TensorFlow Version

[ ] ↳ *숨겨진 셀 3개*

UNZIP

[ ] ↳ *숨겨진 셀 3개*

라이브러리 불러오기

```
# import library
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# 디렉토리 정보 추출
from glob import glob


# import ai library
import tensorflow as tf
import tensorflow.keras

from tensorflow.keras.models import Sequential, Model
from tensorflow.keras.layers import Dense, Activation, ReLU, Flatten, BatchNormalization

# Application
from tensorflow.keras.applications.vgg16 import VGG16

# 데이터 처리(데이터 증량) - ImageDataGenerator
from tensorflow.keras.preprocessing.image import ImageDataGenerator

from tensorflow.keras.preprocessing import image


# image size setting
image_size = [224, 224]
# input_image_size = [224, 224, 3]
```

Matrix Addition

```
test = [224, 224]
test
test = test + [3]
test
```

```
[224, 224, 3]
```

Train Data

```
# Train Data
train_data = '/content/drive/MyDrive/datasets/training_set/'
test_data = '/content/drive/MyDrive/datasets/test_set/'


# import VGG16 Model
vgg16 = VGG16(include_top = False, weights = 'imagenet', input_shape = image_size + [3]) # include_top = True(수정X) / False(수정O)
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/vgg16/vgg16_weights_tf_dim_ordering_tf_kernels_notop.h5
58889256/58889256 [==============================] - 0s 0us/step
```

```
vgg16.summary()
```

```
Model: "vgg16"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_1 (InputLayer)        [(None, 224, 224, 3)]     0
```

```
 block1_conv1 (Conv2D)       (None, 224, 224, 64)      1792

 block1_conv2 (Conv2D)       (None, 224, 224, 64)      36928

 block1_pool (MaxPooling2D)  (None, 112, 112, 64)      0

 block2_conv1 (Conv2D)       (None, 112, 112, 128)     73856

 block2_conv2 (Conv2D)       (None, 112, 112, 128)     147584

 block2_pool (MaxPooling2D)  (None, 56, 56, 128)       0

 block3_conv1 (Conv2D)       (None, 56, 56, 256)       295168

 block3_conv2 (Conv2D)       (None, 56, 56, 256)       590080

 block3_conv3 (Conv2D)       (None, 56, 56, 256)       590080

 block3_pool (MaxPooling2D)  (None, 28, 28, 256)       0

 block4_conv1 (Conv2D)       (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0

 block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0

=================================================================
Total params: 14714688 (56.13 MB)
Trainable params: 14714688 (56.13 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

```
# import VGG16 Model
vgg16_1 = VGG16(include_top = True, weights = 'imagenet')# , input_shape=image_size + [3]) # include_top = True(수정X) / False(수정0)
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/vgg16/vgg16_weights_tf_dim_ordering_tf_kernels.h5
553467096/553467096 [==============================] - 3s 0us/step
```

```
vgg16_1.summary()
```

```
Model: "vgg16"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_2 (InputLayer)        [(None, 224, 224, 3)]     0

 block1_conv1 (Conv2D)       (None, 224, 224, 64)      1792

 block1_conv2 (Conv2D)       (None, 224, 224, 64)      36928

 block1_pool (MaxPooling2D)  (None, 112, 112, 64)      0

 block2_conv1 (Conv2D)       (None, 112, 112, 128)     73856

 block2_conv2 (Conv2D)       (None, 112, 112, 128)     147584

 block2_pool (MaxPooling2D)  (None, 56, 56, 128)       0

 block3_conv1 (Conv2D)       (None, 56, 56, 256)       295168

 block3_conv2 (Conv2D)       (None, 56, 56, 256)       590080

 block3_conv3 (Conv2D)       (None, 56, 56, 256)       590080

 block3_pool (MaxPooling2D)  (None, 28, 28, 256)       0

 block4_conv1 (Conv2D)       (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0

 block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808
```

```
 block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0

 flatten (Flatten)           (None, 25088)             0

 fc1 (Dense)                 (None, 4096)              102764544

 fc2 (Dense)                 (None, 4096)              16781312

 predictions (Dense)         (None, 1000)              4097000

=================================================================
Total params: 138357544 (527.79 MB)
Trainable params: 138357544 (527.79 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

```
# 레이어 구조 확인
for layers in vgg16.layers:
  layers.trainable = False
```

```
vgg16.summary()
```

```
Model: "vgg16"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_1 (InputLayer)        [(None, 224, 224, 3)]     0

 block1_conv1 (Conv2D)       (None, 224, 224, 64)      1792

 block1_conv2 (Conv2D)       (None, 224, 224, 64)      36928

 block1_pool (MaxPooling2D)  (None, 112, 112, 64)      0

 block2_conv1 (Conv2D)       (None, 112, 112, 128)     73856

 block2_conv2 (Conv2D)       (None, 112, 112, 128)     147584

 block2_pool (MaxPooling2D)  (None, 56, 56, 128)       0

 block3_conv1 (Conv2D)       (None, 56, 56, 256)       295168

 block3_conv2 (Conv2D)       (None, 56, 56, 256)       590080

 block3_conv3 (Conv2D)       (None, 56, 56, 256)       590080

 block3_pool (MaxPooling2D)  (None, 28, 28, 256)       0

 block4_conv1 (Conv2D)       (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0

 block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0

=================================================================
Total params: 14714688 (56.13 MB)
Trainable params: 0 (0.00 Byte)
Non-trainable params: 14714688 (56.13 MB)
_________________________________________________________________
```

모델 설계

```
x = Flatten()(vgg16.output)
```

```
# 디렉토리 정보 추출
dir = glob(test_data + '*') # 리눅스/맥에서 .test 같은 히든 파일이 있으면 에러 발생할 수 있음
```

```
dir
```

```
['/content/drive/MyDrive/datasets/test_set/dogs',
 '/content/drive/MyDrive/datasets/test_set/cats']
```

```
len(dir)
```

```
2
```

```
# 마지막 레이어 층 생성
last_dense = Dense(len(dir), activation = 'softmax')(x)
```

```
vgg16_new = Model(inputs = vgg16.inputs, outputs = last_dense)
```

```
vgg16_new.summary()
```

```
Model: "model"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_1 (InputLayer)        [(None, 224, 224, 3)]     0

 block1_conv1 (Conv2D)       (None, 224, 224, 64)      1792

 block1_conv2 (Conv2D)       (None, 224, 224, 64)      36928

 block1_pool (MaxPooling2D)  (None, 112, 112, 64)      0

 block2_conv1 (Conv2D)       (None, 112, 112, 128)     73856

 block2_conv2 (Conv2D)       (None, 112, 112, 128)     147584

 block2_pool (MaxPooling2D)  (None, 56, 56, 128)       0

 block3_conv1 (Conv2D)       (None, 56, 56, 256)       295168

 block3_conv2 (Conv2D)       (None, 56, 56, 256)       590080

 block3_conv3 (Conv2D)       (None, 56, 56, 256)       590080

 block3_pool (MaxPooling2D)  (None, 28, 28, 256)       0

 block4_conv1 (Conv2D)       (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)       (None, 28, 28, 512)       2359808

 block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0

 block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808

 block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0

 flatten (Flatten)           (None, 25088)             0

 dense (Dense)               (None, 2)                 50178

=================================================================
Total params: 14764866 (56.32 MB)
Trainable params: 50178 (196.01 KB)
Non-trainable params: 14714688 (56.13 MB)
_________________________________________________________________
```

```
# 모델 컴파일
vgg16_new.compile(optimizer = 'adam', loss = 'categorical_crossentropy', metrics = ['accuracy']) # 학습이 바이너리로 된 것이 아니라서 loss 값을 cate
```

```
# 데이터 처리(데이터 증량) - ImageDataGenerator
training_data = ImageDataGenerator(
    rescale = 1./255,
    shear_range = 0.2,
    horizontal_flip = True,
    zoom_range = 0.2
)
```

```
testing_data = ImageDataGenerator(rescale=1./255)
```

```
# 데이터 정규화
train = training_data.flow_from_directory(
    train_data,
    target_size = image_size,
    batch_size = 32,
    class_mode = 'categorical'
)
```

```
Found 8000 images belonging to 2 classes.
```

```
test = testing_data.flow_from_directory(
    test_data,
    target_size = image_size,
    batch_size = 32,
    class_mode = 'categorical'
)
```

```
Found 2000 images belonging to 2 classes.
```

```
# 모델 훈련
vgg16_new.fit(train, validation_data = test, epochs = 50, steps_per_epoch = len(train), validation_steps = len(test))
```

```
250/250 [==============================] - 159s 635ms/step - loss: 0.0749 - accuracy: 0.9735 - val_loss: 0.2993 - val_accuracy: 0.9295
Epoch 23/50
250/250 [==============================] - 142s 566ms/step - loss: 0.1115 - accuracy: 0.9606 - val_loss: 0.4118 - val_accuracy: 0.9120
Epoch 24/50
250/250 [==============================] - 144s 573ms/step - loss: 0.0764 - accuracy: 0.9732 - val_loss: 0.2871 - val_accuracy: 0.9345
Epoch 25/50
250/250 [==============================] - 143s 574ms/step - loss: 0.0674 - accuracy: 0.9753 - val_loss: 0.2768 - val_accuracy: 0.9395
Epoch 26/50
250/250 [==============================] - 143s 572ms/step - loss: 0.0609 - accuracy: 0.9774 - val_loss: 0.2969 - val_accuracy: 0.9350
Epoch 27/50
250/250 [==============================] - 146s 581ms/step - loss: 0.0700 - accuracy: 0.9731 - val_loss: 0.3189 - val_accuracy: 0.9295
Epoch 28/50
250/250 [==============================] - 145s 579ms/step - loss: 0.0879 - accuracy: 0.9682 - val_loss: 0.3153 - val_accuracy: 0.9340
Epoch 29/50
250/250 [==============================] - 143s 573ms/step - loss: 0.0760 - accuracy: 0.9729 - val_loss: 0.3383 - val_accuracy: 0.9310
Epoch 30/50
250/250 [==============================] - 141s 564ms/step - loss: 0.0667 - accuracy: 0.9754 - val_loss: 0.3183 - val_accuracy: 0.9320
Epoch 31/50
250/250 [==============================] - 144s 575ms/step - loss: 0.0678 - accuracy: 0.9751 - val_loss: 0.4101 - val_accuracy: 0.9120
Epoch 32/50
250/250 [==============================] - 142s 567ms/step - loss: 0.0624 - accuracy: 0.9759 - val_loss: 0.3349 - val_accuracy: 0.9285
Epoch 33/50
250/250 [==============================] - 155s 619ms/step - loss: 0.0484 - accuracy: 0.9826 - val_loss: 0.3345 - val_accuracy: 0.9300
Epoch 34/50
250/250 [==============================] - 143s 571ms/step - loss: 0.0792 - accuracy: 0.9728 - val_loss: 0.5252 - val_accuracy: 0.9035
Epoch 35/50
250/250 [==============================] - 154s 615ms/step - loss: 0.0628 - accuracy: 0.9776 - val_loss: 0.3353 - val_accuracy: 0.9305
Epoch 36/50
250/250 [==============================] - 149s 594ms/step - loss: 0.0656 - accuracy: 0.9739 - val_loss: 0.3542 - val_accuracy: 0.9260
Epoch 37/50
250/250 [==============================] - 174s 698ms/step - loss: 0.0607 - accuracy: 0.9784 - val_loss: 0.3646 - val_accuracy: 0.9285
Epoch 38/50
250/250 [==============================] - 192s 768ms/step - loss: 0.0451 - accuracy: 0.9851 - val_loss: 0.3437 - val_accuracy: 0.9315
Epoch 39/50
250/250 [==============================] - 155s 618ms/step - loss: 0.0493 - accuracy: 0.9818 - val_loss: 0.3752 - val_accuracy: 0.9275
Epoch 40/50
250/250 [==============================] - 141s 566ms/step - loss: 0.0678 - accuracy: 0.9766 - val_loss: 0.3727 - val_accuracy: 0.9270
Epoch 41/50
250/250 [==============================] - 152s 607ms/step - loss: 0.0808 - accuracy: 0.9728 - val_loss: 0.4454 - val_accuracy: 0.9235
Epoch 42/50
250/250 [==============================] - 153s 611ms/step - loss: 0.0565 - accuracy: 0.9800 - val_loss: 0.3598 - val_accuracy: 0.9320
Epoch 43/50
250/250 [==============================] - 156s 623ms/step - loss: 0.0607 - accuracy: 0.9787 - val_loss: 0.4113 - val_accuracy: 0.9285
Epoch 44/50
250/250 [==============================] - 143s 571ms/step - loss: 0.0695 - accuracy: 0.9758 - val_loss: 0.4807 - val_accuracy: 0.9190
Epoch 45/50
250/250 [==============================] - 142s 569ms/step - loss: 0.0717 - accuracy: 0.9736 - val_loss: 0.4161 - val_accuracy: 0.9265
Epoch 46/50
250/250 [==============================] - 153s 609ms/step - loss: 0.0612 - accuracy: 0.9765 - val_loss: 0.3540 - val_accuracy: 0.9365
Epoch 47/50
250/250 [==============================] - 144s 577ms/step - loss: 0.0461 - accuracy: 0.9840 - val_loss: 0.4174 - val_accuracy: 0.9240
Epoch 48/50
250/250 [==============================] - 145s 578ms/step - loss: 0.0459 - accuracy: 0.9831 - val_loss: 0.3887 - val_accuracy: 0.9335
Epoch 49/50
250/250 [==============================] - 141s 564ms/step - loss: 0.0646 - accuracy: 0.9779 - val_loss: 0.3925 - val_accuracy: 0.9280
Epoch 50/50
250/250 [==============================] - 141s 566ms/step - loss: 0.0458 - accuracy: 0.9841 - val_loss: 0.4070 - val_accuracy: 0.9265
<keras.src.callbacks.History at 0x7f60ec3f10f0>
```

```
# 현재 모델의 history 정보
vgg16_new.history.history.keys()
# dict_keys(['loss', 'accuracy', 'val_loss', 'val_accuracy'])
```

```
dict_keys(['loss', 'accuracy', 'val_loss', 'val_accuracy'])
```

```
# loss 정보 확인
train_loss = vgg16_new.history.history['loss']
```

```
train_loss
```

```
[0.20124934613704681,
 0.1982506811618805,
 0.1826181262731552,
 0.14831463992595673,
 0.14154119789600372,
 0.13283862173557281,
 0.12137243151664734,
 0.12142371386289597,
 0.11698212726078033,
 0.10211852937936783,
 0.10232295095920563,
 0.08746394515037537,
 0.09811276197433472,
 0.0880536586046219,
 0.09416044503450394,
 0.09388098865747452,
 0.10888904333114624,
 0.07868631929159164,
 0.07718221098184586,
 0.0647720620036125 2,
 0.07879369705915451,
 0.07487404346466064,
 0.11150380223989487,
 0.07640613615512848,
 0.06736737489700317,
 0.060947827994823456,
 0.0699984803795814 5,
 0.08786074817180634,
 0.07603047788143158,
 0.06670241057872772,
 0.06777454167604446,
 0.06239888072013855,
 0.04841340705752373,
 0.07923045009374619,
 0.06276828795671463,
 0.06562943756580353,
 0.06074702367186546,
 0.0451490618288517,
 0.0492963045835495,
 0.06782078742980957,
 0.080827996134758,
 0.05645840987563133,
 0.06073998659849167,
 0.06945199519395828,
 0.07173656672239304,
 0.061210840940475464,
 0.04605522379279137,
 0.045915618538856506,
 0.064610056579113,
 0.04578496143221855]
```

```
# 정확도 확인
train_accuracy = vgg16_new.history.history['accuracy']
```

```
train_accuracy
```

```
[0.9167500138282776,
 0.922124981880188,
 0.9283750057220459,
 0.940625011920929,
 0.9438750147819519,
 0.9484999775886536,
 0.9493749737739563,
 0.952750027179718,
 0.937874972820282,
 0.9596250057220459,
 0.9581249952316284,
 0.9653750061988831,
 0.9611250162124634,
 0.9674999713897705,
 0.965624988079071,
 0.9642500281333923,
 0.9586250185966492,
 0.9676250219345093,
 0.9712499976158142,
 0.9743750095367432,
 0.9693750143051147,
 0.9735000133514404,
 0.9606249928474426,
 0.9732499718666077,
```

```
        0.9752500057220459,
        0.9773749709129333,
        0.9731249809265137,
        0.9682499766349792,
        0.9728749990463257,
        0.9753749966621399,
        0.9751250147819519,
        0.9758750200271606,
        0.9826250076293945,
        0.9727500081062317,
        0.9776250123977661,
        0.9738749861717224,
        0.9783750176429749,
        0.9851250052452087,
        0.9817500114440918,
        0.9766250252723694,
        0.9727500081062317,
        0.9800000190734863,
        0.9787499904632568,
        0.9757500290870667,
        0.9736250042915344,
        0.9764999747276306,
        0.984000027179718,
        0.9831249713897705,
        0.9778749942779541,
        0.984125018119812]
```

```
# loss 정보 확인
test_loss = vgg16_new.history.history['val_loss']
```

```
test_loss
```

```
[0.25872573256492615,
 0.23703047633171082,
 0.18434946238994598,
 0.2206425964832306,
 0.20310258865356445,
 0.3609180152416229,
 0.20789214968681335,
 0.32218876481056213,
 0.25152623653411865,
 0.2315736562013626,
 0.2331935465335846,
 0.24869754910469055,
 0.251840740442276,
 0.34378087520599365,
 0.4687614142894745,
 0.25982344150543213,
 0.26999571919441223,
 0.2605658769607544,
 0.31317633390426636,
 0.28446540236473083,
 0.2957494258880615,
 0.299265593290329,
 0.4117937386035919,
 0.28713539242744446,
 0.2767925560474396,
 0.2968549430370331,
 0.31886452436447144,
 0.315309077501297,
 0.33826348185539246,
 0.3182631731033325,
 0.4101202189922333,
 0.33489251136779785,
 0.3345281183719635,
 0.5252248644828796,
 0.33532950282096863,
 0.3541693687438965,
 0.36458855867385864,
 0.34370821714401245,
 0.37516677379608154,
 0.3727196455001831,
 0.44543156027793884,
 0.35979944467544556,
 0.41134360432624817,
 0.4807445704936981,
 0.4161033034324646,
 0.3540446162223816,
 0.4174155294895172,
 0.3886822462081909,
 0.3924591839313507,
 0.4070455729961395]
```

```
# 정확도 확인
test_accuracy = vgg16_new.history.history['val_accuracy']
```

```
test_accuracy
```

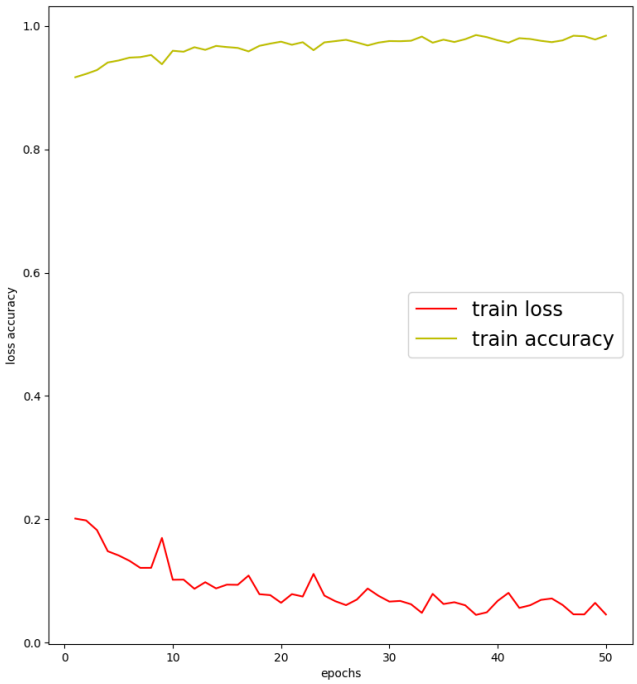
```
[0.8960000276565552,
 0.9075000286102295,
 0.9340000152587891,
 0.921999990940094,
 0.9300000071525574,
 0.8859999775886536,
 0.9319999814033508,
 0.9035000205039978,
 0.9204999804496765,
 0.9265000224113464,
 0.9319999814033508,
 0.9269999861717224,
 0.9319999814033508,
 0.9100000262260437,
 0.8830000162124634,
 0.9309999942779541,
 0.9325000047683716,
 0.9350000023841858,
 0.9269999861717224,
 0.9259999990463257,
 0.9294999837875366,
 0.9294999837875366,
 0.9120000004768372,
 0.934499979019165,
 0.9394999742507935,
 0.9350000023841858,
 0.9294999837875366,
 0.9340000152587891,
 0.9309999942779541,
 0.9319999814033508,
 0.9120000004768372,
 0.9284999966621399,
 0.9300000071525574,
 0.9035000205039978,
 0.9304999709129333,
 0.9259999990463257,
 0.9284999966621399,
 0.9315000176429749,
 0.9275000095367432,
 0.9269999861717224,
 0.9235000014305115,
 0.9319999814033508,
 0.9284999966621399,
 0.9190000295639038,
 0.9265000224113464,
 0.9365000128746033,
 0.9240000247955322,
 0.9334999918937683,
 0.9279999732971191,
 0.9265000224113464]
```

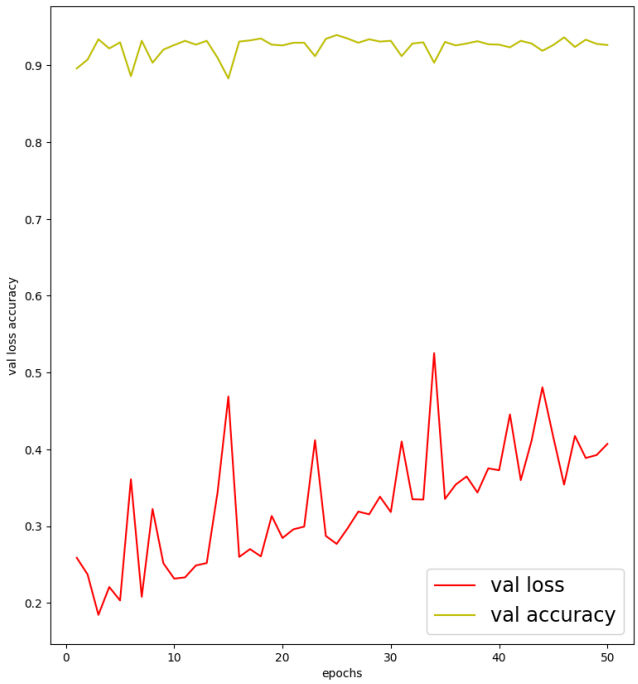
```
# epochs 범위
epochs = np.arange(1, 51) # 총 50개
```

```
plt.figure(figsize=(20, 10))
plt.subplot(1, 2, 1)
plt.plot(epochs, train_loss, color = 'r', label = 'train loss')
plt.plot(epochs, train_accuracy, color = 'y', label = 'train accuracy')
plt.legend(loc ='best', fontsize = 'xx-large')
plt.xlabel('epochs')
plt.ylabel('loss accuracy')

plt.subplot(1, 2, 2)
plt.plot(epochs, test_loss, color = 'r', label = 'val loss')
plt.plot(epochs, test_accuracy, color = 'y', label = 'val accuracy')
plt.legend(loc ='best', fontsize = 'xx-large')
plt.xlabel('epochs')
plt.ylabel('val loss accuracy')

plt.show()
```






```
# 예측을 위한 텍스트값 설정
classes = {0:"cat", 1:"dog"}
for i in classes.items():
  print(i)
```

```
(0, 'cat')
(1, 'dog')
```

```
# 학습결과 저장
vgg16_new.save('/content/drive/MyDrive/datasets/vgg16.h5')
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/engine/training.py:3103: UserWarning: You are saving your model as an HDF5 file via `model.sav
  saving_api.save_model(
```

```
# 실제 동작시킬 때
image_path = './dog1.jpg' # 이미지 파일
new_img = image.load_img(image_path, target_size = (224, 224))
img = image.img_to_array(new_img)
img = np.expand_dims(img, axis = 0)
prediction = vgg16_new.predict(img)
print(prediction)
prediction = np.argmax(prediction, axis=1)
print(prediction)
print(classes[prediction[0]])
plt.imshow(new_img)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-43-323fb0e82cb4> in <cell line: 3>()
      1 # 실제 동작시킬 때
      2 image_path = './dog1.jpg' # 이미지 파일
----> 3 new_img = Image.load_img(image_path, target_size = (224, 224))
      4 img = image.img_to_array(new_img)
      5 img = np.expand_dims(img, axis = 0)

NameError: name 'Image' is not defined
```

다음 단계: 오류 설명

코딩을 시작하거나 AI로 코드를 생성하세요.