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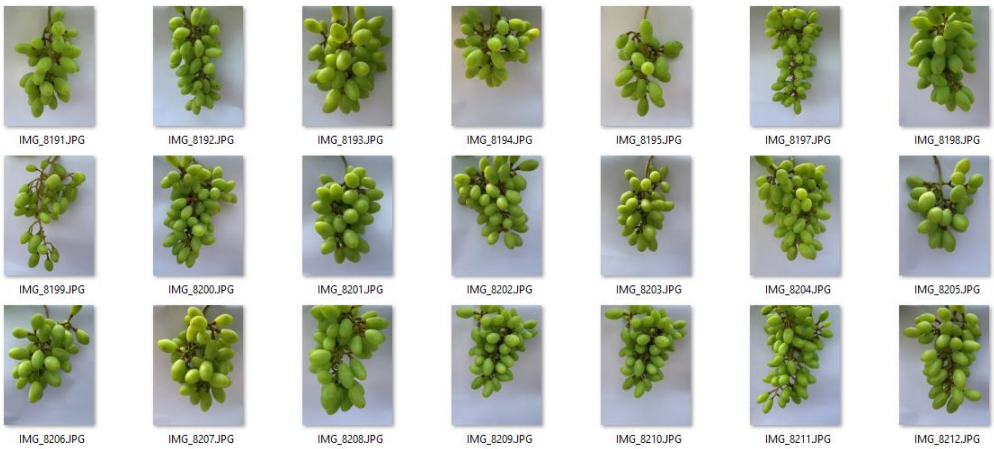
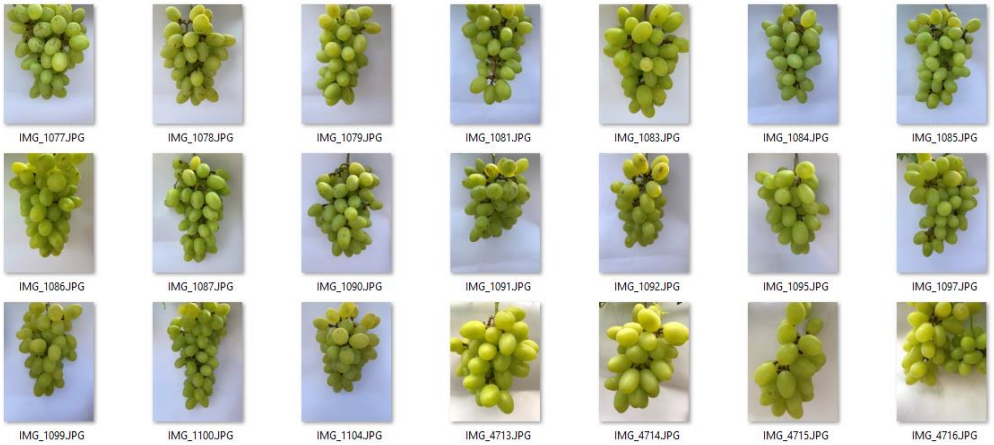
# LAMPIRAN

Lampiran 1 Contoh *Dataset*

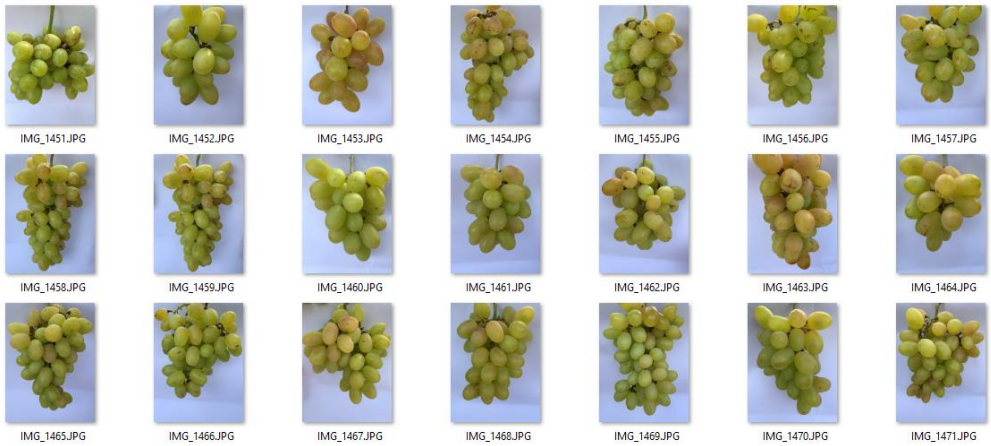
- Kelas Mentah




- Kelas Mengkal




- Kelas Matang



Lampiran 2 *Source Code* Program

a. *Resize* gambar

```
# Library yang dibutuhkan
import cv2
import numpy as np
from os import listdir
from os.path import isfile, join
from pathlib import Path
import argparse
import numpy

# Deklarasi variabel ArgumentParser
ap = argparse.ArgumentParser()

ap.add_argument("-i", "--image",
                required=True,
                help="Path to folder")

args = vars(ap.parse_args())

# Membaca image yang ada pada folder image yang disediakan
mypath = args["image"]
onlyfiles = [f for f in listdir(mypath) if isfile(join(mypath,
f))]
images = numpy.empty(len(onlyfiles), dtype=object)

# Iterasi pada setiap image
for n in range(0, len(onlyfiles)):

    path = join(mypath, onlyfiles[n])
    images[n] = cv2.imread(join(mypath, onlyfiles[n]),
                           cv2.IMREAD_UNCHANGED)

    # Proses Load image pada variabel img
    img = cv2.imread(path, 1)

    # Menentukan skala resize
    resize_scaling = 30
    resize_width = int(img.shape[1] * resize_scaling/100)
    resize_height = int(img.shape[0] * resize_scaling/100)
    resized_dimensions = (resize_width, resize_height)

    # Membuat image baru menggunakan dimensi yang sudah
ditentukan
    resized_image = cv2.resize(img, resized_dimensions,
                               interpolation=cv2.INTER_AREA)

    # Menyimpan image hasil resize di output folder
```

```
    cv2.imwrite(
    'output/' + str(resize_width) + str(resize_height) + str(n) +
'_resized.jpg', resized_image)

print("Images resized Successfully")
```

b. *Import Library*

```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Activation, Dense, Flatt
en, BatchNormalization, Conv2D, MaxPooling2D
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.metrics import categorical_crossentrop
y
from tensorflow.keras.preprocessing.image import ImageDataGe
nerator
from sklearn.metrics import confusion_matrix
import matplotlib.pyplot as plt
import numpy as np
import os
```

c. *Import Dataset*

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

```
data_dir = '/content/drive/MyDrive/Skripsi/dataset2'
os.listdir(data_dir)
```

```
data = tf.keras.utils.image_dataset_from_directory('/content
/drive/MyDrive/Skripsi/dataset2')
```

```
print('Total anggur Matang :', len(os.listdir('/content/driv
e/MyDrive/Skripsi/dataset2/matang')))
print('Total anggur Mengkal :', len(os.listdir('/content/dri
ve/MyDrive/Skripsi/dataset2/mengkal')))
print('Total anggur Mentah :', len(os.listdir('/content/driv
e/MyDrive/Skripsi/dataset2/mentah')))
```

d. *Preview* sampel *dataset*

```
fig, ax = plt.subplots(ncols=5, figsize=(20,20))
for idx, img in enumerate(batch[0][:5]):
    ax[idx].imshow(img.astype(int))
    ax[idx].title.set_text(batch[1][idx])
```

e. *Build model* menggunakan *ResNet152v2*

```
import tensorflow as tf
from tensorflow.keras.layers import Input
from tensorflow.keras.applications import ResNet50
from tensorflow.keras.applications import ResNet152V2
model = tf.keras.models.Sequential([
    ResNet152V2(weights="imagenet", include_top=False, input
_tensor=Input(shape=(256, 256, 3))),
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'),
    tf.keras.layers.Dense(256, activation='relu'),
    tf.keras.layers.Dense(3, activation='softmax')
])
model.layers[0].trainable = False
```

```
model.compile(optimizer=Adam(learning_rate=0.01), loss='spar
se_categorical_crossentropy', metrics=['accuracy'])
```

f. Proses *training*

```
logdir='logs'
tensorboard_callback = tf.keras.callbacks.TensorBoard(log_di
r=logdir)
hist = model.fit(train, validation_data=val, epochs=20, call
backs=[tensorboard_callback])
```

g. *Plotting accuracy* dan *loss*

```
fig = plt.figure()
plt.plot(hist.history['loss'], color='teal', label='loss')
plt.plot(hist.history['val_loss'], color='orange', label='va
l_loss')
fig.suptitle('Loss', fontsize=20)
plt.legend(loc="upper left")
plt.show()
```

```
fig = plt.figure()
plt.plot(hist.history['accuracy'], color='teal', label='accu
racy')
plt.plot(hist.history['val_accuracy'], color='orange', label
='val_accuracy')
fig.suptitle('Accuracy', fontsize=20)
plt.legend(loc="upper left")
plt.show()
```

h. *Testing* model

```
img = cv2.imread('/content/drive/MyDrive/Skripsi/tes2/matang
/matang20.jpg')
plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
plt.show()

resize = tf.image.resize(img, (256,256))
plt.imshow(resize.numpy().astype(int))
plt.show()

yhat = model.predict(np.expand_dims(resize/255, 0))
yhat
```

```
img = cv2.imread('/content/drive/MyDrive/Skripsi/tes2/mengka
l/mengkal20.jpg')
plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
plt.show()

resize = tf.image.resize(img, (256,256))
plt.imshow(resize.numpy().astype(int))
plt.show()

yhat = model.predict(np.expand_dims(resize/255, 0))
yhat
```

```
img = cv2.imread('/content/drive/MyDrive/Skripsi/tes2/mentah
/mentah20.jpg')

plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
plt.show()

resize = tf.image.resize(img, (256,256))
plt.imshow(resize.numpy().astype(int))
plt.show()

yhat = model.predict(np.expand_dims(resize/255, 0))
yhat
```

i. Implementasi model ke Website

```
from flask import Flask, render_template, request, jsonify
from keras.models import load_model

from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import load_img
from tensorflow.keras.preprocessing.image import img_to_array
from keras_applications.mobilenet_v2 import preprocess_input
from keras_applications.mobilenet_v2 import decode_predictions
from keras_applications.mobilenet_v2 import MobileNetV2
```

```
import tensorflow as tf
from tensorflow import keras
from skimage import transform, io
import numpy as np
import os
from PIL import Image
from datetime import datetime
from flask_cors import CORS


app = Flask(__name__)

model = load_model("model.h5")


UPLOAD_FOLDER = 'static/uploads/'
app.config['UPLOAD_FOLDER'] = UPLOAD_FOLDER
ALLOWED_EXTENSIONS = {'png', 'jpg', 'jpeg', 'gif', 'tiff',
'webp', 'jfif'}

def allowed_file(filename):
    return '.' in filename and filename.rsplit('.', 1)[1].lower()
in ALLOWED_EXTENSIONS

# routes
@app.route("/", methods=['GET', 'POST'])
def main():
    return render_template("cnn.html")

@app.route("/classification", methods = ['GET', 'POST'])
def classification():
    return render_template("classifications.html")

@app.route('/submit', methods=['POST'])
def predict():
    if 'file' not in request.files:
        resp = jsonify({'message': 'No image in the request'})
        resp.status_code = 400
        return resp
    files = request.files.getlist('file')
    filename = "temp_image.png"
    errors = {}
    success = False
    for file in files:
        if file and allowed_file(file.filename):
            file.save(os.path.join(app.config['UPLOAD_FOLDER'],
filename))
            success = True
        else:
```

```
            errors["message"] = 'File type of {} is not
allowed'.format(file.filename)

    if not success:
        resp = jsonify(errors)
        resp.status_code = 400
        return resp
    img_url = os.path.join(app.config['UPLOAD_FOLDER'], filename)

    # convert image to RGB
    img = Image.open(img_url).convert('RGB')
    now = datetime.now()
    predict_image_path = 'static/uploads/' +
now.strftime("%d%m%y-%H%M%S") + ".png"
    image_predict = predict_image_path
    img.convert('RGB').save(image_predict, format="png")
    img.close()

    # prepare image for prediction
    img = image.load_img(predict_image_path, target_size=(256,
256, 3))
    x = image.img_to_array(img)
    x = x/127.5-1
    x = np.expand_dims(x, axis=0)
    images = np.vstack([x])

    # predict
    prediction_array_model = model.predict(images)

    # prepare api response
    class_names = ['Matang', 'Mengkal', 'Mentah']
    # def argmedian(x):
    #      return np.argpartition(x, len(x) // 2)[len(x) // 2]
    sorted_indexes = np.argsort(prediction_array_model[0])
    median_index = sorted_indexes[len(sorted_indexes) // 2]
    # result = {
    #     "filename" : predict_image_path,
    #     "prediction": class_names[np.argmax(prediction_array)],
    #     "confidence": '{:2.0f}%'.format(100 *
np.max(prediction_array))
    # }

    return render_template("classifications.html", img_path =
predict_image_path,
                           predictionmodelmax =
class_names[np.argmax(prediction_array_model)],
                           predictionmodelmin =
class_names[np.argmin(prediction_array_model)],
```

```
                        predictionmodelmid =
class_names[median_index],
                        confidencemax = '{:2.0f}%'.format(100 *
np.max(prediction_array_model)),
                        confidencemedian = '{:2.0f}%'.format(100
* np.median(prediction_array_model)),
                        confidencemin = '{:2.0f}%'.format(100 *
np.min(prediction_array_model))
                        )

if __name__ =='__main__':
    #app.debug = True
    app.run(debug = True)
```

Lampiran 3 Hasil proses *Training* dan *Validasi*

```
Epoch 1/20
15/15 [==============================] - 22s 830ms/step -
loss: 11.1560 - accuracy: 0.6958 - val_loss: 0.9435 -
val_accuracy: 0.8854

Epoch 2/20
15/15 [==============================] - 11s 665ms/step -
loss: 1.0316 - accuracy: 0.8292 - val_loss: 0.8684 -
val_accuracy: 0.8333

Epoch 3/20
15/15 [==============================] - 9s 542ms/step - loss:
0.6483 - accuracy: 0.8021 - val_loss: 0.3383 - val_accuracy:
0.8542

Epoch 4/20
15/15 [==============================] - 10s 633ms/step -
loss: 0.3497 - accuracy: 0.8313 - val_loss: 0.4236 -
val_accuracy: 0.8854

Epoch 5/20
15/15 [==============================] - 9s 526ms/step - loss:
0.3689 - accuracy: 0.8750 - val_loss: 0.2676 - val_accuracy:
0.8646

Epoch 6/20
15/15 [==============================] - 9s 533ms/step - loss:
0.3579 - accuracy: 0.8625 - val_loss: 0.3265 - val_accuracy:
0.8854

Epoch 7/20
15/15 [==============================] - 10s 610ms/step -
loss: 0.5303 - accuracy: 0.8771 - val_loss: 0.3703 -
val_accuracy: 0.8750

Epoch 8/20
15/15 [==============================] - 9s 527ms/step - loss:
0.6304 - accuracy: 0.8833 - val_loss: 0.3854 - val_accuracy:
0.8854

Epoch 9/20
15/15 [==============================] - 10s 533ms/step -
loss: 0.9273 - accuracy: 0.9187 - val_loss: 0.2383 -
val_accuracy: 0.9375

Epoch 10/20
15/15 [==============================] - 11s 673ms/step -
loss: 0.8028 - accuracy: 0.9104 - val_loss: 0.3480 -
val_accuracy: 0.8333

Epoch 11/20
15/15 [==============================] - 11s 668ms/step -
loss: 0.3977 - accuracy: 0.8646 - val_loss: 0.4058 -
val_accuracy: 0.8750
```

```
Epoch 12/20
15/15 [==============================] - 12s 674ms/step -
loss: 0.2032 - accuracy: 0.9146 - val_loss: 0.1733 -
val_accuracy: 0.9271

Epoch 13/20
15/15 [==============================] - 11s 668ms/step -
loss: 0.2847 - accuracy: 0.9000 - val_loss: 0.1790 -
val_accuracy: 0.9167

Epoch 14/20
15/15 [==============================] - 9s 526ms/step - loss:
0.2768 - accuracy: 0.9146 - val_loss: 0.2564 - val_accuracy:
0.8958

Epoch 15/20
15/15 [==============================] - 10s 605ms/step -
loss: 0.1788 - accuracy: 0.9187 - val_loss: 0.1535 -
val_accuracy: 0.9271

Epoch 16/20
15/15 [==============================] - 11s 669ms/step -
loss: 0.1547 - accuracy: 0.9312 - val_loss: 0.1044 -
val_accuracy: 0.9271

Epoch 17/20
15/15 [==============================] - 11s 667ms/step -
loss: 0.1215 - accuracy: 0.9333 - val_loss: 0.1189 -
val_accuracy: 0.9271

Epoch 18/20
15/15 [==============================] - 11s 676ms/step -
loss: 0.1314 - accuracy: 0.9333 - val_loss: 0.1886 -
val_accuracy: 0.8750

Epoch 19/20
15/15 [==============================] - 10s 587ms/step -
loss: 0.1230 - accuracy: 0.9292 - val_loss: 0.0762 -
val_accuracy: 0.9479

Epoch 20/20
15/15 [==============================] - 11s 667ms/step -
loss: 0.1156 - accuracy: 0.9417 - val_loss: 0.1102 -
val_accuracy: 0.9479
```