uas_kelompok5

June 26, 2024

0.0.1 Import Libraries

[ ]:
```
import cv2 as cv
import numpy as np
import pandas as pd
import os
from matplotlib import pyplot as plt
from sklearn.preprocessing import MinMaxScaler, OneHotEncoder
from sklearn.model_selection import train_test_split
from tensorflow import keras
from keras import datasets, layers, models
from tensorflow.keras.utils import image_dataset_from_directory
from tensorflow.keras.callbacks import ModelCheckpoint
from tensorflow.keras.preprocessing import image
import random
```

0.0.2 TAHAP PREPROCESSING

Resizing and Thresholding

[ ]:
```
def thresholding(input_folder, output_folder):
    #Samakan ukuran berdasarkan pixel
    new_size = (240, 240)

    # Buat folder baru untuk menyimpan hasil resizing jika belum ada
    if not os.path.exists(output_folder):
        os.makedirs(output_folder)

    # Loop melalui semua file dalam folder
    for filename in os.listdir(input_folder):
        if filename.endswith(('.jpg', '.jpeg', '.png')):  # Filter file gambar
            img_path = os.path.join(input_folder, filename)

            img = cv.imread(img_path,0)

            # Resize gambar
            img_resized = cv.resize(img, new_size, interpolation=cv.
 ↪INTER_LANCZOS4)
```

```
            threshold_value = 100
            ret, img_threshold = cv.threshold(img_resized, threshold_value,␣
 ↪255, cv.THRESH_TRUNC)
            #ret menyimpan nilai ambang yang digunakan dalam operasi␣
 ↪thresholding = threshold_value = 100

            # Simpan hasil thresholding ke folder output
            output_path = os.path.join(output_folder, filename)
            cv.imwrite(output_path, img_threshold)

    print("Thresholding done!")

thresholding('./data_awal/YES','./dataset/YES_thresholding')
thresholding('./data_awal/NO','./dataset/NO_thresholding')
```

```
Thresholding done!
Thresholding done!
```

Edge Detection and Normalization

[ ]:
```
def edge_detection(input_folder, output_folder):
    if not os.path.exists(output_folder):
        os.makedirs(output_folder)

    for filename in os.listdir(input_folder):
        if filename.endswith(('.jpg', '.jpeg', '.png')):  # Filter file gambar
            img_path = os.path.join(input_folder, filename)

            img = cv.imread(img_path)

            #Mengubahnya jadi tipe data floating point (CV_64F) u/ menghindari␣
 ↪hilangnya informasi tepi yg negatif
            sobelx_f = cv.Sobel(img,cv.CV_64F,1,0,ksize=3) #Gradien dalam arah␣
 ↪x hasil dari operasi Sobel
            sobely_f = cv.Sobel(img,cv.CV_64F,0,1,ksize=3) #Gradien dalam arah␣
 ↪y hasil dari operasi Sobel.

            magnitude = cv.magnitude(sobelx_f,sobely_f) #menghitung magnitudo␣
 ↪gradien dari hasil deteksi tepi dalam floating point
            #abs_sobel64f = np.absolute(magnitude) #mengonversi nilai absolut␣
 ↪magnitudo menjadi tipe data 64-bit floating point
            #sobel_8u = np.uint8(abs_sobel64f) #mengonversi hasil tersebut ke␣
 ↪tipe data 8-bit unsigned integer

            #img = sobel_8u

            #Normalisasi gambar
            img_normalized = cv.normalize(magnitude, None, 0, 1, cv.NORM_MINMAX)
```

```
            # Simpan hasil thresholding ke folder output
            output_path = os.path.join(output_folder, filename)
            cv.imwrite(output_path, (img_normalized * 255).astype(np.uint8))

    print("Edge detection and Normalization done!")

edge_detection('./dataset/YES_thresholding','./dataset/data/ya')
edge_detection('./dataset/NO_thresholding','./dataset/data/tidak')
```

```
Edge detection and Normalization done!
Edge detection and Normalization done!
```

[ ]:
```
data = './dataset/data'
kelas = os.listdir(data)
print(kelas)
```

```
['tidak', 'ya']
```

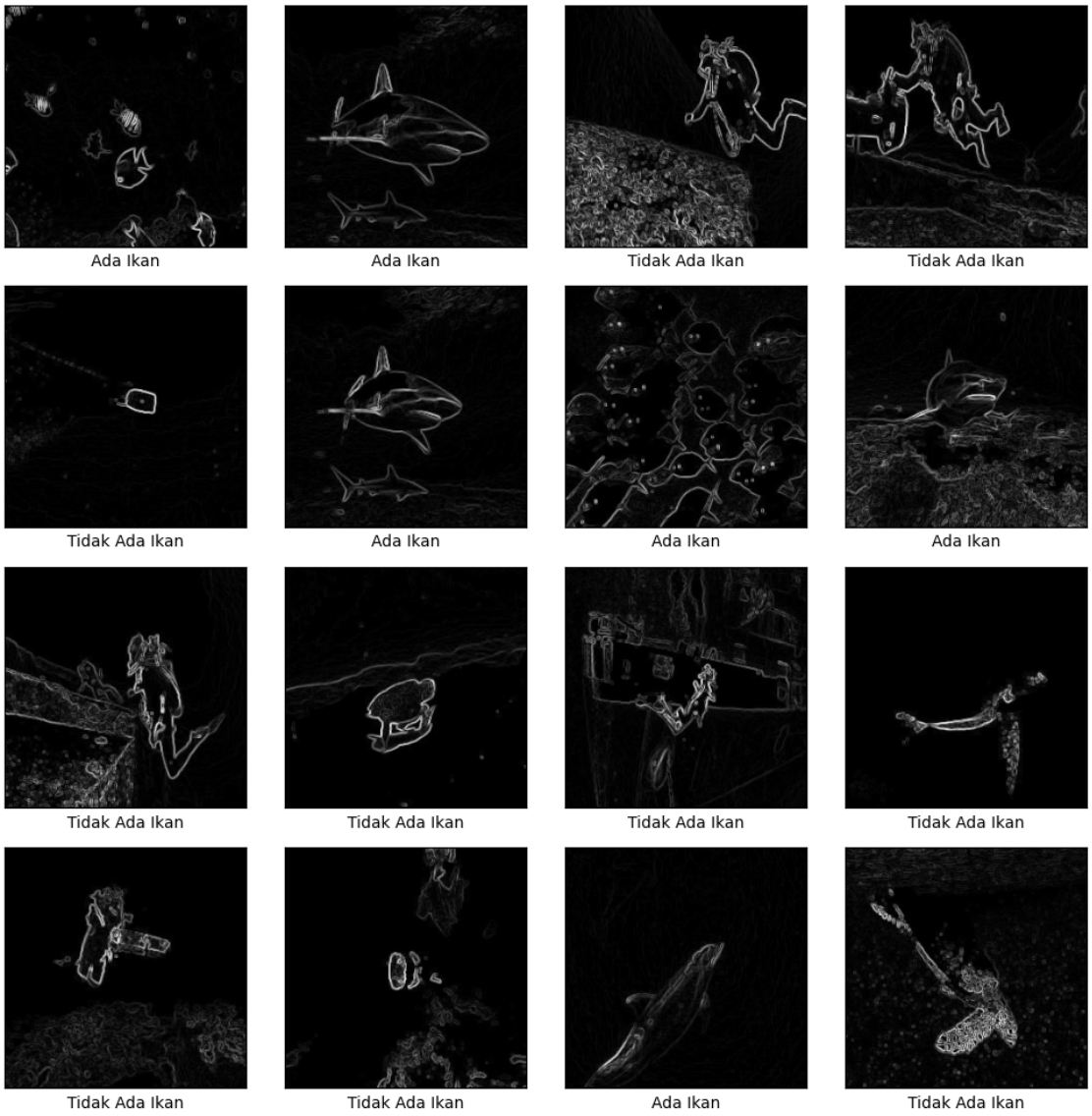
Menampilkan beberapa citra beserta labelnya

[ ]:
```
yes = 'dataset/data/ya'
no = 'dataset/data/tidak'
```

Mengambil images dari folder ya dan tidak untuk diberi label 1 untuk yes, 0 untuk no, dan diletakkan ke dalam list all_images

[ ]:
```
all_images = []

for filename in os.listdir(yes):
    if filename.endswith(('.jpg', '.jpeg', '.png')):
        img_path = os.path.join(yes, filename)
        all_images.append((img_path, 1))

for filename in os.listdir(no):
    if filename.endswith(('.jpg', '.jpeg', '.png')):
        img_path = os.path.join(no, filename)
        all_images.append((img_path, 0))

random.shuffle(all_images)

plt.figure(figsize=(10, 10))
for i in range(min(16, len(all_images))):
    img_path, label = all_images[i]
    img = cv.imread(img_path)
    plt.subplot(4, 4, i + 1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(img)
```

```
    plt.xlabel('Ada Ikan' if label == 1 else 'Tidak Ada Ikan')

plt.tight_layout()
plt.show()
```



Membagi data menjadi data train dan data test

```
[ ]: train_datagen = image_dataset_from_directory(data,
                                                 image_size=(240,240),
                                                 subset='training',
                                                 seed = 1, #untuk konsistensi␣
 ↪gambar mana saja yang jadi train dan test (akan selalu sama)
                                                 validation_split = 0.2,
```

```
                                                batch_size = 32)

test_datagen = image_dataset_from_directory(data,
                                                image_size=(240,240),
                                                subset='validation',
                                                seed = 1, #untuk konsistensi gambar␣
 ↪mana saja yang jadi train dan test (akan selalu sama)
                                                validation_split = 0.2,
                                                batch_size = 32)
```

```
Found 200 files belonging to 2 classes.
Using 160 files for training.
Using 160 files for training.
Found 200 files belonging to 2 classes.
Using 40 files for validation.
```

Membuat Lapisan Konvolusional diikuti MaxPooling untuk mengekstraksi fitur dari citra. Layer Flatten u/ mengubah output dari layer konvolusi menjadi vektor satu dimensi, dan layer Dense di bagian akhir untuk klasifikasi, dengan fungsi aktivasi ReLU untuk layer tersembunyi dan sigmoid untuk output

[ ]:
```
img_height, img_width = 240, 240
new_size = (img_width, img_height)

# Definisikan model
model = models.Sequential()
#layer konvolusi pertama dengan 32 jumlah filter, kernel 3x3, fungsi aktivasi␣
 ↪'ReLU setelah operasi konvolusi. Input model 240, 240, 3(gambar channel 3/
 ↪berwarna)
model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(img_height,␣
 ↪img_width, 3)))
model.add(layers.MaxPooling2D((2, 2))) #ukuran jendela pooling 2x2
#layer konvolusi tambahan menggunakan 64, 128 filter dan fungsi aktivitas ReLU
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(128, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))

#mengubah output layer sebelumnya menjadi vektor satu dimensi agar dapat jadi␣
 ↪masukan pada layer Dense (fully connected)
model.add(layers.Flatten())
model.add(layers.Dropout(0.5))

model.add(layers.Dense(256, activation='relu'))
#layer output dengan 1 unit (karena klasifikasi biner)
#fungsi sigmoid menghasilkan probabilitas 0 hingga 1
model.add(layers.Dense(1, activation='sigmoid'))
```

```
model.summary()

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

```
c:\Users\IKA KUSUMA\AppData\Local\Programs\Python\Python310\lib\site-
packages\keras\src\layers\convolutional\base_conv.py:107: UserWarning: Do not
pass an `input_shape`/`input_dim` argument to a layer. When using Sequential
models, prefer using an `Input(shape)` object as the first layer in the model
instead.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 238, 238, 32)	896
max_pooling2d (MaxPooling2D)	(None, 119, 119, 32)	0
conv2d_1 (Conv2D)	(None, 117, 117, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 58, 58, 64)	0
conv2d_2 (Conv2D)	(None, 56, 56, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 28, 28, 128)	0
flatten (Flatten)	(None, 100352)	0
dropout (Dropout)	(None, 100352)	0
dense (Dense)	(None, 256)	25,690,368
dense_1 (Dense)	(None, 1)	257

Total params: 25,783,873 (98.36 MB)

Trainable params: 25,783,873 (98.36 MB)

Non-trainable params: 0 (0.00 B)

Callback untuk menyimpan model terbaik berdasarkan akurasi validasi

[ ]:
```
checkpoint_callback = ModelCheckpoint(filepath='best_model.keras',
                                      monitor='val_accuracy',
                                      mode='max',
                                      save_best_only=True,
                                      verbose=1)
```

[ ]:
```
#Pelatihan model
history = model.fit(train_datagen,
                    epochs=15,
                    validation_data=test_datagen,
                    callbacks=[checkpoint_callback])

test_loss, test_acc = model.evaluate(test_datagen, verbose=2)
print('Validation loss : ', test_loss)
print('Validation accuracy : ', test_acc)

history_df = pd.DataFrame(history.history)

# Subplot 2: Plot accuracy dan val_accuracy
plt.subplot(2, 1, 1)
history_df[['accuracy', 'val_accuracy']].plot(ax=plt.gca())
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.title('Training Accuracy vs Validation Accuracy')

# Subplot 2 : Plot loss dan val_loss
plt.subplot(2, 1, 2)
history_df[['loss', 'val_loss']].plot(ax=plt.gca())
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.title('Training Loss vs Validation Loss')

# Menambahkan judul utama
plt.suptitle('Accuracy and Loss')
plt.tight_layout()
plt.show()
```

```
Epoch 1/15
5/5             0s 9s/step -
accuracy: 0.5301 - loss: 116.8693
Epoch 1: val_accuracy improved from -inf to 0.57500, saving model to
best_model.keras
5/5             66s 12s/step -
accuracy: 0.5324 - loss: 113.9066 - val_accuracy: 0.5750 - val_loss: 4.6687
Epoch 2/15
```

```
5/5            0s 10s/step -
accuracy: 0.6614 - loss: 2.0318
Epoch 2: val_accuracy improved from 0.57500 to 0.62500, saving model to
best_model.keras
5/5            52s 12s/step -
accuracy: 0.6574 - loss: 1.9683 - val_accuracy: 0.6250 - val_loss: 0.9704
Epoch 3/15
5/5            0s 6s/step -
accuracy: 0.7579 - loss: 0.4371
Epoch 3: val_accuracy did not improve from 0.62500
5/5            61s 6s/step -
accuracy: 0.7649 - loss: 0.4306 - val_accuracy: 0.6000 - val_loss: 0.6697
Epoch 4/15
5/5            0s 18s/step -
accuracy: 0.9103 - loss: 0.2403
Epoch 4: val_accuracy improved from 0.62500 to 0.77500, saving model to
best_model.keras
5/5            101s 21s/step -
accuracy: 0.9169 - loss: 0.2347 - val_accuracy: 0.7750 - val_loss: 0.4871
Epoch 5/15
5/5            0s 12s/step -
accuracy: 0.9907 - loss: 0.0653
Epoch 5: val_accuracy improved from 0.77500 to 0.82500, saving model to
best_model.keras
5/5            117s 15s/step -
accuracy: 0.9902 - loss: 0.0641 - val_accuracy: 0.8250 - val_loss: 0.4504
Epoch 6/15
5/5            0s 12s/step -
accuracy: 1.0000 - loss: 0.0281
Epoch 6: val_accuracy did not improve from 0.82500
5/5            76s 13s/step -
accuracy: 1.0000 - loss: 0.0266 - val_accuracy: 0.8250 - val_loss: 0.4974
Epoch 7/15
5/5            0s 12s/step -
accuracy: 1.0000 - loss: 0.0082
Epoch 7: val_accuracy did not improve from 0.82500
5/5            81s 12s/step -
accuracy: 1.0000 - loss: 0.0088 - val_accuracy: 0.8250 - val_loss: 0.7574
Epoch 8/15
5/5            0s 11s/step -
accuracy: 1.0000 - loss: 0.0064
Epoch 8: val_accuracy did not improve from 0.82500
5/5            78s 11s/step -
accuracy: 1.0000 - loss: 0.0063 - val_accuracy: 0.8000 - val_loss: 1.0496
Epoch 9/15
5/5            0s 8s/step -
accuracy: 1.0000 - loss: 0.0039
Epoch 9: val_accuracy did not improve from 0.82500
```

```
5/5             69s 8s/step -
accuracy: 1.0000 - loss: 0.0041 - val_accuracy: 0.8250 - val_loss: 1.0904
Epoch 10/15
5/5             0s 8s/step -
accuracy: 1.0000 - loss: 0.0013
Epoch 10: val_accuracy improved from 0.82500 to 0.85000, saving model to
best_model.keras
5/5             50s 10s/step -
accuracy: 1.0000 - loss: 0.0018 - val_accuracy: 0.8500 - val_loss: 1.0531
Epoch 11/15
5/5             0s 7s/step -
accuracy: 1.0000 - loss: 0.0022
Epoch 11: val_accuracy did not improve from 0.85000
5/5             38s 8s/step -
accuracy: 1.0000 - loss: 0.0026 - val_accuracy: 0.8250 - val_loss: 1.0453
Epoch 12/15
5/5             0s 7s/step -
accuracy: 1.0000 - loss: 0.0094
Epoch 12: val_accuracy did not improve from 0.85000
5/5             43s 9s/step -
accuracy: 1.0000 - loss: 0.0085 - val_accuracy: 0.8000 - val_loss: 1.0473
Epoch 13/15
5/5             0s 10s/step -
accuracy: 1.0000 - loss: 0.0031
Epoch 13: val_accuracy did not improve from 0.85000
5/5             49s 10s/step -
accuracy: 1.0000 - loss: 0.0032 - val_accuracy: 0.8000 - val_loss: 1.0119
Epoch 14/15
5/5             0s 7s/step -
accuracy: 1.0000 - loss: 0.0016
Epoch 14: val_accuracy did not improve from 0.85000
5/5             68s 7s/step -
accuracy: 1.0000 - loss: 0.0019 - val_accuracy: 0.8000 - val_loss: 0.9483
Epoch 15/15
5/5             0s 7s/step -
accuracy: 1.0000 - loss: 0.0018
Epoch 15: val_accuracy did not improve from 0.85000
5/5             44s 8s/step -
accuracy: 1.0000 - loss: 0.0021 - val_accuracy: 0.7750 - val_loss: 0.7949
2/2 - 2s - 869ms/step - accuracy: 0.7750 - loss: 0.7949
Validation loss :  0.7948988676071167
Validation accuracy :  0.7749999761581421
```

[ ]:
```
best_model = keras.models.load_model('best_model.keras')
```

0.0.3 Tahap Processing Klasifikasi dan Prediksi

Fungsi preprocessing untuk prediksi

[ ]:
```
def preprocess_image(input_folder, filename):
    img_path = os.path.join(input_folder, filename)

    img = cv.imread(img_path, 0)

    #resize image ke piksel 240 x 240
    img_height, img_width = 240, 240
    new_size = (img_width, img_height)
    img_resized = cv.resize(img, new_size, interpolation=cv.INTER_LANCZOS4)

    # Thresholding Trunc
    threshold_value = 100
    ret, img_threshold = cv.threshold(img_resized, threshold_value, 255, cv.
 ↪THRESH_TRUNC)
```

```
    # Sobel u/ mendapatkan gradien dalam arah horizontal dan vertikal untuk␣
↪mendapatkan gradien dalam arah horizontal dan vertikal
    # Sobel magnitude untuk edge detection
    sobelx_f = cv.Sobel(img_threshold, cv.CV_64F, 1, 0, ksize=3)
    sobely_f = cv.Sobel(img_threshold, cv.CV_64F, 0, 1, ksize=3)
    magnitude = cv.magnitude(sobelx_f, sobely_f)

    # Normalize magnitude jadi rentang [0, 1] atau min = 0 dan max = 1 dengan␣
↪NORMALISASI MIN MAX dari openCV
    img_normalized = cv.normalize(magnitude, None, 0, 1, cv.NORM_MINMAX)

    # mengubahnya jadi RGB karena dia 3-channel sebab model butuh inputan␣
↪3-channel
    img_normalized_rgb = cv.cvtColor((img_normalized * 255).astype(np.uint8),␣
↪cv.COLOR_GRAY2RGB)

    return img_normalized_rgb
```

Fungsi untuk memampilkan hasil prediksi

```
[ ]: def predict_and_plot(files):
    plt.figure(figsize=(20, 20))
    for i, file in enumerate(files):
        input_folder, filename = os.path.split(file) #di-split agar mendapatkan␣
↪jalur file sehingga didapatkan direktor dan filname

        # Tahapan preprocessing (resizing, thresholding, edge detection,␣
↪normalization)
        img_normalized = preprocess_image(input_folder, filename)

        #Memprediksi citra dengan model
        img_for_prediction = np.expand_dims(img_normalized, axis=0)
        predictions = model.predict(img_for_prediction)
        label = 'Ikan' if predictions[0][0] > 0.5 else 'Tidak ada ikan' #jika␣
↪hasil prediksi >0.5, gambar diprediksi 'Ikan' sebaliknya, 'TIdak Ada Ikan'

        plt.subplot(4, 4, i + 1)
        plt.xticks([])
        plt.yticks([])
        plt.grid(False)
        plt.imshow(img_normalized)
        plt.xlabel(label)

    plt.show()
```

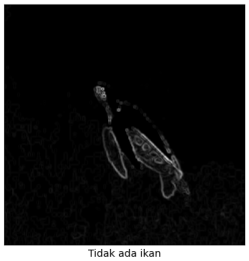
Fungsi mengambil gambar acak dari data awal untuk mengecek hasil prediksi oleh model

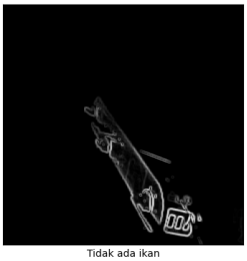
[ ]:
```
def get_random_files(dataset_folder, num_files=16):
    all_files = []
    for label in ['YES', 'NO']:
        folder_path = os.path.join(dataset_folder, label)
        files = [os.path.join(folder_path, f) for f in os.listdir(folder_path)␣
 ↪if f.endswith(('.jpg', '.jpeg', '.png'))]
        all_files.extend(files)

    random_files = random.sample(all_files, num_files)
    return random_files
```

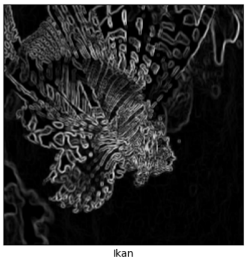
Data yang diprediksi adalah data random berjumlah 16 yang didapatkan dari data awal sebelum di-preprocessing

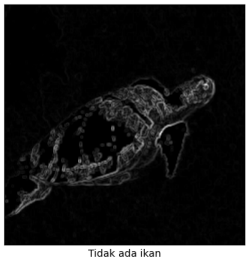
[ ]:
```
dataset_folder = './data_awal'
random_files = get_random_files(dataset_folder)
predict_and_plot(random_files)
```

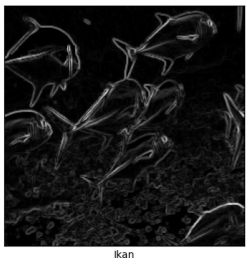
```
1/1             2s 2s/step
1/1             0s 252ms/step
1/1             0s 341ms/step
1/1             0s 347ms/step
1/1             0s 114ms/step
1/1             0s 121ms/step
1/1             0s 115ms/step
1/1             0s 137ms/step
1/1             0s 124ms/step
1/1             0s 253ms/step
1/1             0s 216ms/step
1/1             0s 304ms/step
1/1             0s 337ms/step
1/1             0s 480ms/step
1/1             1s 1s/step
1/1             1s 528ms/step
```

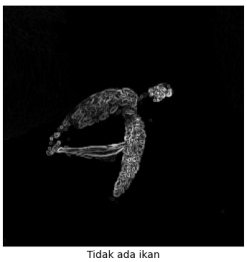

Tidak ada ikan


Tidak ada ikan

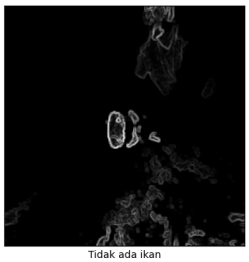

Ikan

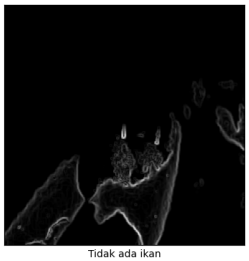

Tidak ada ikan

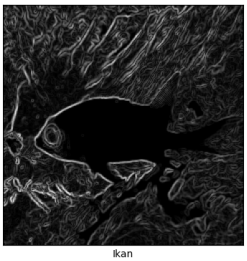

Ikan

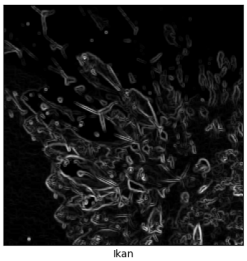

Tidak ada ikan

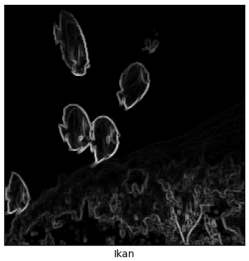

Tidak ada ikan


Tidak ada ikan

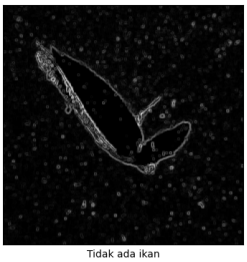

Tidak ada ikan


Ikan


Ikan


Ikan


Ikan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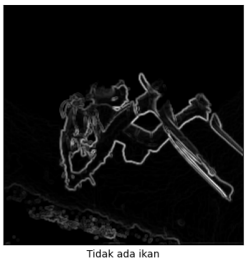
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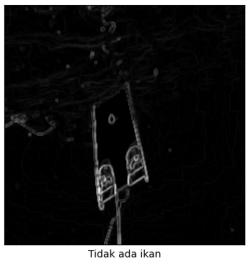
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