prepare dataset

```
import os
import zipfile
import shutil
import random
from keras.preprocessing.image import ImageDataGenerator
import matplotlib.pyplot as plt
import glob
from PIL import Image
import numpy as np
```

```
# Unduh dataset dari Kaggle dan unggah ke Google Colab
!pip install -q kaggle
os.environ['KAGGLE_USERNAME'] = 'rezaldi'
os.environ['KAGGLE_KEY'] = '8cf4e8b9dbf3749ff34c10459a53a6f4'
!kaggle datasets download -d alexfordna/garbage-seg-10-v5
!kaggle datasets download -d dataclusterlabs/masks-dataset
# Ekstrak file zip
with zipfile.ZipFile('/content/garbage-seg-10-v5.zip', 'r') as zip_ref:
    zip_ref.extractall('/content/dataset')

with zipfile.ZipFile('/content/masks-dataset.zip', 'r') as zip_ref:
    zip_ref.extractall('/content/masks-datasett')
```

```
Downloading garbage-seg-10-v5.zip to /content
 94% 234M/250M [00:01<00:00, 147MB/s]
100% 250M/250M [00:01<00:00, 146MB/s]
Downloading masks-dataset.zip to /content
 85% 33.0M/39.0M [00:00<00:00, 58.7MB/s]
100% 39.0M/39.0M [00:00<00:00, 67.9MB/s]
```

```
# Tentukan direktori dataset medical yang akan digabungkan
medical_dataset_dir = '/content/masks-datasett/images/images'

# Tentukan direktori tujuan untuk menggabungkan dataset ke dalam kategori "medical"
medical_target_dir = '/content/dataset/Garbage Seg 10 V5/medical'
os.makedirs(medical_target_dir, exist_ok=True)

# Pindahkan semua file dari dataset medical ke direktori tujuan
for root, dirs, files in os.walk(medical_dataset_dir):
    for file in files:
        src_file = os.path.join(root, file)
        shutil.move(src_file, medical_target_dir)

print("Dataset medical telah digabungkan ke dalam kategori 'medical'.")
```

```
Dataset medical telah digabungkan ke dalam kategori 'medical'.
```

```
# Tentukan direktori dataset medical yang akan digabungkan
medical_dataset_dir = '/content/fotosampah'

# Tentukan direktori tujuan untuk menggabungkan dataset ke dalam kategori "medical"
medical_target_dir = '/content/dataset/Garbage Seg 10 V5/medical'
os.makedirs(medical_target_dir, exist_ok=True)

# Pindahkan semua file dari dataset medical ke direktori tujuan
for root, dirs, files in os.walk(medical_dataset_dir):
    for file in files:
        src_file = os.path.join(root, file)
        shutil.move(src_file, medical_target_dir)

print("Dataset medical telah digabungkan ke dalam kategori 'medical'.")
```

```
Dataset medical telah digabungkan ke dalam kategori 'medical'.
```

```
# Buat folder untuk train, validation, dan test
base_dir = '/content/dataset'
os.makedirs(base_dir, exist_ok=True)

train_dir = os.path.join(base_dir, 'train')
os.makedirs(train_dir, exist_ok=True)

validation_dir = os.path.join(base_dir, 'validation')
os.makedirs(validation_dir, exist_ok=True)

test_dir = os.path.join(base_dir, 'test')
os.makedirs(test_dir, exist_ok=True)
```

```
# Kategori sampah yang bisa dijual (sellable)
sellable_categories = ['battery', 'cardboard', 'clothes', 'glass', 'metal', 'paper', 'plastic', 'shoes']
# Kategori sampah yang tidak bisa dijual (unsellable)
unsellable_categories = ['food', 'medical']
```

```
# Memindahkan gambar ke folder yang sesuai
for category in sellable_categories:
    category_train_dir = os.path.join(train_dir, 'sellable', category)
    os.makedirs(category_train_dir, exist_ok=True)

    images_dir = os.path.join('/content/dataset/Garbage Seg 10 V5/', category)
    images = os.listdir(images_dir)

    for image in images:
        src_path = os.path.join(images_dir, image)
        dst_path = os.path.join(category_train_dir, image)
        shutil.copy(src_path, dst_path)

for category in unsellable_categories:
    category_train_dir = os.path.join(train_dir, 'unsellable', category)
    os.makedirs(category_train_dir, exist_ok=True)

    images_dir = os.path.join('/content/dataset/Garbage Seg 10 V5/', category)
    images = os.listdir(images_dir)

    for image in images:
        src_path = os.path.join(images_dir, image)
        dst_path = os.path.join(category_train_dir, image)
        shutil.copy(src_path, dst_path)
```

```
import shutil

# Menentukan jumlah oversampling yang dibutuhkan
food_count = 6500
medical_count = 6500
food_dir = os.path.join(train_dir, 'unsellable', 'food')
medical_dir = os.path.join(train_dir, 'unsellable', 'medical')
```

```python
# Membuat direktori tujuan untuk oversampling
oversampled_food_dir = '/content/dataset/train/unsellable/food'
oversampled_medical_dir = '/content/dataset/train/unsellable/medical'

os.makedirs(oversampled_food_dir, exist_ok=True)
os.makedirs(oversampled_medical_dir, exist_ok=True)

# Melakukan oversampling pada kategori 'food'
food_images = os.listdir(food_dir)
oversampling_factor = food_count // len(food_images)

for image in food_images:
    src_path = os.path.join(food_dir, image)

    # Mengulang pengulangan gambar sesuai faktor oversampling
    for i in range(oversampling_factor):
        new_image_name = f"oversampled_{i}_{image}"
        dst_path = os.path.join(oversampled_food_dir, new_image_name)
        shutil.copy(src_path, dst_path)

# Melakukan oversampling pada kategori 'medical'
medical_images = os.listdir(medical_dir)
oversampling_factor = medical_count // len(medical_images)

for image in medical_images:
    src_path = os.path.join(medical_dir, image)

    # Mengulang pengulangan gambar sesuai faktor oversampling
    for i in range(oversampling_factor):
        new_image_name = f"oversampled_{i}_{image}"
        dst_path = os.path.join(oversampled_medical_dir, new_image_name)
        shutil.copy(src_path, dst_path)
```

```python
# Menampilkan hasil setelah oversampling
food_oversampled_count = len(os.listdir(oversampled_food_dir))
medical_oversampled_count = len(os.listdir(oversampled_medical_dir))

print(f"Jumlah food setelah oversampling: {food_oversampled_count}")
print(f"Jumlah medical setelah oversampling: {medical_oversampled_count}")
```

```
Jumlah food setelah oversampling: 6895
Jumlah medical setelah oversampling: 7352
```

```python
# Memindahkan sebagian gambar dari train ke validation
for category in sellable_categories:
    category_train_dir = os.path.join(train_dir, 'sellable', category)
    category_validation_dir = os.path.join(validation_dir, 'sellable', category)
    os.makedirs(category_validation_dir, exist_ok=True)

    images = os.listdir(category_train_dir)
    num_images = len(images)
    num_validation_images = int(num_images * 0.1)  # 10% untuk validation

    validation_images = images[:num_validation_images]
    for image in validation_images:
        src_path = os.path.join(category_train_dir, image)
        dst_path = os.path.join(category_validation_dir, image)
        shutil.move(src_path, dst_path)
```

```python
# Memindahkan sebagian gambar dari train ke test
for category in sellable_categories:
    category_train_dir = os.path.join(train_dir, 'sellable', category)
    category_test_dir = os.path.join(test_dir, 'sellable', category)
    os.makedirs(category_test_dir, exist_ok=True)

    images = os.listdir(category_train_dir)
    num_images = len(images)
    num_test_images = int(num_images * 0.1)  # 10% untuk test

    test_images = images[:num_test_images]
    for image in test_images:
        src_path = os.path.join(category_train_dir, image)
        dst_path = os.path.join(category_test_dir, image)
        shutil.move(src_path, dst_path)

# Memindahkan sebagian gambar dari train ke validation (unsellable)
for category in unsellable_categories:
    category_train_dir = os.path.join(train_dir, 'unsellable', category)
    category_validation_dir = os.path.join(validation_dir, 'unsellable', category)
    os.makedirs(category_validation_dir, exist_ok=True)

    images = os.listdir(category_train_dir)
    num_images = len(images)
    num_validation_images = int(num_images * 0.1)  # 10% untuk validation

    validation_images = images[:num_validation_images]
    for image in validation_images:
        src_path = os.path.join(category_train_dir, image)
        dst_path = os.path.join(category_validation_dir, image)
        shutil.move(src_path, dst_path)
```

```python
# Memindahkan sebagian gambar dari train ke test (unsellable)
for category in unsellable_categories:
    category_train_dir = os.path.join(train_dir, 'unsellable', category)
    category_test_dir = os.path.join(test_dir, 'unsellable', category)
    os.makedirs(category_test_dir, exist_ok=True)

    images = os.listdir(category_train_dir)
    num_images = len(images)
    num_test_images = int(num_images * 0.1)  # 10% untuk test

    test_images = images[:num_test_images]
    for image in test_images:
        src_path = os.path.join(category_train_dir, image)
        dst_path = os.path.join(category_test_dir, image)
        shutil.move(src_path, dst_path)
```

```python
# melihat kelas yang ada di direktori train, validation, dan test:
train_classes = os.listdir(os.path.join(train_dir))
validation_classes = os.listdir(os.path.join(validation_dir))
test_classes = os.listdir(os.path.join(test_dir))

print("Classes in Train directory:")
print(train_classes)

print("Classes in Validation directory:")
print(validation_classes)

print("Classes in Test directory:")
print(test_classes)
```

```
Classes in Train directory:
['unsellable', 'sellable']
Classes in Validation directory:
['unsellable', 'sellable']
Classes in Test directory:
['unsellable', 'sellable']
```

```python
# Menghitung jumlah gambar pada setiap kategori train
train_sellable_counts = sum([len(files) for r, d, files in os.walk(os.path.join(train_dir, 'sellable'))])
train_unsellable_counts = sum([len(files) for r, d, files in os.walk(os.path.join(train_dir, 'unsellable'))])
print(f"Jumlah gambar sellable pada train: {train_sellable_counts}")
print(f"Jumlah gambar unsellable pada train: {train_unsellable_counts}")
```

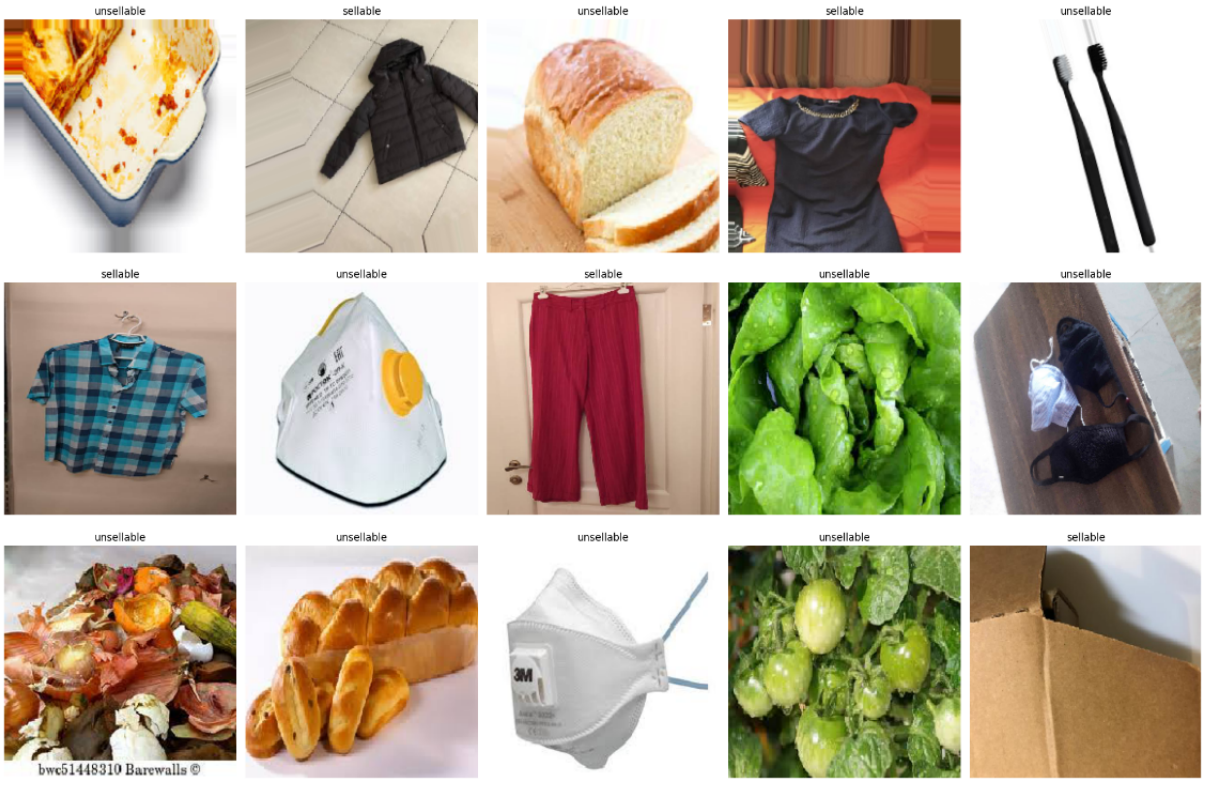
```
Jumlah gambar sellable pada train: 11651
Jumlah gambar unsellable pada train: 11542
```

Pra-pemrosesan Data

```
train_datagen = ImageDataGenerator(
    rescale=1.0/255,
    rotation_range=20,
    width_shift_range=0.2,
    height_shift_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    fill_mode='nearest'
)

validation_datagen = ImageDataGenerator(rescale=1.0 / 255.0)
test_datagen = ImageDataGenerator(rescale=1.0 / 255.0)

train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size=(224, 224),
    batch_size=64,
    class_mode='categorical'
)

validation_generator = validation_datagen.flow_from_directory(
    validation_dir,
    target_size=(224, 224),
    batch_size=64,
    class_mode='categorical'
)

test_generator = test_datagen.flow_from_directory(
    test_dir,
    target_size=(224, 224),
    batch_size=64,
    class_mode='categorical'
)
```

```
Found 23193 images belonging to 2 classes.
Found 2858 images belonging to 2 classes.
Found 2573 images belonging to 2 classes.
```

```python
import matplotlib.pyplot as plt
import numpy as np

# Fungsi untuk menampilkan beberapa contoh gambar
def show_images(image_generator, num_images=5):
    # Mendapatkan nama kategori
    class_names = list(image_generator.class_indices.keys())

    # Mendapatkan beberapa contoh gambar
    images, labels = next(image_generator)

    # Menampilkan gambar dan labelnya
    fig, axes = plt.subplots(1, num_images, figsize=(20, 20))
    axes = axes.flatten()
    for i in range(num_images):
        img = images[i]
        label = labels[i]
        class_name = class_names[np.argmax(label)]
        axes[i].imshow(img)
        axes[i].set_title(class_name)
        axes[i].axis('off')
    plt.tight_layout()
    plt.show()

# Memanggil fungsi show_images untuk train_generator
show_images(train_generator)

# Memanggil fungsi show_images untuk validation_generator
show_images(validation_generator)

# Memanggil fungsi show_images untuk test_generator
show_images(test_generator)
```



modelmanual

```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from tensorflow.keras.optimizers import RMSprop
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
# Membangun model CNN
model = Sequential()
model.add(Conv2D(32, (3, 3), activation='relu', input_shape=(224, 224, 3)))
model.add(MaxPooling2D((2, 2)))
model.add(Conv2D(64, (3, 3), activation='relu'))
model.add(MaxPooling2D((2, 2)))
model.add(Conv2D(128, (3, 3), activation='relu'))
model.add(MaxPooling2D((2, 2)))
model.add(Conv2D(256, (3, 3), activation='relu'))
model.add(MaxPooling2D((2, 2)))
model.add(Flatten())
model.add(Dense(512, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(2, activation='softmax'))
```

```
# Mengompilasi model
model.compile(optimizer=RMSprop(learning_rate=1e-4),
              loss='categorical_crossentropy',
              metrics=['accuracy'])
```

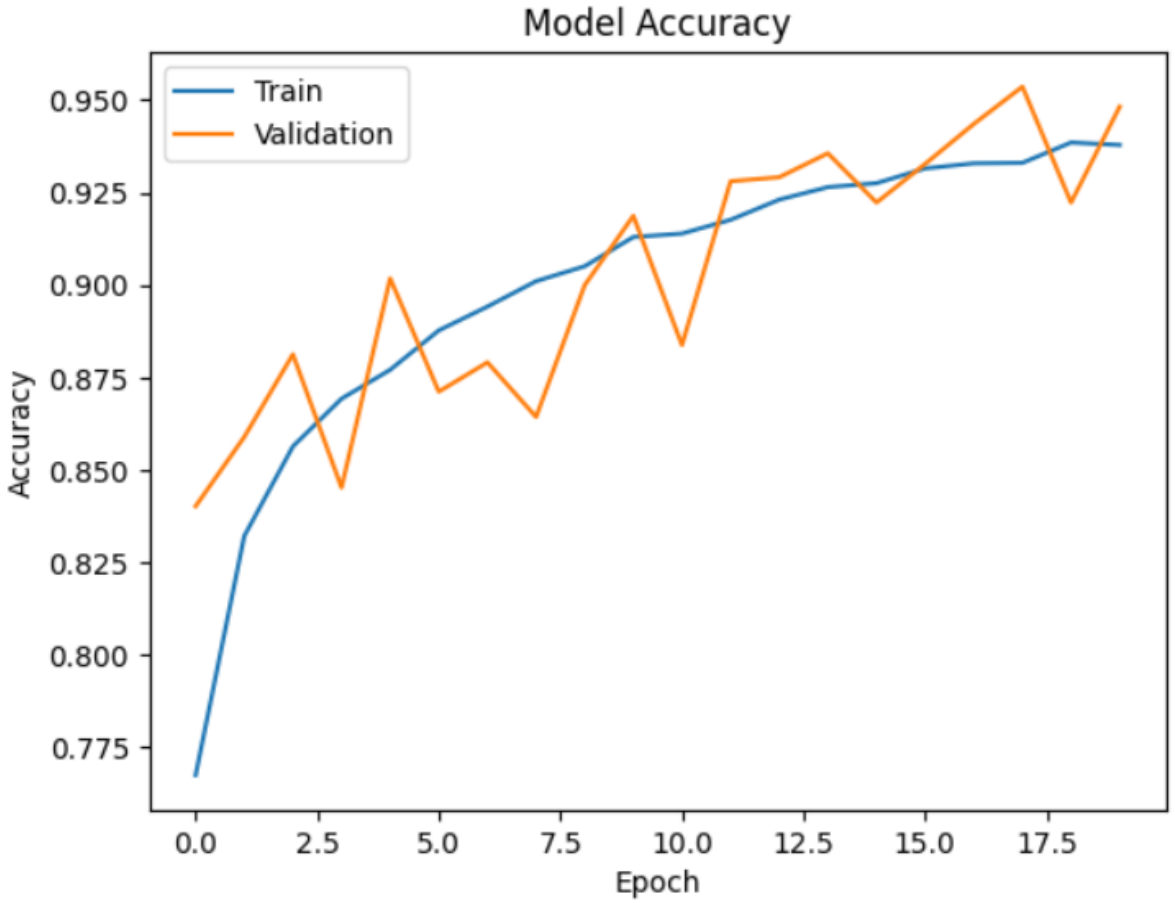
```
# Melatih model
history = model.fit(
    train_generator,
    steps_per_epoch=len(train_generator),
    epochs=20,
    validation_data=validation_generator,
    validation_steps=len(validation_generator)
)
```

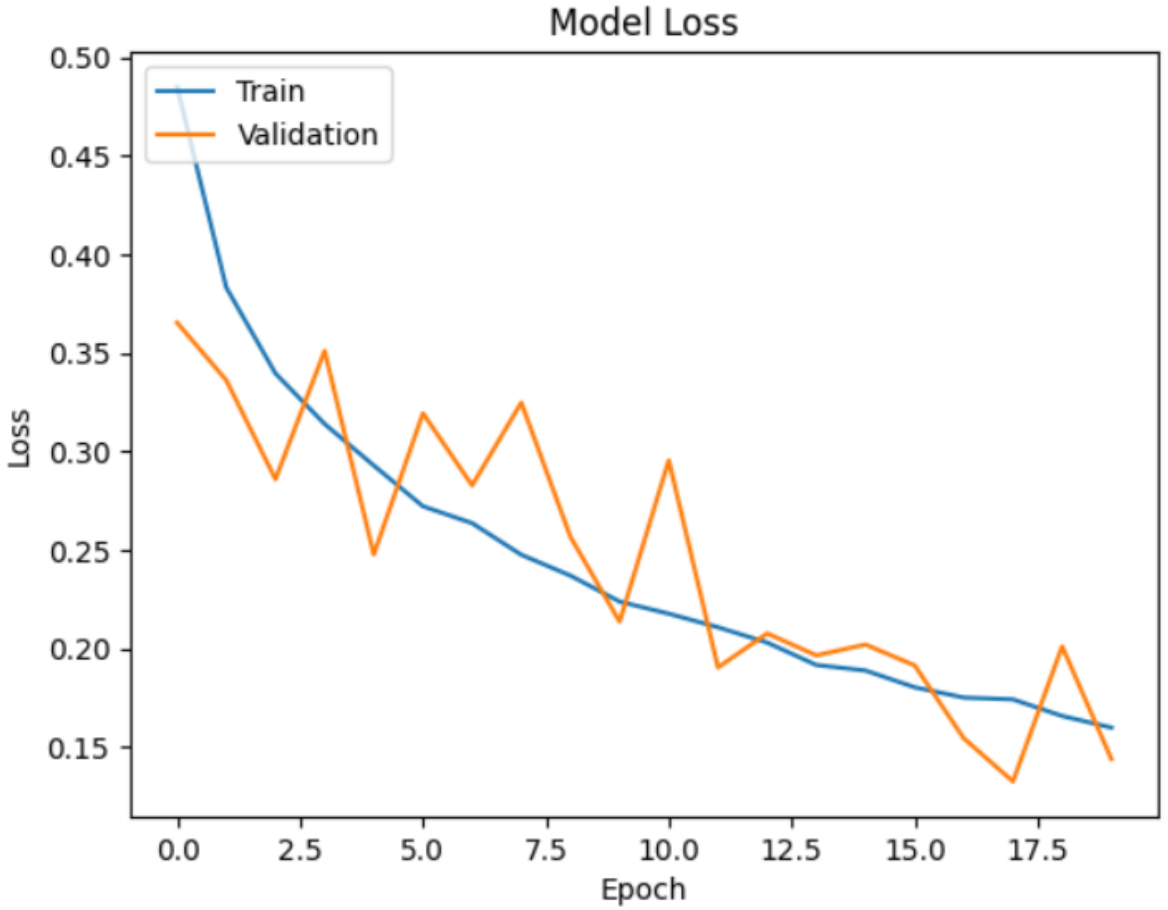
```
Epoch 7/20
705/705 [==============================] - 297s 422ms/step - loss: 0.2636 - accuracy: 0.8942 - val_loss: 0.2827 - val_accurac
y: 0.8791
Epoch 8/20
705/705 [==============================] - 302s 428ms/step - loss: 0.2475 - accuracy: 0.9010 - val_loss: 0.3247 - val_accurac
y: 0.8643
Epoch 9/20
705/705 [==============================] - 303s 430ms/step - loss: 0.2369 - accuracy: 0.9051 - val_loss: 0.2566 - val_accurac
y: 0.9000
Epoch 10/20
705/705 [==============================] - 305s 432ms/step - loss: 0.2237 - accuracy: 0.9130 - val_loss: 0.2135 - val_accurac
y: 0.9187
Epoch 11/20
705/705 [==============================] - 301s 427ms/step - loss: 0.2176 - accuracy: 0.9139 - val_loss: 0.2954 - val_accurac
y: 0.8838
Epoch 12/20
705/705 [==============================] - 300s 425ms/step - loss: 0.2107 - accuracy: 0.9176 - val_loss: 0.1903 - val_accurac
y: 0.9280
Epoch 13/20
705/705 [==============================] - 300s 426ms/step - loss: 0.2029 - accuracy: 0.9231 - val_loss: 0.2076 - val_accurac
y: 0.9291
Epoch 14/20
705/705 [==============================] - 298s 423ms/step - loss: 0.1916 - accuracy: 0.9264 - val_loss: 0.1965 - val_accurac
y: 0.9356
Epoch 15/20
705/705 [==============================] - 305s 433ms/step - loss: 0.1888 - accuracy: 0.9275 - val_loss: 0.2019 - val_accurac
y: 0.9223
Epoch 16/20
705/705 [==============================] - 304s 432ms/step - loss: 0.1802 - accuracy: 0.9315 - val_loss: 0.1914 - val_accurac
y: 0.9327
Epoch 17/20
705/705 [==============================] - 304s 432ms/step - loss: 0.1750 - accuracy: 0.9329 - val_loss: 0.1543 - val_accurac
y: 0.9435
Epoch 18/20
705/705 [==============================] - 302s 429ms/step - loss: 0.1741 - accuracy: 0.9330 - val_loss: 0.1325 - val_accurac
y: 0.9536
Epoch 19/20
705/705 [==============================] - 301s 427ms/step - loss: 0.1657 - accuracy: 0.9385 - val_loss: 0.2010 - val_accurac
y: 0.9223
Epoch 20/20
705/705 [==============================] - 300s 426ms/step - loss: 0.1598 - accuracy: 0.9378 - val_loss: 0.1439 - val_accurac
y: 0.9482
```

```
# Evaluasi model menggunakan dataset uji
test_loss, test_acc = model.evaluate(test_generator, steps=len(test_generator))
print('Test Loss:', test_loss)
print('Test Accuracy:', test_acc)
```

```
79/79 [==============================] - 7s 88ms/step - loss: 0.1338 - accuracy: 0.9480
Test Loss: 0.13382068276405334
Test Accuracy: 0.948041558265686
```

```
# Menampilkan grafik akurasi
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()

# Menampilkan grafik loss
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()
```






```python
# Fungsi untuk memprediksi kategori sampah dari gambar
def predict_category(image_path):
    img = Image.open(image_path)
    img = img.resize((224, 224))
    img = np.array(img) / 255.0
    img = np.expand_dims(img, axis=0)

    prediction = model.predict(img)
    sellable_prob = prediction[0][0]
    unsellable_prob = prediction[0][1]

    if sellable_prob > unsellable_prob:
        return "Sellable"
    else:
        return "Unsellable"

# Contoh penggunaan fungsi predict_category untuk memprediksi kategori sampah dari beberapa gambar
image_paths = glob.glob("/content/tidakdijual/*.jpg")
for image_path in image_paths:
    predicted_category = predict_category(image_path)
    print("Image:", image_path)
    print("Predicted category:", predicted_category)
    print()
```

```
1/1 [==============================] - 0s 252ms/step
Image: /content/tidakdijual/055600000_1588684866-20200505-Masker-Bekas-Pakai-Tercecer-di-Pinggir-Jalan-4.jpg
Predicted category: Unsellable

1/1 [==============================] - 0s 23ms/step
Image: /content/tidakdijual/medikal1.jpg
Predicted category: Unsellable

1/1 [==============================] - 0s 23ms/step
Image: /content/tidakdijual/Masker-4-Lapis-Masker-Hana-KF94-dari-Polytron.jpg
Predicted category: Unsellable

1/1 [==============================] - 0s 24ms/step
Image: /content/tidakdijual/sampah-organik.jpg
Predicted category: Unsellable
```

Model_TrashCash

```
from tensorflow.keras.applications import MobileNet
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, GlobalAveragePooling2D, Dropout
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import ReduceLROnPlateau, EarlyStopping

base_model = MobileNet(weights='imagenet', include_top=False, input_shape=(224, 224, 3))

model = Sequential()
model.add(base_model)
model.add(GlobalAveragePooling2D())
model.add(Dense(256, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(2, activation='softmax'))

for layer in base_model.layers:
    layer.trainable = False

optimizer = Adam(lr=0.001)
model.compile(optimizer=optimizer, loss='categorical_crossentropy', metrics=['accuracy'])
model.summary()
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/mobilenet/mobilenet_1_0_224_tf_no_top.h5
17225924/17225924 [==============================] - 0s 0us/step
WARNING:absl:`lr` is deprecated in Keras optimizer, please use `learning_rate` or use the legacy optimizer, e.g.,tf.keras.optimizers.legacy.Adam.
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 mobilenet_1.00_224 (Functional)  (None, 7, 7, 1024)       3228864

 global_average_pooling2d (GlobalAveragePooling2D)  (None, 1024)            0

 dense (Dense)               (None, 256)               262400

 dropout (Dropout)           (None, 256)               0

 dense_1 (Dense)             (None, 2)                 514

=================================================================
Total params: 3,491,778
Trainable params: 262,914
Non-trainable params: 3,228,864
_________________________________________________________________
```

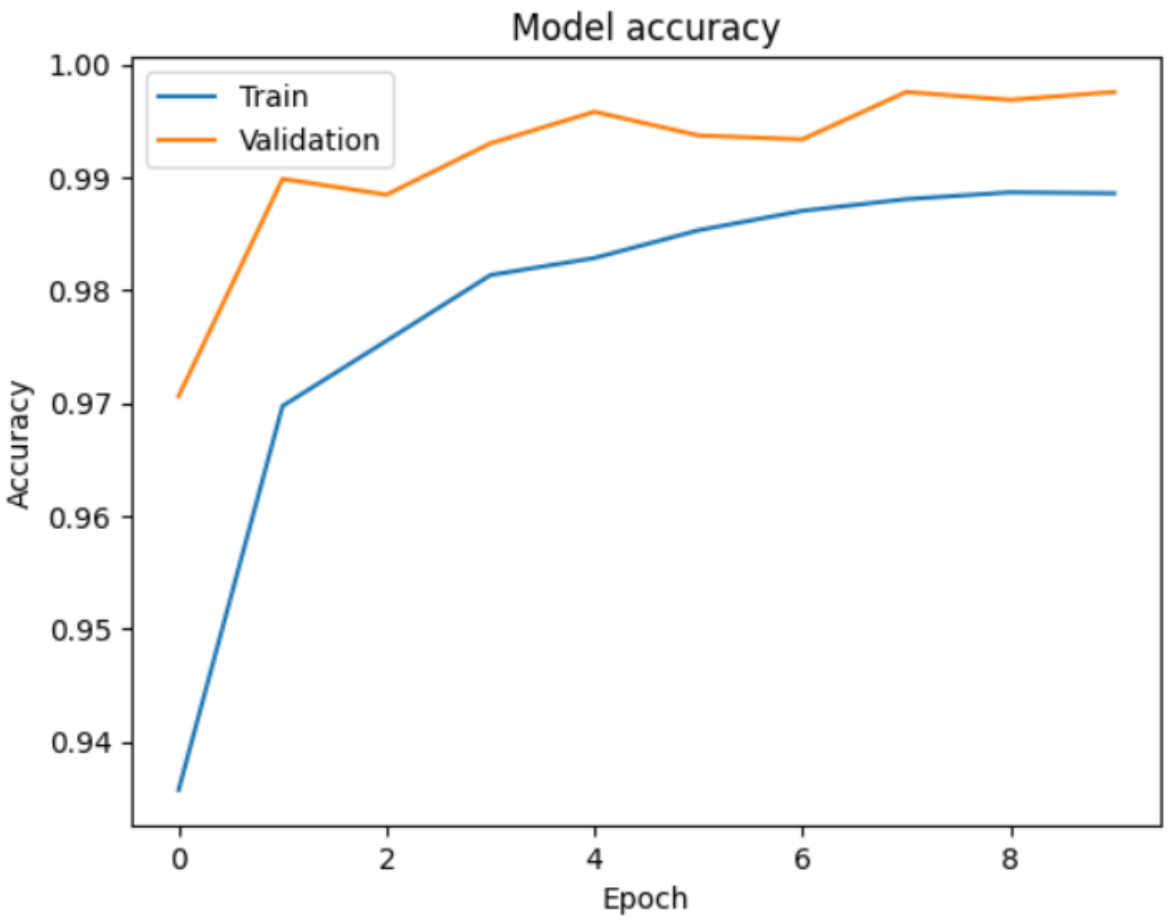
```
# Callbacks
reduce_lr = ReduceLROnPlateau(monitor='val_loss', factor=0.2, patience=3, min_lr=1e-6)
early_stop = EarlyStopping(monitor='val_loss', patience=5, restore_best_weights=True)

# Melatih model
history = model.fit(
    train_generator,
    steps_per_epoch=len(train_generator),
    epochs=10,
    validation_data=validation_generator,
    validation_steps=len(validation_generator),
    callbacks=[reduce_lr, early_stop]
)
```

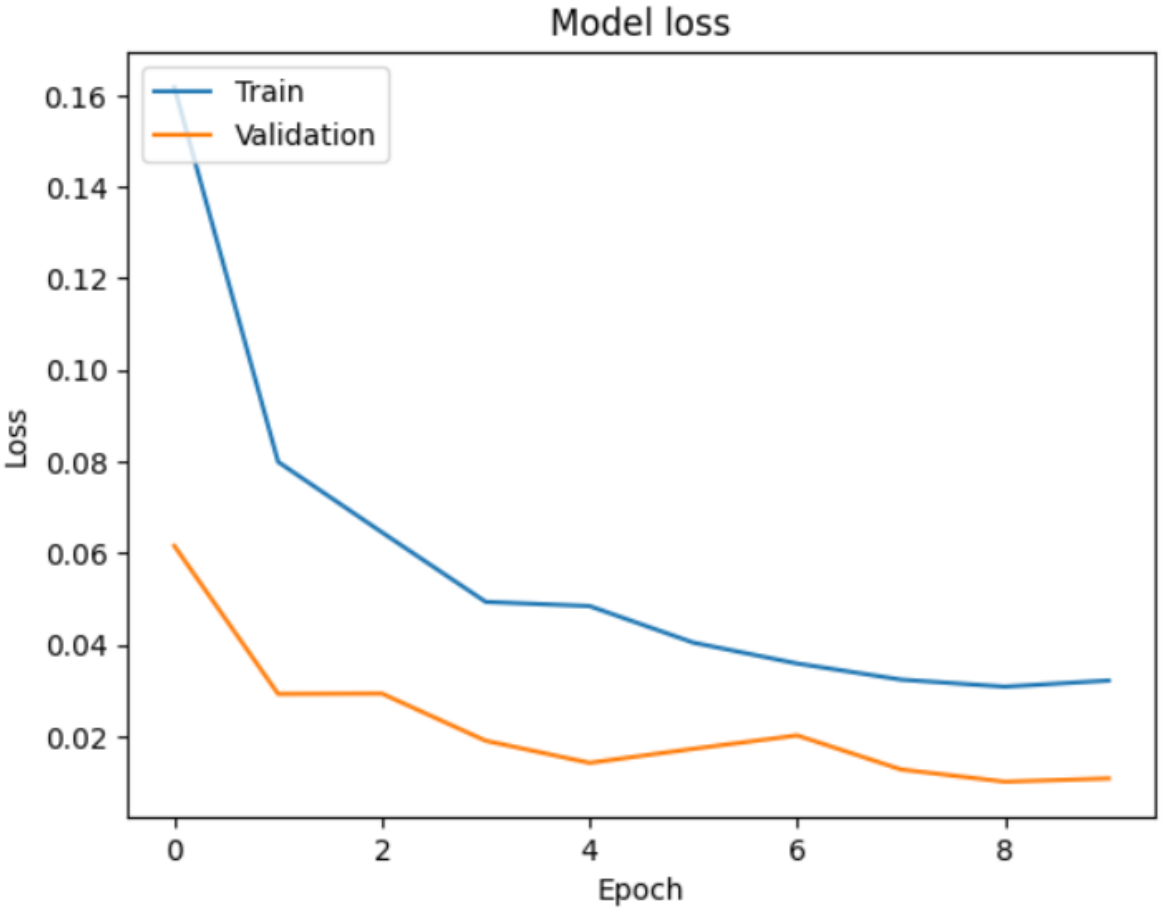
```
Epoch 1/10
363/363 [==============================] - 409s 1s/step - loss: 0.1618 - accuracy: 0.9357 - val_loss: 0.0616 - val_accuracy:
0.9706 - lr: 0.0010
Epoch 2/10
363/363 [==============================] - 387s 1s/step - loss: 0.0799 - accuracy: 0.9697 - val_loss: 0.0293 - val_accuracy:
0.9899 - lr: 0.0010
Epoch 3/10
363/363 [==============================] - 392s 1s/step - loss: 0.0646 - accuracy: 0.9755 - val_loss: 0.0294 - val_accuracy:
0.9885 - lr: 0.0010
Epoch 4/10
363/363 [==============================] - 397s 1s/step - loss: 0.0494 - accuracy: 0.9813 - val_loss: 0.0191 - val_accuracy:
0.9930 - lr: 0.0010
Epoch 5/10
363/363 [==============================] - 396s 1s/step - loss: 0.0485 - accuracy: 0.9828 - val_loss: 0.0142 - val_accuracy:
0.9958 - lr: 0.0010
Epoch 6/10
363/363 [==============================] - 395s 1s/step - loss: 0.0405 - accuracy: 0.9853 - val_loss: 0.0173 - val_accuracy:
0.9937 - lr: 0.0010
Epoch 7/10
363/363 [==============================] - 397s 1s/step - loss: 0.0359 - accuracy: 0.9870 - val_loss: 0.0202 - val_accuracy:
0.9934 - lr: 0.0010
Epoch 8/10
363/363 [==============================] - 394s 1s/step - loss: 0.0324 - accuracy: 0.9881 - val_loss: 0.0128 - val_accuracy:
0.9976 - lr: 0.0010
Epoch 9/10
363/363 [==============================] - 395s 1s/step - loss: 0.0309 - accuracy: 0.9887 - val_loss: 0.0101 - val_accuracy:
0.9969 - lr: 0.0010
Epoch 10/10
363/363 [==============================] - 400s 1s/step - loss: 0.0322 - accuracy: 0.9886 - val_loss: 0.0108 - val_accuracy:
0.9976 - lr: 0.0010
```

```python
scores = model.evaluate(test_generator, steps=len(test_generator))
print("Test loss:", scores[0])
print("Test accuracy:", scores[1])
```

```
41/41 [==============================] - 18s 423ms/step - loss: 0.0189 - accuracy: 0.9953
Test loss: 0.018856368958950043
Test accuracy: 0.9953361749649048
```

```python
# Plot training & validation accuracy values
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()

# Plot training & validation loss values
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model loss')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()
```


Model accuracy
Train
Validation
1.00
0.99
0.98
0.97
0.96
0.95
0.94
Accuracy
0
2
4
6
8
Epoch


Model loss
Train
Validation
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
Loss
0
2
4
6
8
Epoch