accuracy: 0.9609
Epoch 4/20
345/345 [==============================] - ETA: 0s - loss: 0.0960 - accuracy: 0.9683\Stopped, Akurasi mencapai 98%

Epoch 4: loss improved from 0.10132 to 0.09596, saving model to /content/drive/MyDrive/Percobaan-Desnet201-1/Desnet201-512-015.h5
345/345 [==============================] - 360s 1s/step - loss: 0.0960 - accuracy: 0.9683 - val_loss: 0.0653 - val_accuracy: 0.9790
```

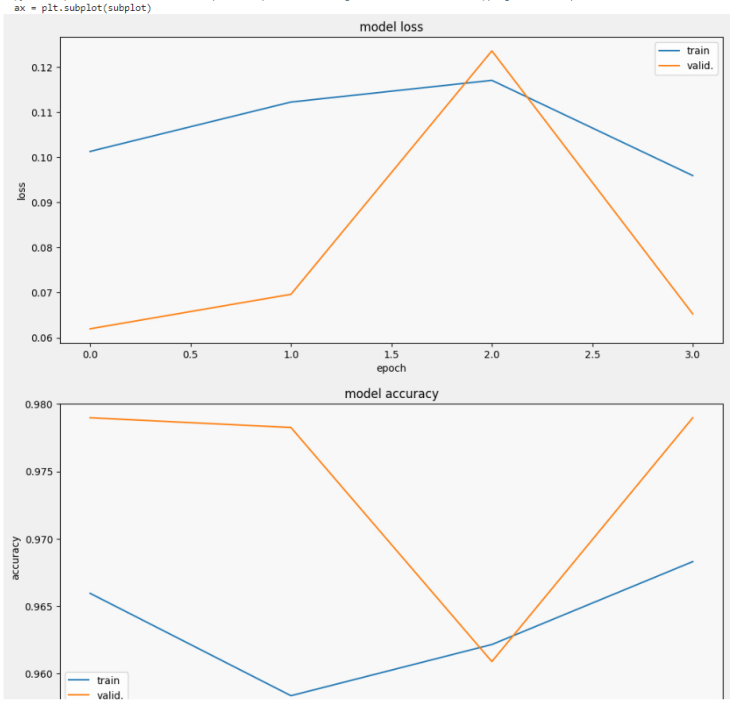
```
[ ]
```

```
[ ] #plotting
    import matplotlib.pyplot as plt
    def display_training_curves(training, validation, title, subplot):

        if subplot%10==1: # set up the subplots on the first call
            plt.subplots(figsize=(10,10), facecolor='#F0F0F0')
            plt.tight_layout()
        ax = plt.subplot(subplot)
        ax.set_facecolor('#F8F8F8')
        ax.plot(training)
        ax.plot(validation)
        ax.set_title('model '+ title)
        ax.set_ylabel(title)
        #ax.set_ylim(0.28,1.05)
        ax.set_xlabel('epoch')
```

```
    ax.legend(['train', 'valid.'])
```

```
[ ] #display
    display_training_curves(
        history_denseNet.history['loss'],
        history_denseNet.history['val_loss'],
        'loss', 211)
    display_training_curves(
        history_denseNet.history['accuracy'],
        history_denseNet.history['val_accuracy'],
        'accuracy', 212)
```

```
<ipython-input-27-c272c2965b67>:8: MatplotlibDeprecationWarning: Auto-removal of overlapping axes is deprecated since 3.6 and will be removed two minor releases later; explicitly call ax.remove() as needed.
  ax = plt.subplot(subplot)
```



Evaluation dan Prediction

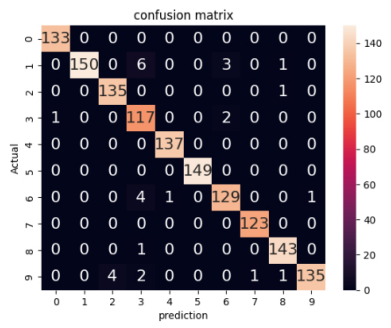
```
[ ] # Predict the label of the test_images
    import numpy as np
    pred = denseNet_model.predict(validasi_data)
    pred = np.argmax(pred,axis=1)

    # Map the label
    labels = (train_data.class_indices)
    labels = dict((v,k) for k,v in labels.items())
    pred = [labels[k] for k in pred]

    # Display the result
    print(f'The first 10 predictions: {pred[:10]}')
```

```
87/87 [==============================] - 26s 263ms/step
The first 10 predictions: ['Ikan Cakalang', 'Ikan Tuna', 'Ikan Tenggiri', 'Ikan Gembolo', 'Ikan Gembolo', 'Ikan Cakalang', 'Ikan Tuna', 'Ikan Gembolo', 'Ikan Tuna', 'Ikan Bawal Putih']
```

```
[ ] #classification Report
    from sklearn.metrics import classification_report
    from sklearn.metrics import confusion_matrix

    y_test = list(validasi_df.Label)
    print(classification_report(y_test, pred))
```

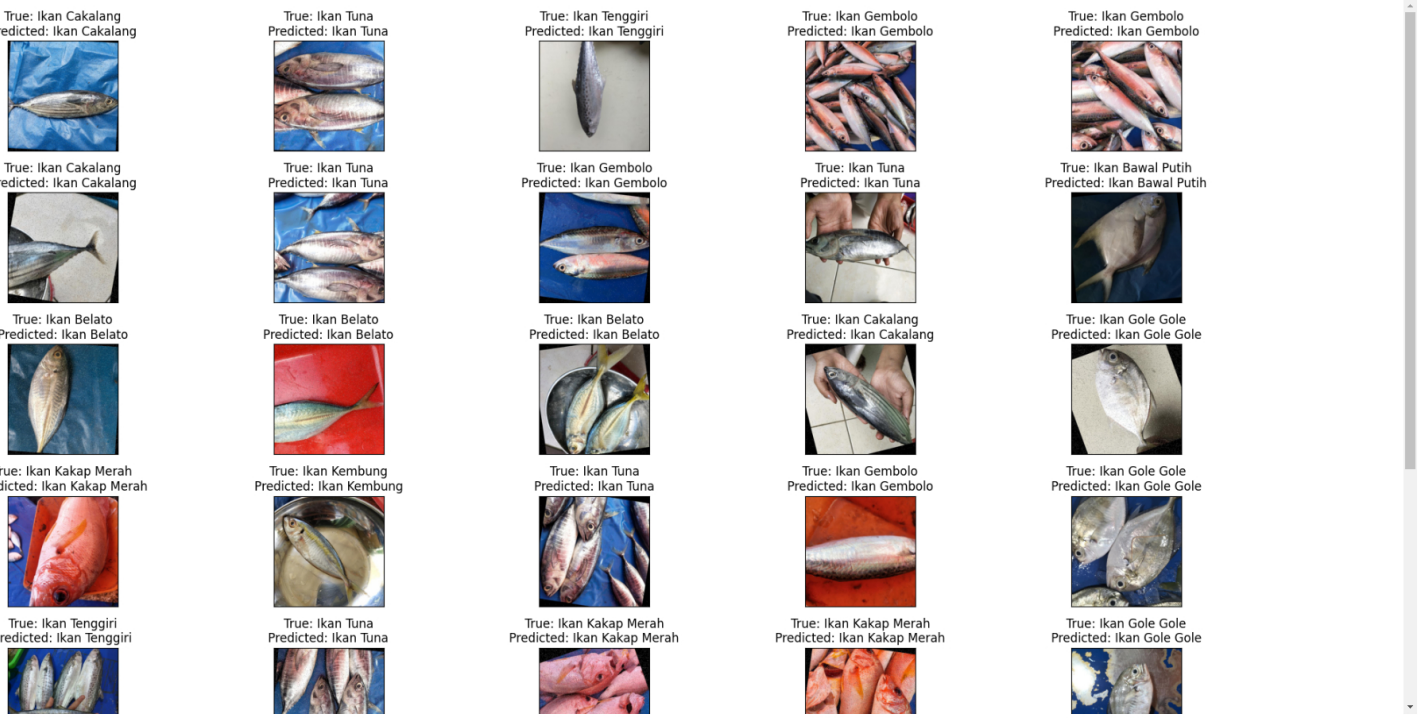
```
                  precision    recall  f1-score   support

Ikan Bawal Putih       1.00      0.99      1.00       134
     Ikan Belato       0.94      1.00      0.97       150
   Ikan Cakalang       0.99      0.97      0.98       139
    Ikan Gembolo       0.97      0.90      0.94       130
  Ikan Gole Gole       1.00      0.99      1.00       138
Ikan Kakap Merah       1.00      1.00      1.00       149
    Ikan Kembung       0.96      0.96      0.96       134
     Ikan Kerapu       1.00      0.99      1.00       124
   Ikan Tenggiri       0.99      0.98      0.99       146
       Ikan Tuna       0.94      0.99      0.97       136

        accuracy                           0.98      1380
       macro avg       0.98      0.98      0.98      1380
    weighted avg       0.98      0.98      0.98      1380
```

```
    import seaborn as sns
    import pandas as pd
    cm  = confusion_matrix(pred,y_test)
    df_cm = pd.DataFrame(cm, index = [i for i in range(10)],
                         columns = [i for i in range(10)])
    sns.heatmap(df_cm, annot=True, annot_kws={"size": 16}, fmt='d')
    plt.title('confusion matrix')
    plt.xlabel('prediction')
    plt.ylabel('Actual');
```




```
[ ] # Display some pictures of the dataset with their labels and the predictions
```

```
fig, axes = plt.subplots(nrows=7, ncols=5, figsize=(20, 15),
                         subplot_kw={'xticks': [], 'yticks': []})

for i, ax in enumerate(axes.flat):
    ax.imshow(plt.imread(validasi_df.Filepath.iloc[i]))
    ax.set_title(f"True: {validasi_df.Label.iloc[i]}\nPredicted: {pred[i]}")
plt.tight_layout()
plt.show()
```



Load Model

```
[ ] import tensorflow as tf
    class myCallback(tf.keras.callbacks.Callback):
      def on_epoch_end(self, epoch, logs={}):
        if(logs.get('loss') < 0.1 and logs.get('val_loss') < 0.1):
          print("\Stopped, Akurasi mencapai 98%")
          self.model.stop_training = True;
```

```
from tensorflow.keras.callbacks import ModelCheckpoint

# Tentukan path penyimpanan model
checkpoint_path = '/content/drive/MyDrive/Percobaan-Desnet201-1/Desnet201-512-015.h5'

# Buat callback ModelCheckpoint
checkpoint_callback = ModelCheckpoint(filepath=checkpoint_path,
                                      monitor='loss',  # Metrik yang akan dipantau
                                      save_best_only=True,  # Hanya menyimpan model terbaik
                                      save_weights_only=False,  # Menyimpan seluruh model
                                      mode='min',  # Mode pemantauan (misalnya, 'min', 'max', atau 'auto')
                                      verbose=1)  # Menampilkan pesan saat menyimpan
```

```
[ ] from tensorflow.keras.models import load_model
    denseNet_model = load_model(checkpoint_path)
```

```
[ ] from tensorflow.keras.optimizers import RMSprop
    optimizer = RMSprop(learning_rate=0.0001)
    denseNet_model.compile(loss='categorical_crossentropy',
                  optimizer=optimizer,
                  metrics=['accuracy'])
```

```
[ ]
```

```
MODEL_BASE_PATH = "/content/drive/MyDrive"
PROJECT_NAME = "Percobaan-Desnet201-1"
SAVE_MODEL_NAME = "Final(26-5-23 : 02 AM)-Desnet201-512-015.h5"
save_model_path = os.path.join(MODEL_BASE_PATH, PROJECT_NAME, SAVE_MODEL_NAME)
if os.path.exists(os.path.join(MODEL_BASE_PATH, PROJECT_NAME)) == False:
    os.makedirs(os.path.join(MODEL_BASE_PATH, PROJECT_NAME))

print('Saving Model At {}...'.format(save_model_path))
denseNet_model.save(save_model_path,include_optimizer=False)
```

```
Saving Model At /content/drive/MyDrive/Percobaan-Desnet201-1/Final(26-5-23 : 02 AM)-Desnet201-512-015.h5...
```