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1. Setup & Load Data

1.1 Load Required Libraries:

```
import tensorflow as tf
import os
from matplotlib import pyplot as plt
import cv2
import imghdr
import numpy as np
from tensorflow import keras
from keras.models import Sequential, load_model
from keras.layers import Conv2D, MaxPooling2D, Dense, Flatten, Dropout
from keras.callbacks import ReduceLROnPlateau
from silence_tensorflow import silence_tensorflow
silence_tensorflow()
from keras.callbacks import ModelCheckpoint
from keras.layers import Rescaling, RandomFlip, RandomRotation,
RandomZoom, Resizing
import numpy as np
import splitfolders
import seaborn as sns
from keras.metrics import Precision, Recall, BinaryAccuracy
```

1.2 Setting Up The Directory:

```
data_dir = 'CatsDogs_ds'
```

```
os.listdir(data_dir)
```

```
['Cats', 'Dogs']
```

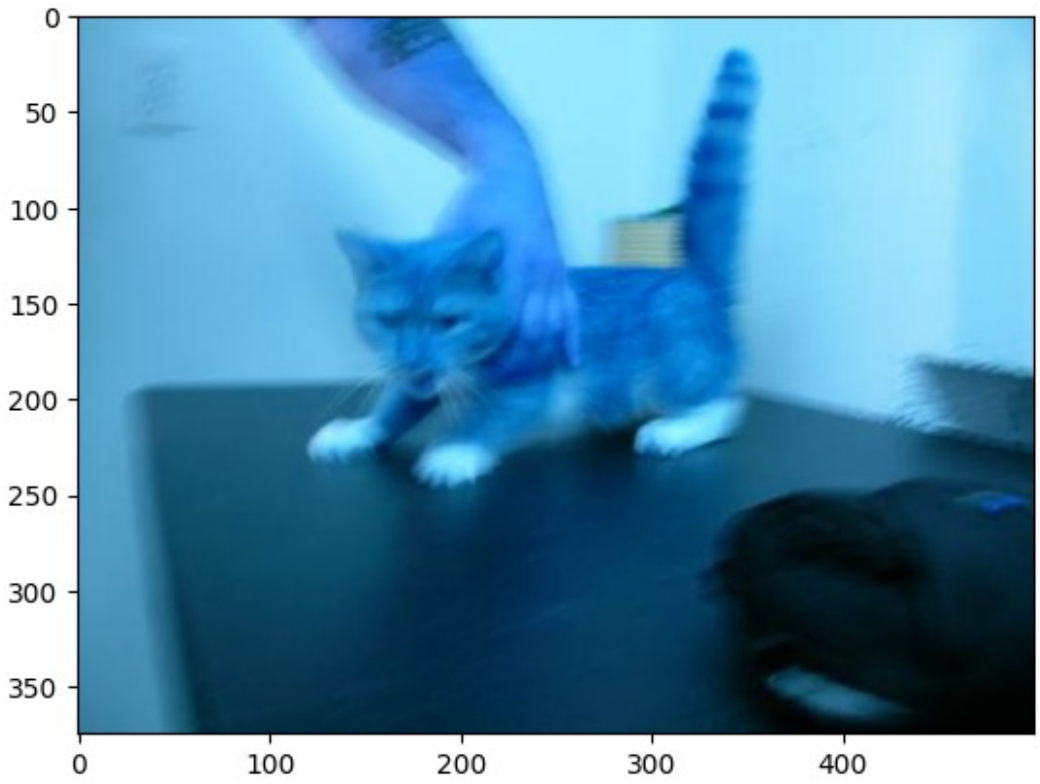
```
image_exts = ['jpeg', 'jpg', 'bmp', 'png']

# Removing corrupted and broken images
for image_class in os.listdir(data_dir):
    for image in os.listdir(os.path.join(data_dir, image_class)):
        image_path = os.path.join(data_dir, image_class, image)
        try:
            img = cv2.imread(image_path)
            tip = imghdr.what(image_path)
            if tip!= 'jpeg':
                print('image does not have 3 channels
{}'.format(image_path))
                os.remove(image_path)
            if tip not in image_exts:
                print('image is not in ext list
{}'.format(image_path))
                os.remove(image_path)
        except Exception as e:
            print('Issue with image {}'.format(image_path))

splitfolders.ratio(data_dir, output='CatsDogs_Split', seed= 1234,
ratio = (0.8, 0.2))

Train_dir = 'CatsDogs_Split/train'
Test_dir = 'CatsDogs_Split/test'

#Visualizing an image
img = cv2.imread(os.path.join('CatsDogs_Split/train','Cats', '0.jpg'))
plt.imshow(img)
plt.show()
```



1.3 Loading & Exploring The Dataset:

```
#Building an image dataset on the fly, no need to build the labels,
the classes.
#Note: this will resize the images to 64x64.
#Images will be shuffled as well.
data =
tf.keras.utils.image_dataset_from_directory('CatsDogs_Split/train',
image_size=(64,64))
```

```
Found 19785 files belonging to 2 classes.
```

```
#This will allow us to access the generator from our data pipeline
data_iterator = data.as_numpy_iterator()
```

```
#Get another batch from the iterator
batch = data_iterator.next()
```

```
len(batch)
```

```
2
```

- There are 2 parts of the dataset:
  - The actual dataset images stored as numpy arrays
  - labels

```
batch[0].shape
```

```
(32, 64, 64, 3)
```

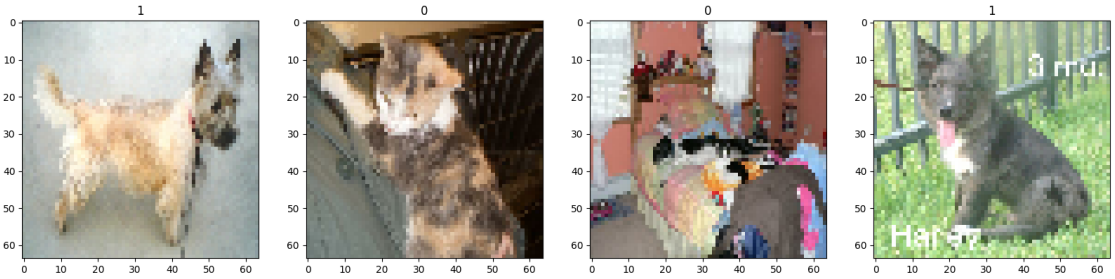
- Batch size is 32, image size is 256 by 256 by 3 channels

```
batch[1]
```

```
array([1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0,
1,
       0, 1, 1, 0, 0, 1, 1, 1, 0, 1])
```

- Labels are either 0 or 1, meaning Cat or Dog.

```
#Plotting the images to determine which value means Cat and which
value means Dog
fig, ax = plt.subplots(ncols=4, figsize=(20,20))
for idx, img in enumerate(batch[0][:4]):
    ax[idx].imshow(img.astype(int))
    ax[idx].title.set_text(batch[1][idx])
```



- From the above plot, we can determine that label 1 means dog and label 0 means cat.

2. The Deep Learning Model

2.1 Building The Model:

```
def cnn_model():
    model = Sequential()
    #Resizing the images
    model.add(Resizing(100,100))
    #Scaling the image values between 0 & 1 instead of 0 to 255. This
will help our Deep learning model to optimize faster and produce
better results.
    model.add(Rescaling(1./255))
    #Data Augmentation to prevent overfitting
    model.add(RandomFlip('horizontal'))
    model.add(RandomRotation(0.2))
    model.add(RandomZoom(0.2))

    #Adding a convolutional layer and a MaxPooling layer
    #Each filter is going to be 3x3 in size and we are moving by 1
step/stride each time
    #Activation is going to be Rectified Linear Unit(relu), meaning
any output below zero is going to be equal 0 and any other positive
```

```
value is going to be preserved
    #MaxPooling helps us condense the information we get after the
activation with the aim of getting the maximum values
    #MaxPooling halves the output of the Convolutional layer

    #First Layer
    model.add(Conv2D(32, (3,3), 1, activation = 'relu'))
    model.add(MaxPooling2D(2,2))

    #Second Layer
    model.add(Conv2D(64, (3,3), 1, activation = 'relu'))
    model.add(MaxPooling2D(2,2))

    #Third Layer
    model.add(Conv2D(128, (3,3), 1, activation = 'relu'))
    model.add(MaxPooling2D(2,2))

    #Fourth Layer
    model.add(Conv2D(256, (3,3), 1, activation = 'relu'))
    model.add(MaxPooling2D(2,2))

    model.add(Dropout(0.2))

    #We have condensed the rows and the width and the number of
filters will form the channel value
    #Now the aim when flattening the data is condense the channel
value to a single value
    model.add(Flatten())

    model.add(Dense(128, activation = 'relu'))

    model.add(Dropout(0.5))
    #Now we are condensing them even more to get the final value (0 or
1 --> cat or dog)
    model.add(Dense(1, activation = 'sigmoid'))

    #List of optimizers can be checked --> (tf.optimizers.)
    model.compile('adam', loss = tf.losses.BinaryCrossentropy(),
metrics = ['accuracy'])

    return model
```

2.2 Splitting The Data:

```
n_folds = 5
for i in range(n_folds):
    splitfolders.ratio(Train_dir, output='Fold_'+str(i+1), seed=
np.random.randint(1,1000,1)[0], ratio = (0.8, 0.2))

n_folds = 5
```

2.3 Fitting The Model:

```
#creating two empty arrays that will contain the loss and accuracy
scores & a directory where best models of each iteration will be
saved.
cv_accuracy_scores = []
cv_loss_scores = []
models_dir = 'saved_models'

def get_model_name(k):
    return '/model_'+str(k)+'.h5'

def fit_model(tr, val, iterator):
    model = None
    model = cnn_model()

    #define the model checkpoint callback -> this will keep on saving
the model as a physical file
    model_checkpoint =
ModelCheckpoint(models_dir+get_model_name(iterator), verbose=1,
monitor='val_accuracy', mode=max, save_best_only=True)

    call_backs_list = [model_checkpoint]

    #fitting the model
    hist = model.fit(tr, validation_data = val, epochs=60, verbose =
1, callbacks = [call_backs_list, ReduceLROnPlateau()])

    #Evaluating the model
    best_model = load_model('saved_models/model_'+str(iterator)+'.h5')
    scores = best_model.evaluate(val, verbose = 0)
    cv_loss_scores.append(scores[0])
    cv_accuracy_scores.append(scores[1])
    iterator = iterator+1

    return hist
```

2.4 Training The Model & Visualizing Average Scores:

```
model_hist = []
for i in range(n_folds):
    train_data =
tf.keras.utils.image_dataset_from_directory('Fold_'+str(i+1)+'/train',
image_size = (100,100))
    val_data =
tf.keras.utils.image_dataset_from_directory('Fold_'+str(i+1)+'/val',
image_size = (100,100))
    print("Training On Fold: ", i+1)
    model_hist.append(fit_model(train_data, val_data, (i+1)))
    print("======="*10, end="\n\n\n")
```

```
Found 15827 files belonging to 2 classes.
Found 3958 files belonging to 2 classes.
Training On Fold:  1
Epoch 1/60
495/495 [==============================] - ETA: 0s - loss: 0.6879 -
accuracy: 0.5295
Epoch 1: val_accuracy improved from -inf to 0.57377, saving model to
saved_models\model_1.h5
495/495 [==============================] - 271s 537ms/step - loss:
0.6879 - accuracy: 0.5295 - val_loss: 0.6825 - val_accuracy: 0.5738 -
lr: 0.0010
Epoch 2/60
495/495 [==============================] - ETA: 0s - loss: 0.6779 -
accuracy: 0.5762
Epoch 2: val_accuracy did not improve from 0.57377
495/495 [==============================] - 286s 578ms/step - loss:
0.6779 - accuracy: 0.5762 - val_loss: 0.6815 - val_accuracy: 0.5424 -
lr: 0.0010
Epoch 3/60
495/495 [==============================] - ETA: 0s - loss: 0.6529 -
accuracy: 0.6168
Epoch 3: val_accuracy improved from 0.57377 to 0.59626, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.6529 - accuracy: 0.6168 - val_loss: 0.6501 - val_accuracy: 0.5963 -
lr: 0.0010
Epoch 4/60
495/495 [==============================] - ETA: 0s - loss: 0.6167 -
accuracy: 0.6637
Epoch 4: val_accuracy improved from 0.59626 to 0.70490, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 574ms/step - loss:
0.6167 - accuracy: 0.6637 - val_loss: 0.5767 - val_accuracy: 0.7049 -
lr: 0.0010
Epoch 5/60
495/495 [==============================] - ETA: 0s - loss: 0.5874 -
accuracy: 0.6944
Epoch 5: val_accuracy improved from 0.70490 to 0.71501, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 573ms/step - loss:
0.5874 - accuracy: 0.6944 - val_loss: 0.5591 - val_accuracy: 0.7150 -
lr: 0.0010
Epoch 6/60
495/495 [==============================] - ETA: 0s - loss: 0.5719 -
accuracy: 0.7077
Epoch 6: val_accuracy improved from 0.71501 to 0.72436, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 574ms/step - loss:
0.5719 - accuracy: 0.7077 - val_loss: 0.5407 - val_accuracy: 0.7244 -
lr: 0.0010
```

```
Epoch 7/60
495/495 [==============================] - ETA: 0s - loss: 0.5527 -
accuracy: 0.7193
Epoch 7: val_accuracy improved from 0.72436 to 0.74128, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.5527 - accuracy: 0.7193 - val_loss: 0.5219 - val_accuracy: 0.7413 -
lr: 0.0010
Epoch 8/60
495/495 [==============================] - ETA: 0s - loss: 0.5367 -
accuracy: 0.7343
Epoch 8: val_accuracy improved from 0.74128 to 0.75745, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 574ms/step - loss:
0.5367 - accuracy: 0.7343 - val_loss: 0.4991 - val_accuracy: 0.7575 -
lr: 0.0010
Epoch 9/60
495/495 [==============================] - ETA: 0s - loss: 0.5220 -
accuracy: 0.7445
Epoch 9: val_accuracy improved from 0.75745 to 0.76074, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.5220 - accuracy: 0.7445 - val_loss: 0.4996 - val_accuracy: 0.7607 -
lr: 0.0010
Epoch 10/60
495/495 [==============================] - ETA: 0s - loss: 0.5024 -
accuracy: 0.7538
Epoch 10: val_accuracy improved from 0.76074 to 0.77842, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 574ms/step - loss:
0.5024 - accuracy: 0.7538 - val_loss: 0.4706 - val_accuracy: 0.7784 -
lr: 0.0010
Epoch 11/60
495/495 [==============================] - ETA: 0s - loss: 0.4882 -
accuracy: 0.7690
Epoch 11: val_accuracy did not improve from 0.77842
495/495 [==============================] - 285s 575ms/step - loss:
0.4882 - accuracy: 0.7690 - val_loss: 0.4595 - val_accuracy: 0.7777 -
lr: 0.0010
Epoch 12/60
495/495 [==============================] - ETA: 0s - loss: 0.4769 -
accuracy: 0.7761
Epoch 12: val_accuracy improved from 0.77842 to 0.79586, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.4769 - accuracy: 0.7761 - val_loss: 0.4382 - val_accuracy: 0.7959 -
lr: 0.0010
Epoch 13/60
495/495 [==============================] - ETA: 0s - loss: 0.4663 -
accuracy: 0.7799
```

```
Epoch 13: val_accuracy did not improve from 0.79586
495/495 [==============================] - 284s 574ms/step - loss:
0.4663 - accuracy: 0.7799 - val_loss: 0.4587 - val_accuracy: 0.7850 -
lr: 0.0010
Epoch 14/60
495/495 [==============================] - ETA: 0s - loss: 0.4608 -
accuracy: 0.7830
Epoch 14: val_accuracy improved from 0.79586 to 0.80015, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.4608 - accuracy: 0.7830 - val_loss: 0.4255 - val_accuracy: 0.8002 -
lr: 0.0010
Epoch 15/60
495/495 [==============================] - ETA: 0s - loss: 0.4515 -
accuracy: 0.7895
Epoch 15: val_accuracy improved from 0.80015 to 0.81076, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.4515 - accuracy: 0.7895 - val_loss: 0.4262 - val_accuracy: 0.8108 -
lr: 0.0010
Epoch 16/60
495/495 [==============================] - ETA: 0s - loss: 0.4350 -
accuracy: 0.8002
Epoch 16: val_accuracy did not improve from 0.81076
495/495 [==============================] - 285s 575ms/step - loss:
0.4350 - accuracy: 0.8002 - val_loss: 0.4394 - val_accuracy: 0.7969 -
lr: 0.0010
Epoch 17/60
495/495 [==============================] - ETA: 0s - loss: 0.4326 -
accuracy: 0.7988
Epoch 17: val_accuracy improved from 0.81076 to 0.83426, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.4326 - accuracy: 0.7988 - val_loss: 0.3700 - val_accuracy: 0.8343 -
lr: 0.0010
Epoch 18/60
495/495 [==============================] - ETA: 0s - loss: 0.4157 -
accuracy: 0.8108
Epoch 18: val_accuracy did not improve from 0.83426
495/495 [==============================] - 285s 575ms/step - loss:
0.4157 - accuracy: 0.8108 - val_loss: 0.4112 - val_accuracy: 0.8087 -
lr: 0.0010
Epoch 19/60
495/495 [==============================] - ETA: 0s - loss: 0.4084 -
accuracy: 0.8124
Epoch 19: val_accuracy did not improve from 0.83426
495/495 [==============================] - 285s 575ms/step - loss:
0.4084 - accuracy: 0.8124 - val_loss: 0.4039 - val_accuracy: 0.8269 -
lr: 0.0010
Epoch 20/60
```

```
495/495 [==============================] - ETA: 0s - loss: 0.3926 -
accuracy: 0.8204
Epoch 20: val_accuracy did not improve from 0.83426
495/495 [==============================] - 285s 576ms/step - loss:
0.3926 - accuracy: 0.8204 - val_loss: 0.4134 - val_accuracy: 0.8085 -
lr: 0.0010
Epoch 21/60
495/495 [==============================] - ETA: 0s - loss: 0.3928 -
accuracy: 0.8244
Epoch 21: val_accuracy improved from 0.83426 to 0.84639, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.3928 - accuracy: 0.8244 - val_loss: 0.3677 - val_accuracy: 0.8464 -
lr: 0.0010
Epoch 22/60
495/495 [==============================] - ETA: 0s - loss: 0.3858 -
accuracy: 0.8216
Epoch 22: val_accuracy did not improve from 0.84639
495/495 [==============================] - 285s 575ms/step - loss:
0.3858 - accuracy: 0.8216 - val_loss: 0.3671 - val_accuracy: 0.8360 -
lr: 0.0010
Epoch 23/60
495/495 [==============================] - ETA: 0s - loss: 0.3757 -
accuracy: 0.8324
Epoch 23: val_accuracy did not improve from 0.84639
495/495 [==============================] - 285s 576ms/step - loss:
0.3757 - accuracy: 0.8324 - val_loss: 0.4160 - val_accuracy: 0.8103 -
lr: 0.0010
Epoch 24/60
495/495 [==============================] - ETA: 0s - loss: 0.3759 -
accuracy: 0.8310
Epoch 24: val_accuracy did not improve from 0.84639
495/495 [==============================] - 284s 574ms/step - loss:
0.3759 - accuracy: 0.8310 - val_loss: 0.3678 - val_accuracy: 0.8327 -
lr: 0.0010
Epoch 25/60
495/495 [==============================] - ETA: 0s - loss: 0.3805 -
accuracy: 0.8320
Epoch 25: val_accuracy improved from 0.84639 to 0.84992, saving model
to saved_models\model_1.h5
495/495 [==============================] - 286s 576ms/step - loss:
0.3805 - accuracy: 0.8320 - val_loss: 0.3442 - val_accuracy: 0.8499 -
lr: 0.0010
Epoch 26/60
495/495 [==============================] - ETA: 0s - loss: 0.3630 -
accuracy: 0.8383
Epoch 26: val_accuracy improved from 0.84992 to 0.85321, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.3630 - accuracy: 0.8383 - val_loss: 0.3422 - val_accuracy: 0.8532 -
```

```
lr: 0.0010
Epoch 27/60
495/495 [==============================] - ETA: 0s - loss: 0.3565 -
accuracy: 0.8407
Epoch 27: val_accuracy did not improve from 0.85321
495/495 [==============================] - 285s 575ms/step - loss:
0.3565 - accuracy: 0.8407 - val_loss: 0.4134 - val_accuracy: 0.8297 -
lr: 0.0010
Epoch 28/60
495/495 [==============================] - ETA: 0s - loss: 0.3546 -
accuracy: 0.8439
Epoch 28: val_accuracy did not improve from 0.85321
495/495 [==============================] - 285s 576ms/step - loss:
0.3546 - accuracy: 0.8439 - val_loss: 0.3606 - val_accuracy: 0.8502 -
lr: 0.0010
Epoch 29/60
495/495 [==============================] - ETA: 0s - loss: 0.3474 -
accuracy: 0.8463
Epoch 29: val_accuracy did not improve from 0.85321
495/495 [==============================] - 285s 575ms/step - loss:
0.3474 - accuracy: 0.8463 - val_loss: 0.3507 - val_accuracy: 0.8479 -
lr: 0.0010
Epoch 30/60
495/495 [==============================] - ETA: 0s - loss: 0.3506 -
accuracy: 0.8420
Epoch 30: val_accuracy improved from 0.85321 to 0.86761, saving model
to saved_models\model_1.h5
495/495 [==============================] - 284s 574ms/step - loss:
0.3506 - accuracy: 0.8420 - val_loss: 0.3162 - val_accuracy: 0.8676 -
lr: 0.0010
Epoch 31/60
495/495 [==============================] - ETA: 0s - loss: 0.3316 -
accuracy: 0.8522
Epoch 31: val_accuracy did not improve from 0.86761
495/495 [==============================] - 285s 575ms/step - loss:
0.3316 - accuracy: 0.8522 - val_loss: 0.3537 - val_accuracy: 0.8431 -
lr: 0.0010
Epoch 32/60
495/495 [==============================] - ETA: 0s - loss: 0.3368 -
accuracy: 0.8527
Epoch 32: val_accuracy did not improve from 0.86761
495/495 [==============================] - 285s 575ms/step - loss:
0.3368 - accuracy: 0.8527 - val_loss: 0.3331 - val_accuracy: 0.8643 -
lr: 0.0010
Epoch 33/60
495/495 [==============================] - ETA: 0s - loss: 0.3296 -
accuracy: 0.8568
Epoch 33: val_accuracy did not improve from 0.86761
495/495 [==============================] - 285s 575ms/step - loss:
0.3296 - accuracy: 0.8568 - val_loss: 0.3396 - val_accuracy: 0.8613 -
```

```
lr: 0.0010
Epoch 34/60
495/495 [==============================] - ETA: 0s - loss: 0.3228 -
accuracy: 0.8589
Epoch 34: val_accuracy did not improve from 0.86761
495/495 [==============================] - 285s 576ms/step - loss:
0.3228 - accuracy: 0.8589 - val_loss: 0.3671 - val_accuracy: 0.8439 -
lr: 0.0010
Epoch 35/60
495/495 [==============================] - ETA: 0s - loss: 0.3236 -
accuracy: 0.8559
Epoch 35: val_accuracy did not improve from 0.86761
495/495 [==============================] - 285s 575ms/step - loss:
0.3236 - accuracy: 0.8559 - val_loss: 0.3184 - val_accuracy: 0.8633 -
lr: 0.0010
Epoch 36/60
495/495 [==============================] - ETA: 0s - loss: 0.3172 -
accuracy: 0.8605
Epoch 36: val_accuracy did not improve from 0.86761
495/495 [==============================] - 284s 574ms/step - loss:
0.3172 - accuracy: 0.8605 - val_loss: 0.3530 - val_accuracy: 0.8595 -
lr: 0.0010
Epoch 37/60
495/495 [==============================] - ETA: 0s - loss: 0.3173 -
accuracy: 0.8604
Epoch 37: val_accuracy improved from 0.86761 to 0.87216, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.3173 - accuracy: 0.8604 - val_loss: 0.3070 - val_accuracy: 0.8722 -
lr: 0.0010
Epoch 38/60
495/495 [==============================] - ETA: 0s - loss: 0.3143 -
accuracy: 0.8604
Epoch 38: val_accuracy did not improve from 0.87216
495/495 [==============================] - 285s 575ms/step - loss:
0.3143 - accuracy: 0.8604 - val_loss: 0.3230 - val_accuracy: 0.8638 -
lr: 0.0010
Epoch 39/60
495/495 [==============================] - ETA: 0s - loss: 0.3127 -
accuracy: 0.8649
Epoch 39: val_accuracy did not improve from 0.87216
495/495 [==============================] - 284s 574ms/step - loss:
0.3127 - accuracy: 0.8649 - val_loss: 0.3247 - val_accuracy: 0.8605 -
lr: 0.0010
Epoch 40/60
495/495 [==============================] - ETA: 0s - loss: 0.2978 -
accuracy: 0.8697
Epoch 40: val_accuracy did not improve from 0.87216
495/495 [==============================] - 285s 575ms/step - loss:
0.2978 - accuracy: 0.8697 - val_loss: 0.3469 - val_accuracy: 0.8522 -
```

```
lr: 0.0010
Epoch 41/60
495/495 [==============================] - ETA: 0s - loss: 0.3076 -
accuracy: 0.8678
Epoch 41: val_accuracy improved from 0.87216 to 0.87317, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.3076 - accuracy: 0.8678 - val_loss: 0.3076 - val_accuracy: 0.8732 -
lr: 0.0010
Epoch 42/60
495/495 [==============================] - ETA: 0s - loss: 0.3012 -
accuracy: 0.8700
Epoch 42: val_accuracy did not improve from 0.87317
495/495 [==============================] - 285s 575ms/step - loss:
0.3012 - accuracy: 0.8700 - val_loss: 0.3074 - val_accuracy: 0.8729 -
lr: 0.0010
Epoch 43/60
495/495 [==============================] - ETA: 0s - loss: 0.3022 -
accuracy: 0.8679
Epoch 43: val_accuracy improved from 0.87317 to 0.87873, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 575ms/step - loss:
0.3022 - accuracy: 0.8679 - val_loss: 0.2974 - val_accuracy: 0.8787 -
lr: 0.0010
Epoch 44/60
495/495 [==============================] - ETA: 0s - loss: 0.3039 -
accuracy: 0.8679
Epoch 44: val_accuracy did not improve from 0.87873
495/495 [==============================] - 285s 576ms/step - loss:
0.3039 - accuracy: 0.8679 - val_loss: 0.3321 - val_accuracy: 0.8727 -
lr: 0.0010
Epoch 45/60
495/495 [==============================] - ETA: 0s - loss: 0.2874 -
accuracy: 0.8761
Epoch 45: val_accuracy did not improve from 0.87873
495/495 [==============================] - 285s 575ms/step - loss:
0.2874 - accuracy: 0.8761 - val_loss: 0.3421 - val_accuracy: 0.8615 -
lr: 0.0010
Epoch 46/60
495/495 [==============================] - ETA: 0s - loss: 0.3004 -
accuracy: 0.8718
Epoch 46: val_accuracy did not improve from 0.87873
495/495 [==============================] - 285s 575ms/step - loss:
0.3004 - accuracy: 0.8718 - val_loss: 0.3621 - val_accuracy: 0.8502 -
lr: 0.0010
Epoch 47/60
495/495 [==============================] - ETA: 0s - loss: 0.2823 -
accuracy: 0.8815
Epoch 47: val_accuracy improved from 0.87873 to 0.88075, saving model
to saved_models\model_1.h5
```

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495/495 [==============================] - 285s 576ms/step - loss:
0.2823 - accuracy: 0.8815 - val_loss: 0.3054 - val_accuracy: 0.8807 -
lr: 0.0010
Epoch 48/60
495/495 [==============================] - ETA: 0s - loss: 0.2850 -
accuracy: 0.8772
Epoch 48: val_accuracy did not improve from 0.88075
495/495 [==============================] - 285s 575ms/step - loss:
0.2850 - accuracy: 0.8772 - val_loss: 0.3245 - val_accuracy: 0.8772 -
lr: 0.0010
Epoch 49/60
495/495 [==============================] - ETA: 0s - loss: 0.2850 -
accuracy: 0.8749
Epoch 49: val_accuracy improved from 0.88075 to 0.88782, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.2850 - accuracy: 0.8749 - val_loss: 0.2914 - val_accuracy: 0.8878 -
lr: 0.0010
Epoch 50/60
495/495 [==============================] - ETA: 0s - loss: 0.2836 -
accuracy: 0.8813
Epoch 50: val_accuracy did not improve from 0.88782
495/495 [==============================] - 286s 577ms/step - loss:
0.2836 - accuracy: 0.8813 - val_loss: 0.3440 - val_accuracy: 0.8570 -
lr: 0.0010
Epoch 51/60
495/495 [==============================] - ETA: 0s - loss: 0.2803 -
accuracy: 0.8777
Epoch 51: val_accuracy improved from 0.88782 to 0.88807, saving model
to saved_models\model_1.h5
495/495 [==============================] - 286s 577ms/step - loss:
0.2803 - accuracy: 0.8777 - val_loss: 0.2892 - val_accuracy: 0.8881 -
lr: 0.0010
Epoch 52/60
495/495 [==============================] - ETA: 0s - loss: 0.2807 -
accuracy: 0.8813
Epoch 52: val_accuracy did not improve from 0.88807
495/495 [==============================] - 286s 577ms/step - loss:
0.2807 - accuracy: 0.8813 - val_loss: 0.3601 - val_accuracy: 0.8638 -
lr: 0.0010
Epoch 53/60
495/495 [==============================] - ETA: 0s - loss: 0.2772 -
accuracy: 0.8819
Epoch 53: val_accuracy did not improve from 0.88807
495/495 [==============================] - 286s 577ms/step - loss:
0.2772 - accuracy: 0.8819 - val_loss: 0.3000 - val_accuracy: 0.8840 -
lr: 0.0010
Epoch 54/60
495/495 [==============================] - ETA: 0s - loss: 0.2668 -
accuracy: 0.8845
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Epoch 54: val_accuracy did not improve from 0.88807
495/495 [==============================] - 285s 576ms/step - loss:
0.2668 - accuracy: 0.8845 - val_loss: 0.3046 - val_accuracy: 0.8800 -
lr: 0.0010
Epoch 55/60
495/495 [==============================] - ETA: 0s - loss: 0.2649 -
accuracy: 0.8856
Epoch 55: val_accuracy improved from 0.88807 to 0.89212, saving model
to saved_models\model_1.h5
495/495 [==============================] - 285s 576ms/step - loss:
0.2649 - accuracy: 0.8856 - val_loss: 0.2839 - val_accuracy: 0.8921 -
lr: 0.0010
Epoch 56/60
495/495 [==============================] - ETA: 0s - loss: 0.2735 -
accuracy: 0.8837
Epoch 56: val_accuracy did not improve from 0.89212
495/495 [==============================] - 286s 577ms/step - loss:
0.2735 - accuracy: 0.8837 - val_loss: 0.3086 - val_accuracy: 0.8706 -
lr: 0.0010
Epoch 57/60
495/495 [==============================] - ETA: 0s - loss: 0.2722 -
accuracy: 0.8828
Epoch 57: val_accuracy did not improve from 0.89212
495/495 [==============================] - 285s 576ms/step - loss:
0.2722 - accuracy: 0.8828 - val_loss: 0.2938 - val_accuracy: 0.8800 -
lr: 0.0010
Epoch 58/60
495/495 [==============================] - ETA: 0s - loss: 0.2609 -
accuracy: 0.8872
Epoch 58: val_accuracy did not improve from 0.89212
495/495 [==============================] - 286s 577ms/step - loss:
0.2609 - accuracy: 0.8872 - val_loss: 0.2976 - val_accuracy: 0.8871 -
lr: 0.0010
Epoch 59/60
495/495 [==============================] - ETA: 0s - loss: 0.2629 -
accuracy: 0.8859
Epoch 59: val_accuracy did not improve from 0.89212
495/495 [==============================] - 286s 577ms/step - loss:
0.2629 - accuracy: 0.8859 - val_loss: 0.3135 - val_accuracy: 0.8835 -
lr: 0.0010
Epoch 60/60
495/495 [==============================] - ETA: 0s - loss: 0.2629 -
accuracy: 0.8897
Epoch 60: val_accuracy did not improve from 0.89212
495/495 [==============================] - 286s 577ms/step - loss:
0.2629 - accuracy: 0.8897 - val_loss: 0.2767 - val_accuracy: 0.8906 -
lr: 0.0010
======================================================================
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Found 15827 files belonging to 2 classes.
Found 3958 files belonging to 2 classes.
Training On Fold:  2
Epoch 1/60
495/495 [==============================] - ETA: 0s - loss: 0.6797 -
accuracy: 0.5635
Epoch 1: val_accuracy improved from -inf to 0.61091, saving model to
saved_models\model_2.h5
495/495 [==============================] - 270s 534ms/step - loss:
0.6797 - accuracy: 0.5635 - val_loss: 0.6462 - val_accuracy: 0.6109 -
lr: 0.0010
Epoch 2/60
495/495 [==============================] - ETA: 0s - loss: 0.6468 -
accuracy: 0.6299
Epoch 2: val_accuracy improved from 0.61091 to 0.64553, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 541ms/step - loss:
0.6468 - accuracy: 0.6299 - val_loss: 0.6189 - val_accuracy: 0.6455 -
lr: 0.0010
Epoch 3/60
495/495 [==============================] - ETA: 0s - loss: 0.5951 -
accuracy: 0.6834
Epoch 3: val_accuracy improved from 0.64553 to 0.66599, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 542ms/step - loss:
0.5951 - accuracy: 0.6834 - val_loss: 0.6109 - val_accuracy: 0.6660 -
lr: 0.0010
Epoch 4/60
495/495 [==============================] - ETA: 0s - loss: 0.5656 -
accuracy: 0.7164
Epoch 4: val_accuracy improved from 0.66599 to 0.73699, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 541ms/step - loss:
0.5656 - accuracy: 0.7164 - val_loss: 0.5259 - val_accuracy: 0.7370 -
lr: 0.0010
Epoch 5/60
495/495 [==============================] - ETA: 0s - loss: 0.5487 -
accuracy: 0.7284
Epoch 5: val_accuracy improved from 0.73699 to 0.74457, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.5487 - accuracy: 0.7284 - val_loss: 0.5117 - val_accuracy: 0.7446 -
lr: 0.0010
Epoch 6/60
495/495 [==============================] - ETA: 0s - loss: 0.5226 -
accuracy: 0.7430
Epoch 6: val_accuracy improved from 0.74457 to 0.76908, saving model
to saved_models\model_2.h5
495/495 [==============================] - 271s 548ms/step - loss:
0.5226 - accuracy: 0.7430 - val_loss: 0.4814 - val_accuracy: 0.7691 -
```

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lr: 0.0010
Epoch 7/60
495/495 [==============================] - ETA: 0s - loss: 0.4981 -
accuracy: 0.7588
Epoch 7: val_accuracy did not improve from 0.76908
495/495 [==============================] - 269s 543ms/step - loss:
0.4981 - accuracy: 0.7588 - val_loss: 0.5188 - val_accuracy: 0.7511 -
lr: 0.0010
Epoch 8/60
495/495 [==============================] - ETA: 0s - loss: 0.4808 -
accuracy: 0.7747
Epoch 8: val_accuracy improved from 0.76908 to 0.79485, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.4808 - accuracy: 0.7747 - val_loss: 0.4414 - val_accuracy: 0.7948 -
lr: 0.0010
Epoch 9/60
495/495 [==============================] - ETA: 0s - loss: 0.4628 -
accuracy: 0.7865
Epoch 9: val_accuracy improved from 0.79485 to 0.80849, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.4628 - accuracy: 0.7865 - val_loss: 0.4209 - val_accuracy: 0.8085 -
lr: 0.0010
Epoch 10/60
495/495 [==============================] - ETA: 0s - loss: 0.4435 -
accuracy: 0.7995
Epoch 10: val_accuracy improved from 0.80849 to 0.81632, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.4435 - accuracy: 0.7995 - val_loss: 0.4053 - val_accuracy: 0.8163 -
lr: 0.0010
Epoch 11/60
495/495 [==============================] - ETA: 0s - loss: 0.4349 -
accuracy: 0.8004
Epoch 11: val_accuracy did not improve from 0.81632
495/495 [==============================] - 269s 542ms/step - loss:
0.4349 - accuracy: 0.8004 - val_loss: 0.4352 - val_accuracy: 0.7959 -
lr: 0.0010
Epoch 12/60
495/495 [==============================] - ETA: 0s - loss: 0.4142 -
accuracy: 0.8099
Epoch 12: val_accuracy improved from 0.81632 to 0.82567, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.4142 - accuracy: 0.8099 - val_loss: 0.3868 - val_accuracy: 0.8257 -
lr: 0.0010
Epoch 13/60
495/495 [==============================] - ETA: 0s - loss: 0.4120 -
accuracy: 0.8135
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Epoch 13: val_accuracy did not improve from 0.82567
495/495 [==============================] - 268s 542ms/step - loss:
0.4120 - accuracy: 0.8135 - val_loss: 0.4133 - val_accuracy: 0.8110 -
lr: 0.0010
Epoch 14/60
495/495 [==============================] - ETA: 0s - loss: 0.3948 -
accuracy: 0.8232
Epoch 14: val_accuracy did not improve from 0.82567
495/495 [==============================] - 268s 542ms/step - loss:
0.3948 - accuracy: 0.8232 - val_loss: 0.4304 - val_accuracy: 0.7964 -
lr: 0.0010
Epoch 15/60
495/495 [==============================] - ETA: 0s - loss: 0.3873 -
accuracy: 0.8273
Epoch 15: val_accuracy improved from 0.82567 to 0.84992, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.3873 - accuracy: 0.8273 - val_loss: 0.3458 - val_accuracy: 0.8499 -
lr: 0.0010
Epoch 16/60
495/495 [==============================] - ETA: 0s - loss: 0.3810 -
accuracy: 0.8309
Epoch 16: val_accuracy did not improve from 0.84992
495/495 [==============================] - 269s 543ms/step - loss:
0.3810 - accuracy: 0.8309 - val_loss: 0.3429 - val_accuracy: 0.8487 -
lr: 0.0010
Epoch 17/60
495/495 [==============================] - ETA: 0s - loss: 0.3665 -
accuracy: 0.8379
Epoch 17: val_accuracy improved from 0.84992 to 0.85169, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 541ms/step - loss:
0.3665 - accuracy: 0.8379 - val_loss: 0.3446 - val_accuracy: 0.8517 -
lr: 0.0010
Epoch 18/60
495/495 [==============================] - ETA: 0s - loss: 0.3599 -
accuracy: 0.8363
Epoch 18: val_accuracy did not improve from 0.85169
495/495 [==============================] - 268s 541ms/step - loss:
0.3599 - accuracy: 0.8363 - val_loss: 0.3795 - val_accuracy: 0.8380 -
lr: 0.0010
Epoch 19/60
495/495 [==============================] - ETA: 0s - loss: 0.3576 -
accuracy: 0.8414
Epoch 19: val_accuracy improved from 0.85169 to 0.85574, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.3576 - accuracy: 0.8414 - val_loss: 0.3224 - val_accuracy: 0.8557 -
lr: 0.0010
Epoch 20/60
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495/495 [==============================] - ETA: 0s - loss: 0.3412 -
accuracy: 0.8482
Epoch 20: val_accuracy improved from 0.85574 to 0.86508, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 542ms/step - loss:
0.3412 - accuracy: 0.8482 - val_loss: 0.3188 - val_accuracy: 0.8651 -
lr: 0.0010
Epoch 21/60
495/495 [==============================] - ETA: 0s - loss: 0.3430 -
accuracy: 0.8491
Epoch 21: val_accuracy improved from 0.86508 to 0.86988, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.3430 - accuracy: 0.8491 - val_loss: 0.3054 - val_accuracy: 0.8699 -
lr: 0.0010
Epoch 22/60
495/495 [==============================] - ETA: 0s - loss: 0.3380 -
accuracy: 0.8518
Epoch 22: val_accuracy did not improve from 0.86988
495/495 [==============================] - 268s 541ms/step - loss:
0.3380 - accuracy: 0.8518 - val_loss: 0.3194 - val_accuracy: 0.8633 -
lr: 0.0010
Epoch 23/60
495/495 [==============================] - ETA: 0s - loss: 0.3282 -
accuracy: 0.8572
Epoch 23: val_accuracy did not improve from 0.86988
495/495 [==============================] - 268s 542ms/step - loss:
0.3282 - accuracy: 0.8572 - val_loss: 0.3102 - val_accuracy: 0.8651 -
lr: 0.0010
Epoch 24/60
495/495 [==============================] - ETA: 0s - loss: 0.3256 -
accuracy: 0.8569
Epoch 24: val_accuracy did not improve from 0.86988
495/495 [==============================] - 268s 542ms/step - loss:
0.3256 - accuracy: 0.8569 - val_loss: 0.3239 - val_accuracy: 0.8608 -
lr: 0.0010
Epoch 25/60
495/495 [==============================] - ETA: 0s - loss: 0.3216 -
accuracy: 0.8563
Epoch 25: val_accuracy improved from 0.86988 to 0.87064, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.3216 - accuracy: 0.8563 - val_loss: 0.2991 - val_accuracy: 0.8706 -
lr: 0.0010
Epoch 26/60
495/495 [==============================] - ETA: 0s - loss: 0.3175 -
accuracy: 0.8587
Epoch 26: val_accuracy did not improve from 0.87064
495/495 [==============================] - 268s 542ms/step - loss:
0.3175 - accuracy: 0.8587 - val_loss: 0.3273 - val_accuracy: 0.8547 -
```

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lr: 0.0010
Epoch 27/60
495/495 [==============================] - ETA: 0s - loss: 0.3197 -
accuracy: 0.8605
Epoch 27: val_accuracy did not improve from 0.87064
495/495 [==============================] - 269s 544ms/step - loss:
0.3197 - accuracy: 0.8605 - val_loss: 0.3147 - val_accuracy: 0.8694 -
lr: 0.0010
Epoch 28/60
495/495 [==============================] - ETA: 0s - loss: 0.3062 -
accuracy: 0.8669
Epoch 28: val_accuracy did not improve from 0.87064
495/495 [==============================] - 268s 541ms/step - loss:
0.3062 - accuracy: 0.8669 - val_loss: 0.3135 - val_accuracy: 0.8684 -
lr: 0.0010
Epoch 29/60
495/495 [==============================] - ETA: 0s - loss: 0.3022 -
accuracy: 0.8701
Epoch 29: val_accuracy improved from 0.87064 to 0.87266, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.3022 - accuracy: 0.8701 - val_loss: 0.2961 - val_accuracy: 0.8727 -
lr: 0.0010
Epoch 30/60
495/495 [==============================] - ETA: 0s - loss: 0.3019 -
accuracy: 0.8667
Epoch 30: val_accuracy improved from 0.87266 to 0.88201, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.3019 - accuracy: 0.8667 - val_loss: 0.2831 - val_accuracy: 0.8820 -
lr: 0.0010
Epoch 31/60
495/495 [==============================] - ETA: 0s - loss: 0.2972 -
accuracy: 0.8690
Epoch 31: val_accuracy did not improve from 0.88201
495/495 [==============================] - 268s 542ms/step - loss:
0.2972 - accuracy: 0.8690 - val_loss: 0.2886 - val_accuracy: 0.8722 -
lr: 0.0010
Epoch 32/60
495/495 [==============================] - ETA: 0s - loss: 0.2930 -
accuracy: 0.8724
Epoch 32: val_accuracy did not improve from 0.88201
495/495 [==============================] - 268s 542ms/step - loss:
0.2930 - accuracy: 0.8724 - val_loss: 0.2869 - val_accuracy: 0.8815 -
lr: 0.0010
Epoch 33/60
495/495 [==============================] - ETA: 0s - loss: 0.2881 -
accuracy: 0.8762
Epoch 33: val_accuracy did not improve from 0.88201
495/495 [==============================] - 269s 544ms/step - loss:
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0.2881 - accuracy: 0.8762 - val_loss: 0.3038 - val_accuracy: 0.8754 -
lr: 0.0010
Epoch 34/60
495/495 [==============================] - ETA: 0s - loss: 0.2841 -
accuracy: 0.8785
Epoch 34: val_accuracy did not improve from 0.88201
495/495 [==============================] - 269s 543ms/step - loss:
0.2841 - accuracy: 0.8785 - val_loss: 0.2973 - val_accuracy: 0.8663 -
lr: 0.0010
Epoch 35/60
495/495 [==============================] - ETA: 0s - loss: 0.2862 -
accuracy: 0.8777
Epoch 35: val_accuracy improved from 0.88201 to 0.88555, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 541ms/step - loss:
0.2862 - accuracy: 0.8777 - val_loss: 0.2863 - val_accuracy: 0.8855 -
lr: 0.0010
Epoch 36/60
495/495 [==============================] - ETA: 0s - loss: 0.2768 -
accuracy: 0.8789
Epoch 36: val_accuracy did not improve from 0.88555
495/495 [==============================] - 269s 542ms/step - loss:
0.2768 - accuracy: 0.8789 - val_loss: 0.2792 - val_accuracy: 0.8845 -
lr: 0.0010
Epoch 37/60
495/495 [==============================] - ETA: 0s - loss: 0.2791 -
accuracy: 0.8806
Epoch 37: val_accuracy improved from 0.88555 to 0.88858, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.2791 - accuracy: 0.8806 - val_loss: 0.2790 - val_accuracy: 0.8886 -
lr: 0.0010
Epoch 38/60
495/495 [==============================] - ETA: 0s - loss: 0.2743 -
accuracy: 0.8827
Epoch 38: val_accuracy did not improve from 0.88858
495/495 [==============================] - 269s 543ms/step - loss:
0.2743 - accuracy: 0.8827 - val_loss: 0.3476 - val_accuracy: 0.8560 -
lr: 0.0010
Epoch 39/60
495/495 [==============================] - ETA: 0s - loss: 0.2750 -
accuracy: 0.8805
Epoch 39: val_accuracy did not improve from 0.88858
495/495 [==============================] - 269s 543ms/step - loss:
0.2750 - accuracy: 0.8805 - val_loss: 0.2900 - val_accuracy: 0.8807 -
lr: 0.0010
Epoch 40/60
495/495 [==============================] - ETA: 0s - loss: 0.2715 -
accuracy: 0.8825
Epoch 40: val_accuracy did not improve from 0.88858
```

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495/495 [==============================] - 269s 543ms/step - loss:
0.2715 - accuracy: 0.8825 - val_loss: 0.3021 - val_accuracy: 0.8800 -
lr: 0.0010
Epoch 41/60
495/495 [==============================] - ETA: 0s - loss: 0.2710 -
accuracy: 0.8833
Epoch 41: val_accuracy did not improve from 0.88858
495/495 [==============================] - 269s 543ms/step - loss:
0.2710 - accuracy: 0.8833 - val_loss: 0.2783 - val_accuracy: 0.8828 -
lr: 0.0010
Epoch 42/60
495/495 [==============================] - ETA: 0s - loss: 0.2704 -
accuracy: 0.8841
Epoch 42: val_accuracy did not improve from 0.88858
495/495 [==============================] - 269s 543ms/step - loss:
0.2704 - accuracy: 0.8841 - val_loss: 0.2824 - val_accuracy: 0.8830 -
lr: 0.0010
Epoch 43/60
495/495 [==============================] - ETA: 0s - loss: 0.2611 -
accuracy: 0.8893
Epoch 43: val_accuracy did not improve from 0.88858
495/495 [==============================] - 269s 543ms/step - loss:
0.2611 - accuracy: 0.8893 - val_loss: 0.2883 - val_accuracy: 0.8818 -
lr: 0.0010
Epoch 44/60
495/495 [==============================] - ETA: 0s - loss: 0.2684 -
accuracy: 0.8856
Epoch 44: val_accuracy improved from 0.88858 to 0.89490, saving model
to saved_models\model_2.h5
495/495 [==============================] - 268s 542ms/step - loss:
0.2684 - accuracy: 0.8856 - val_loss: 0.2613 - val_accuracy: 0.8949 -
lr: 0.0010
Epoch 45/60
495/495 [==============================] - ETA: 0s - loss: 0.2552 -
accuracy: 0.8905
Epoch 45: val_accuracy did not improve from 0.89490
495/495 [==============================] - 268s 542ms/step - loss:
0.2552 - accuracy: 0.8905 - val_loss: 0.2897 - val_accuracy: 0.8828 -
lr: 0.0010
Epoch 46/60
495/495 [==============================] - ETA: 0s - loss: 0.2564 -
accuracy: 0.8909
Epoch 46: val_accuracy did not improve from 0.89490
495/495 [==============================] - 269s 542ms/step - loss:
0.2564 - accuracy: 0.8909 - val_loss: 0.2908 - val_accuracy: 0.8807 -
lr: 0.0010
Epoch 47/60
495/495 [==============================] - ETA: 0s - loss: 0.2561 -
accuracy: 0.8942
Epoch 47: val_accuracy did not improve from 0.89490
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495/495 [==============================] - 269s 542ms/step - loss:
0.2561 - accuracy: 0.8942 - val_loss: 0.2748 - val_accuracy: 0.8853 -
lr: 0.0010
Epoch 48/60
495/495 [==============================] - ETA: 0s - loss: 0.2537 -
accuracy: 0.8890
Epoch 48: val_accuracy did not improve from 0.89490
495/495 [==============================] - 268s 542ms/step - loss:
0.2537 - accuracy: 0.8890 - val_loss: 0.3140 - val_accuracy: 0.8714 -
lr: 0.0010
Epoch 49/60
495/495 [==============================] - ETA: 0s - loss: 0.2523 -
accuracy: 0.8951
Epoch 49: val_accuracy did not improve from 0.89490
495/495 [==============================] - 268s 542ms/step - loss:
0.2523 - accuracy: 0.8951 - val_loss: 0.2614 - val_accuracy: 0.8944 -
lr: 0.0010
Epoch 50/60
495/495 [==============================] - ETA: 0s - loss: 0.2543 -
accuracy: 0.8923
Epoch 50: val_accuracy improved from 0.89490 to 0.89641, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.2543 - accuracy: 0.8923 - val_loss: 0.2637 - val_accuracy: 0.8964 -
lr: 0.0010
Epoch 51/60
495/495 [==============================] - ETA: 0s - loss: 0.2510 -
accuracy: 0.8942
Epoch 51: val_accuracy did not improve from 0.89641
495/495 [==============================] - 269s 543ms/step - loss:
0.2510 - accuracy: 0.8942 - val_loss: 0.2620 - val_accuracy: 0.8946 -
lr: 0.0010
Epoch 52/60
495/495 [==============================] - ETA: 0s - loss: 0.2402 -
accuracy: 0.9002
Epoch 52: val_accuracy did not improve from 0.89641
495/495 [==============================] - 269s 542ms/step - loss:
0.2402 - accuracy: 0.9002 - val_loss: 0.3028 - val_accuracy: 0.8810 -
lr: 0.0010
Epoch 53/60
495/495 [==============================] - ETA: 0s - loss: 0.2452 -
accuracy: 0.8971
Epoch 53: val_accuracy did not improve from 0.89641
495/495 [==============================] - 269s 542ms/step - loss:
0.2452 - accuracy: 0.8971 - val_loss: 0.2544 - val_accuracy: 0.8949 -
lr: 0.0010
Epoch 54/60
495/495 [==============================] - ETA: 0s - loss: 0.2343 -
accuracy: 0.9006
Epoch 54: val_accuracy did not improve from 0.89641
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495/495 [==============================] - 269s 543ms/step - loss:
0.2343 - accuracy: 0.9006 - val_loss: 0.2638 - val_accuracy: 0.8891 -
lr: 0.0010
Epoch 55/60
495/495 [==============================] - ETA: 0s - loss: 0.2352 -
accuracy: 0.9022
Epoch 55: val_accuracy did not improve from 0.89641
495/495 [==============================] - 268s 542ms/step - loss:
0.2352 - accuracy: 0.9022 - val_loss: 0.2831 - val_accuracy: 0.8828 -
lr: 0.0010
Epoch 56/60
495/495 [==============================] - ETA: 0s - loss: 0.2403 -
accuracy: 0.8979
Epoch 56: val_accuracy did not improve from 0.89641
495/495 [==============================] - 269s 544ms/step - loss:
0.2403 - accuracy: 0.8979 - val_loss: 0.2693 - val_accuracy: 0.8883 -
lr: 0.0010
Epoch 57/60
495/495 [==============================] - ETA: 0s - loss: 0.2374 -
accuracy: 0.9018
Epoch 57: val_accuracy did not improve from 0.89641
495/495 [==============================] - 268s 542ms/step - loss:
0.2374 - accuracy: 0.9018 - val_loss: 0.2851 - val_accuracy: 0.8825 -
lr: 0.0010
Epoch 58/60
495/495 [==============================] - ETA: 0s - loss: 0.2342 -
accuracy: 0.9014
Epoch 58: val_accuracy did not improve from 0.89641
495/495 [==============================] - 269s 543ms/step - loss:
0.2342 - accuracy: 0.9014 - val_loss: 0.2795 - val_accuracy: 0.8901 -
lr: 0.0010
Epoch 59/60
495/495 [==============================] - ETA: 0s - loss: 0.2317 -
accuracy: 0.9033
Epoch 59: val_accuracy improved from 0.89641 to 0.89717, saving model
to saved_models\model_2.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.2317 - accuracy: 0.9033 - val_loss: 0.2574 - val_accuracy: 0.8972 -
lr: 0.0010
Epoch 60/60
495/495 [==============================] - ETA: 0s - loss: 0.2273 -
accuracy: 0.9035
Epoch 60: val_accuracy did not improve from 0.89717
495/495 [==============================] - 269s 542ms/step - loss:
0.2273 - accuracy: 0.9035 - val_loss: 0.2919 - val_accuracy: 0.8906 -
lr: 0.0010
================================================================================


Found 15827 files belonging to 2 classes.
```

```
Found 3958 files belonging to 2 classes.
Training On Fold:  3
Epoch 1/60
495/495 [==============================] - ETA: 0s - loss: 0.6904 -
accuracy: 0.5266
Epoch 1: val_accuracy improved from -inf to 0.52249, saving model to
saved_models\model_3.h5
495/495 [==============================] - 255s 500ms/step - loss:
0.6904 - accuracy: 0.5266 - val_loss: 0.6871 - val_accuracy: 0.5225 -
lr: 0.0010
Epoch 2/60
495/495 [==============================] - ETA: 0s - loss: 0.6842 -
accuracy: 0.5518
Epoch 2: val_accuracy improved from 0.52249 to 0.53891, saving model
to saved_models\model_3.h5
495/495 [==============================] - 252s 509ms/step - loss:
0.6842 - accuracy: 0.5518 - val_loss: 0.6845 - val_accuracy: 0.5389 -
lr: 0.0010
Epoch 3/60
495/495 [==============================] - ETA: 0s - loss: 0.6624 -
accuracy: 0.6021
Epoch 3: val_accuracy improved from 0.53891 to 0.61066, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.6624 - accuracy: 0.6021 - val_loss: 0.6483 - val_accuracy: 0.6107 -
lr: 0.0010
Epoch 4/60
495/495 [==============================] - ETA: 0s - loss: 0.6244 -
accuracy: 0.6605
Epoch 4: val_accuracy improved from 0.61066 to 0.65336, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.6244 - accuracy: 0.6605 - val_loss: 0.6331 - val_accuracy: 0.6534 -
lr: 0.0010
Epoch 5/60
495/495 [==============================] - ETA: 0s - loss: 0.5896 -
accuracy: 0.6918
Epoch 5: val_accuracy improved from 0.65336 to 0.66902, saving model
to saved_models\model_3.h5
495/495 [==============================] - 258s 522ms/step - loss:
0.5896 - accuracy: 0.6918 - val_loss: 0.6024 - val_accuracy: 0.6690 -
lr: 0.0010
Epoch 6/60
495/495 [==============================] - ETA: 0s - loss: 0.5670 -
accuracy: 0.7095
Epoch 6: val_accuracy improved from 0.66902 to 0.73017, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.5670 - accuracy: 0.7095 - val_loss: 0.5349 - val_accuracy: 0.7302 -
lr: 0.0010
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Epoch 7/60
495/495 [==============================] - ETA: 0s - loss: 0.5502 -
accuracy: 0.7238
Epoch 7: val_accuracy improved from 0.73017 to 0.75063, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.5502 - accuracy: 0.7238 - val_loss: 0.5159 - val_accuracy: 0.7506 -
lr: 0.0010
Epoch 8/60
495/495 [==============================] - ETA: 0s - loss: 0.5414 -
accuracy: 0.7299
Epoch 8: val_accuracy did not improve from 0.75063
495/495 [==============================] - 256s 517ms/step - loss:
0.5414 - accuracy: 0.7299 - val_loss: 0.5064 - val_accuracy: 0.7476 -
lr: 0.0010
Epoch 9/60
495/495 [==============================] - ETA: 0s - loss: 0.5363 -
accuracy: 0.7335
Epoch 9: val_accuracy improved from 0.75063 to 0.76427, saving model
to saved_models\model_3.h5
495/495 [==============================] - 257s 519ms/step - loss:
0.5363 - accuracy: 0.7335 - val_loss: 0.4932 - val_accuracy: 0.7643 -
lr: 0.0010
Epoch 10/60
495/495 [==============================] - ETA: 0s - loss: 0.5255 -
accuracy: 0.7422
Epoch 10: val_accuracy did not improve from 0.76427
495/495 [==============================] - 256s 516ms/step - loss:
0.5255 - accuracy: 0.7422 - val_loss: 0.4953 - val_accuracy: 0.7595 -
lr: 0.0010
Epoch 11/60
495/495 [==============================] - ETA: 0s - loss: 0.5157 -
accuracy: 0.7483
Epoch 11: val_accuracy did not improve from 0.76427
495/495 [==============================] - 256s 517ms/step - loss:
0.5157 - accuracy: 0.7483 - val_loss: 0.5242 - val_accuracy: 0.7375 -
lr: 0.0010
Epoch 12/60
495/495 [==============================] - ETA: 0s - loss: 0.5089 -
accuracy: 0.7569
Epoch 12: val_accuracy did not improve from 0.76427
495/495 [==============================] - 255s 515ms/step - loss:
0.5089 - accuracy: 0.7569 - val_loss: 0.4896 - val_accuracy: 0.7640 -
lr: 0.0010
Epoch 13/60
495/495 [==============================] - ETA: 0s - loss: 0.5035 -
accuracy: 0.7555
Epoch 13: val_accuracy improved from 0.76427 to 0.78297, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 516ms/step - loss:
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0.5035 - accuracy: 0.7555 - val_loss: 0.4619 - val_accuracy: 0.7830 -
lr: 0.0010
Epoch 14/60
495/495 [==============================] - ETA: 0s - loss: 0.4949 -
accuracy: 0.7662
Epoch 14: val_accuracy did not improve from 0.78297
495/495 [==============================] - 255s 515ms/step - loss:
0.4949 - accuracy: 0.7662 - val_loss: 0.4888 - val_accuracy: 0.7580 -
lr: 0.0010
Epoch 15/60
495/495 [==============================] - ETA: 0s - loss: 0.4881 -
accuracy: 0.7663
Epoch 15: val_accuracy did not improve from 0.78297
495/495 [==============================] - 256s 516ms/step - loss:
0.4881 - accuracy: 0.7663 - val_loss: 0.4819 - val_accuracy: 0.7681 -
lr: 0.0010
Epoch 16/60
495/495 [==============================] - ETA: 0s - loss: 0.4798 -
accuracy: 0.7713
Epoch 16: val_accuracy improved from 0.78297 to 0.78348, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.4798 - accuracy: 0.7713 - val_loss: 0.4453 - val_accuracy: 0.7835 -
lr: 0.0010
Epoch 17/60
495/495 [==============================] - ETA: 0s - loss: 0.4791 -
accuracy: 0.7710
Epoch 17: val_accuracy did not improve from 0.78348
495/495 [==============================] - 255s 515ms/step - loss:
0.4791 - accuracy: 0.7710 - val_loss: 0.4561 - val_accuracy: 0.7815 -
lr: 0.0010
Epoch 18/60
495/495 [==============================] - ETA: 0s - loss: 0.4793 -
accuracy: 0.7748
Epoch 18: val_accuracy did not improve from 0.78348
495/495 [==============================] - 256s 516ms/step - loss:
0.4793 - accuracy: 0.7748 - val_loss: 0.4678 - val_accuracy: 0.7671 -
lr: 0.0010
Epoch 19/60
495/495 [==============================] - ETA: 0s - loss: 0.4715 -
accuracy: 0.7773
Epoch 19: val_accuracy improved from 0.78348 to 0.79308, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.4715 - accuracy: 0.7773 - val_loss: 0.4394 - val_accuracy: 0.7931 -
lr: 0.0010
Epoch 20/60
495/495 [==============================] - ETA: 0s - loss: 0.4607 -
accuracy: 0.7868
Epoch 20: val_accuracy did not improve from 0.79308
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495/495 [==============================] - 255s 515ms/step - loss:
0.4607 - accuracy: 0.7868 - val_loss: 0.4445 - val_accuracy: 0.7880 -
lr: 0.0010
Epoch 21/60
495/495 [==============================] - ETA: 0s - loss: 0.4525 -
accuracy: 0.7868
Epoch 21: val_accuracy did not improve from 0.79308
495/495 [==============================] - 255s 515ms/step - loss:
0.4525 - accuracy: 0.7868 - val_loss: 0.4526 - val_accuracy: 0.7860 -
lr: 0.0010
Epoch 22/60
495/495 [==============================] - ETA: 0s - loss: 0.4519 -
accuracy: 0.7908
Epoch 22: val_accuracy improved from 0.79308 to 0.81026, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.4519 - accuracy: 0.7908 - val_loss: 0.4148 - val_accuracy: 0.8103 -
lr: 0.0010
Epoch 23/60
495/495 [==============================] - ETA: 0s - loss: 0.4456 -
accuracy: 0.7931
Epoch 23: val_accuracy did not improve from 0.81026
495/495 [==============================] - 255s 515ms/step - loss:
0.4456 - accuracy: 0.7931 - val_loss: 0.4716 - val_accuracy: 0.7635 -
lr: 0.0010
Epoch 24/60
495/495 [==============================] - ETA: 0s - loss: 0.4394 -
accuracy: 0.7986
Epoch 24: val_accuracy did not improve from 0.81026
495/495 [==============================] - 256s 516ms/step - loss:
0.4394 - accuracy: 0.7986 - val_loss: 0.4098 - val_accuracy: 0.8032 -
lr: 0.0010
Epoch 25/60
495/495 [==============================] - ETA: 0s - loss: 0.4384 -
accuracy: 0.7964
Epoch 25: val_accuracy did not improve from 0.81026
495/495 [==============================] - 255s 516ms/step - loss:
0.4384 - accuracy: 0.7964 - val_loss: 0.4204 - val_accuracy: 0.7994 -
lr: 0.0010
Epoch 26/60
495/495 [==============================] - ETA: 0s - loss: 0.4341 -
accuracy: 0.8015
Epoch 26: val_accuracy did not improve from 0.81026
495/495 [==============================] - 255s 515ms/step - loss:
0.4341 - accuracy: 0.8015 - val_loss: 0.4574 - val_accuracy: 0.7638 -
lr: 0.0010
Epoch 27/60
495/495 [==============================] - ETA: 0s - loss: 0.4293 -
accuracy: 0.8031
Epoch 27: val_accuracy did not improve from 0.81026
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495/495 [==============================] - 255s 516ms/step - loss:
0.4293 - accuracy: 0.8031 - val_loss: 0.4869 - val_accuracy: 0.7617 -
lr: 0.0010
Epoch 28/60
495/495 [==============================] - ETA: 0s - loss: 0.4236 -
accuracy: 0.8031
Epoch 28: val_accuracy did not improve from 0.81026
495/495 [==============================] - 255s 515ms/step - loss:
0.4236 - accuracy: 0.8031 - val_loss: 0.4132 - val_accuracy: 0.8002 -
lr: 0.0010
Epoch 29/60
495/495 [==============================] - ETA: 0s - loss: 0.4194 -
accuracy: 0.8066
Epoch 29: val_accuracy improved from 0.81026 to 0.81228, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.4194 - accuracy: 0.8066 - val_loss: 0.4085 - val_accuracy: 0.8123 -
lr: 0.0010
Epoch 30/60
495/495 [==============================] - ETA: 0s - loss: 0.4189 -
accuracy: 0.8115
Epoch 30: val_accuracy did not improve from 0.81228
495/495 [==============================] - 255s 516ms/step - loss:
0.4189 - accuracy: 0.8115 - val_loss: 0.3997 - val_accuracy: 0.8120 -
lr: 0.0010
Epoch 31/60
495/495 [==============================] - ETA: 0s - loss: 0.4052 -
accuracy: 0.8153
Epoch 31: val_accuracy improved from 0.81228 to 0.82643, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.4052 - accuracy: 0.8153 - val_loss: 0.3738 - val_accuracy: 0.8264 -
lr: 0.0010
Epoch 32/60
495/495 [==============================] - ETA: 0s - loss: 0.4015 -
accuracy: 0.8211
Epoch 32: val_accuracy did not improve from 0.82643
495/495 [==============================] - 255s 516ms/step - loss:
0.4015 - accuracy: 0.8211 - val_loss: 0.3857 - val_accuracy: 0.8158 -
lr: 0.0010
Epoch 33/60
495/495 [==============================] - ETA: 0s - loss: 0.4054 -
accuracy: 0.8175
Epoch 33: val_accuracy did not improve from 0.82643
495/495 [==============================] - 256s 516ms/step - loss:
0.4054 - accuracy: 0.8175 - val_loss: 0.3957 - val_accuracy: 0.8130 -
lr: 0.0010
Epoch 34/60
495/495 [==============================] - ETA: 0s - loss: 0.4051 -
accuracy: 0.8196
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Epoch 34: val_accuracy did not improve from 0.82643
495/495 [==============================] - 255s 515ms/step - loss:
0.4051 - accuracy: 0.8196 - val_loss: 0.4277 - val_accuracy: 0.7969 -
lr: 0.0010
Epoch 35/60
495/495 [==============================] - ETA: 0s - loss: 0.4018 -
accuracy: 0.8197
Epoch 35: val_accuracy improved from 0.82643 to 0.83274, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.4018 - accuracy: 0.8197 - val_loss: 0.3751 - val_accuracy: 0.8327 -
lr: 0.0010
Epoch 36/60
495/495 [==============================] - ETA: 0s - loss: 0.3926 -
accuracy: 0.8239
Epoch 36: val_accuracy did not improve from 0.83274
495/495 [==============================] - 256s 516ms/step - loss:
0.3926 - accuracy: 0.8239 - val_loss: 0.3813 - val_accuracy: 0.8242 -
lr: 0.0010
Epoch 37/60
495/495 [==============================] - ETA: 0s - loss: 0.3877 -
accuracy: 0.8271
Epoch 37: val_accuracy did not improve from 0.83274
495/495 [==============================] - 255s 515ms/step - loss:
0.3877 - accuracy: 0.8271 - val_loss: 0.3713 - val_accuracy: 0.8259 -
lr: 0.0010
Epoch 38/60
495/495 [==============================] - ETA: 0s - loss: 0.3933 -
accuracy: 0.8237
Epoch 38: val_accuracy did not improve from 0.83274
495/495 [==============================] - 256s 516ms/step - loss:
0.3933 - accuracy: 0.8237 - val_loss: 0.3705 - val_accuracy: 0.8300 -
lr: 0.0010
Epoch 39/60
495/495 [==============================] - ETA: 0s - loss: 0.3858 -
accuracy: 0.8294
Epoch 39: val_accuracy improved from 0.83274 to 0.84209, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.3858 - accuracy: 0.8294 - val_loss: 0.3622 - val_accuracy: 0.8421 -
lr: 0.0010
Epoch 40/60
495/495 [==============================] - ETA: 0s - loss: 0.3791 -
accuracy: 0.8348
Epoch 40: val_accuracy did not improve from 0.84209
495/495 [==============================] - 256s 517ms/step - loss:
0.3791 - accuracy: 0.8348 - val_loss: 0.3656 - val_accuracy: 0.8320 -
lr: 0.0010
Epoch 41/60
495/495 [==============================] - ETA: 0s - loss: 0.3834 -
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accuracy: 0.8289
Epoch 41: val_accuracy did not improve from 0.84209
495/495 [==============================] - 255s 514ms/step - loss:
0.3834 - accuracy: 0.8289 - val_loss: 0.3783 - val_accuracy: 0.8226 -
lr: 0.0010
Epoch 42/60
495/495 [==============================] - ETA: 0s - loss: 0.3770 -
accuracy: 0.8305
Epoch 42: val_accuracy did not improve from 0.84209
495/495 [==============================] - 255s 515ms/step - loss:
0.3770 - accuracy: 0.8305 - val_loss: 0.4009 - val_accuracy: 0.8151 -
lr: 0.0010
Epoch 43/60
495/495 [==============================] - ETA: 0s - loss: 0.3693 -
accuracy: 0.8348
Epoch 43: val_accuracy improved from 0.84209 to 0.84538, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.3693 - accuracy: 0.8348 - val_loss: 0.3408 - val_accuracy: 0.8454 -
lr: 0.0010
Epoch 44/60
495/495 [==============================] - ETA: 0s - loss: 0.3637 -
accuracy: 0.8404
Epoch 44: val_accuracy did not improve from 0.84538
495/495 [==============================] - 256s 516ms/step - loss:
0.3637 - accuracy: 0.8404 - val_loss: 0.4270 - val_accuracy: 0.8029 -
lr: 0.0010
Epoch 45/60
495/495 [==============================] - ETA: 0s - loss: 0.3706 -
accuracy: 0.8357
Epoch 45: val_accuracy improved from 0.84538 to 0.84715, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 514ms/step - loss:
0.3706 - accuracy: 0.8357 - val_loss: 0.3331 - val_accuracy: 0.8471 -
lr: 0.0010
Epoch 46/60
495/495 [==============================] - ETA: 0s - loss: 0.3636 -
accuracy: 0.8383
Epoch 46: val_accuracy did not improve from 0.84715
495/495 [==============================] - 255s 515ms/step - loss:
0.3636 - accuracy: 0.8383 - val_loss: 0.3429 - val_accuracy: 0.8421 -
lr: 0.0010
Epoch 47/60
495/495 [==============================] - ETA: 0s - loss: 0.3604 -
accuracy: 0.8413
Epoch 47: val_accuracy did not improve from 0.84715
495/495 [==============================] - 256s 517ms/step - loss:
0.3604 - accuracy: 0.8413 - val_loss: 0.3896 - val_accuracy: 0.8158 -
lr: 0.0010
Epoch 48/60
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495/495 [==============================] - ETA: 0s - loss: 0.3606 -
accuracy: 0.8425
Epoch 48: val_accuracy did not improve from 0.84715
495/495 [==============================] - 256s 516ms/step - loss:
0.3606 - accuracy: 0.8425 - val_loss: 0.3653 - val_accuracy: 0.8393 -
lr: 0.0010
Epoch 49/60
495/495 [==============================] - ETA: 0s - loss: 0.3544 -
accuracy: 0.8464
Epoch 49: val_accuracy did not improve from 0.84715
495/495 [==============================] - 255s 515ms/step - loss:
0.3544 - accuracy: 0.8464 - val_loss: 0.3988 - val_accuracy: 0.8151 -
lr: 0.0010
Epoch 50/60
495/495 [==============================] - ETA: 0s - loss: 0.3552 -
accuracy: 0.8439
Epoch 50: val_accuracy did not improve from 0.84715
495/495 [==============================] - 255s 515ms/step - loss:
0.3552 - accuracy: 0.8439 - val_loss: 0.3498 - val_accuracy: 0.8456 -
lr: 0.0010
Epoch 51/60
495/495 [==============================] - ETA: 0s - loss: 0.3461 -
accuracy: 0.8480
Epoch 51: val_accuracy improved from 0.84715 to 0.85195, saving model
to saved_models\model_3.h5
495/495 [==============================] - 256s 516ms/step - loss:
0.3461 - accuracy: 0.8480 - val_loss: 0.3393 - val_accuracy: 0.8519 -
lr: 0.0010
Epoch 52/60
495/495 [==============================] - ETA: 0s - loss: 0.3511 -
accuracy: 0.8483
Epoch 52: val_accuracy improved from 0.85195 to 0.85548, saving model
to saved_models\model_3.h5
495/495 [==============================] - 256s 517ms/step - loss:
0.3511 - accuracy: 0.8483 - val_loss: 0.3357 - val_accuracy: 0.8555 -
lr: 0.0010
Epoch 53/60
495/495 [==============================] - ETA: 0s - loss: 0.3470 -
accuracy: 0.8477
Epoch 53: val_accuracy did not improve from 0.85548
495/495 [==============================] - 256s 517ms/step - loss:
0.3470 - accuracy: 0.8477 - val_loss: 0.3265 - val_accuracy: 0.8532 -
lr: 0.0010
Epoch 54/60
495/495 [==============================] - ETA: 0s - loss: 0.3421 -
accuracy: 0.8506
Epoch 54: val_accuracy did not improve from 0.85548
495/495 [==============================] - 255s 516ms/step - loss:
0.3421 - accuracy: 0.8506 - val_loss: 0.3272 - val_accuracy: 0.8527 -
lr: 0.0010
```

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Epoch 55/60
495/495 [==============================] - ETA: 0s - loss: 0.3367 -
accuracy: 0.8526
Epoch 55: val_accuracy did not improve from 0.85548
495/495 [==============================] - 256s 516ms/step - loss:
0.3367 - accuracy: 0.8526 - val_loss: 0.3356 - val_accuracy: 0.8484 -
lr: 0.0010
Epoch 56/60
495/495 [==============================] - ETA: 0s - loss: 0.3349 -
accuracy: 0.8516
Epoch 56: val_accuracy improved from 0.85548 to 0.85725, saving model
to saved_models\model_3.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.3349 - accuracy: 0.8516 - val_loss: 0.3225 - val_accuracy: 0.8573 -
lr: 0.0010
Epoch 57/60
495/495 [==============================] - ETA: 0s - loss: 0.3356 -
accuracy: 0.8538
Epoch 57: val_accuracy did not improve from 0.85725
495/495 [==============================] - 256s 517ms/step - loss:
0.3356 - accuracy: 0.8538 - val_loss: 0.3345 - val_accuracy: 0.8449 -
lr: 0.0010
Epoch 58/60
495/495 [==============================] - ETA: 0s - loss: 0.3261 -
accuracy: 0.8586
Epoch 58: val_accuracy did not improve from 0.85725
495/495 [==============================] - 256s 516ms/step - loss:
0.3261 - accuracy: 0.8586 - val_loss: 0.3402 - val_accuracy: 0.8487 -
lr: 0.0010
Epoch 59/60
495/495 [==============================] - ETA: 0s - loss: 0.3301 -
accuracy: 0.8557
Epoch 59: val_accuracy did not improve from 0.85725
495/495 [==============================] - 256s 517ms/step - loss:
0.3301 - accuracy: 0.8557 - val_loss: 0.3401 - val_accuracy: 0.8466 -
lr: 0.0010
Epoch 60/60
495/495 [==============================] - ETA: 0s - loss: 0.3309 -
accuracy: 0.8549
Epoch 60: val_accuracy did not improve from 0.85725
495/495 [==============================] - 255s 514ms/step - loss:
0.3309 - accuracy: 0.8549 - val_loss: 0.3368 - val_accuracy: 0.8502 -
lr: 0.0010
================================================================================


Found 15827 files belonging to 2 classes.
Found 3958 files belonging to 2 classes.
Training On Fold:  4
Epoch 1/60
```

```
495/495 [==============================] - ETA: 0s - loss: 0.6820 -
accuracy: 0.5534
Epoch 1: val_accuracy improved from -inf to 0.60738, saving model to
saved_models\model_4.h5
495/495 [==============================] - 263s 519ms/step - loss:
0.6820 - accuracy: 0.5534 - val_loss: 0.6635 - val_accuracy: 0.6074 -
lr: 0.0010
Epoch 2/60
495/495 [==============================] - ETA: 0s - loss: 0.6476 -
accuracy: 0.6214
Epoch 2: val_accuracy improved from 0.60738 to 0.67130, saving model
to saved_models\model_4.h5
495/495 [==============================] - 267s 539ms/step - loss:
0.6476 - accuracy: 0.6214 - val_loss: 0.6064 - val_accuracy: 0.6713 -
lr: 0.0010
Epoch 3/60
495/495 [==============================] - ETA: 0s - loss: 0.5993 -
accuracy: 0.6829
Epoch 3: val_accuracy improved from 0.67130 to 0.73471, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.5993 - accuracy: 0.6829 - val_loss: 0.5507 - val_accuracy: 0.7347 -
lr: 0.0010
Epoch 4/60
495/495 [==============================] - ETA: 0s - loss: 0.5698 -
accuracy: 0.7041
Epoch 4: val_accuracy improved from 0.73471 to 0.73901, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.5698 - accuracy: 0.7041 - val_loss: 0.5373 - val_accuracy: 0.7390 -
lr: 0.0010
Epoch 5/60
495/495 [==============================] - ETA: 0s - loss: 0.5512 -
accuracy: 0.7204
Epoch 5: val_accuracy improved from 0.73901 to 0.76882, saving model
to saved_models\model_4.h5
495/495 [==============================] - 272s 549ms/step - loss:
0.5512 - accuracy: 0.7204 - val_loss: 0.4874 - val_accuracy: 0.7688 -
lr: 0.0010
Epoch 6/60
495/495 [==============================] - ETA: 0s - loss: 0.5293 -
accuracy: 0.7372
Epoch 6: val_accuracy improved from 0.76882 to 0.77211, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.5293 - accuracy: 0.7372 - val_loss: 0.4780 - val_accuracy: 0.7721 -
lr: 0.0010
Epoch 7/60
495/495 [==============================] - ETA: 0s - loss: 0.5137 -
accuracy: 0.7473
```

```
Epoch 7: val_accuracy improved from 0.77211 to 0.78777, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.5137 - accuracy: 0.7473 - val_loss: 0.4545 - val_accuracy: 0.7878 -
lr: 0.0010
Epoch 8/60
495/495 [==============================] - ETA: 0s - loss: 0.4907 -
accuracy: 0.7671
Epoch 8: val_accuracy improved from 0.78777 to 0.80116, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 544ms/step - loss:
0.4907 - accuracy: 0.7671 - val_loss: 0.4298 - val_accuracy: 0.8012 -
lr: 0.0010
Epoch 9/60
495/495 [==============================] - ETA: 0s - loss: 0.4739 -
accuracy: 0.7738
Epoch 9: val_accuracy did not improve from 0.80116
495/495 [==============================] - 269s 544ms/step - loss:
0.4739 - accuracy: 0.7738 - val_loss: 0.4641 - val_accuracy: 0.7840 -
lr: 0.0010
Epoch 10/60
495/495 [==============================] - ETA: 0s - loss: 0.4546 -
accuracy: 0.7905
Epoch 10: val_accuracy improved from 0.80116 to 0.81405, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 542ms/step - loss:
0.4546 - accuracy: 0.7905 - val_loss: 0.4077 - val_accuracy: 0.8140 -
lr: 0.0010
Epoch 11/60
495/495 [==============================] - ETA: 0s - loss: 0.4420 -
accuracy: 0.7926
Epoch 11: val_accuracy improved from 0.81405 to 0.82744, saving model
to saved_models\model_4.h5
495/495 [==============================] - 270s 545ms/step - loss:
0.4420 - accuracy: 0.7926 - val_loss: 0.3823 - val_accuracy: 0.8274 -
lr: 0.0010
Epoch 12/60
495/495 [==============================] - ETA: 0s - loss: 0.4322 -
accuracy: 0.8022
Epoch 12: val_accuracy did not improve from 0.82744
495/495 [==============================] - 269s 544ms/step - loss:
0.4322 - accuracy: 0.8022 - val_loss: 0.3862 - val_accuracy: 0.8224 -
lr: 0.0010
Epoch 13/60
495/495 [==============================] - ETA: 0s - loss: 0.4122 -
accuracy: 0.8115
Epoch 13: val_accuracy improved from 0.82744 to 0.83325, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.4122 - accuracy: 0.8115 - val_loss: 0.3776 - val_accuracy: 0.8332 -
```

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lr: 0.0010
Epoch 14/60
495/495 [==============================] - ETA: 0s - loss: 0.4085 -
accuracy: 0.8127
Epoch 14: val_accuracy did not improve from 0.83325
495/495 [==============================] - 269s 543ms/step - loss:
0.4085 - accuracy: 0.8127 - val_loss: 0.4262 - val_accuracy: 0.8057 -
lr: 0.0010
Epoch 15/60
495/495 [==============================] - ETA: 0s - loss: 0.3959 -
accuracy: 0.8229
Epoch 15: val_accuracy improved from 0.83325 to 0.83982, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 544ms/step - loss:
0.3959 - accuracy: 0.8229 - val_loss: 0.3778 - val_accuracy: 0.8398 -
lr: 0.0010
Epoch 16/60
495/495 [==============================] - ETA: 0s - loss: 0.3873 -
accuracy: 0.8235
Epoch 16: val_accuracy did not improve from 0.83982
495/495 [==============================] - 269s 544ms/step - loss:
0.3873 - accuracy: 0.8235 - val_loss: 0.3671 - val_accuracy: 0.8332 -
lr: 0.0010
Epoch 17/60
495/495 [==============================] - ETA: 0s - loss: 0.3798 -
accuracy: 0.8269
Epoch 17: val_accuracy improved from 0.83982 to 0.85270, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 542ms/step - loss:
0.3798 - accuracy: 0.8269 - val_loss: 0.3377 - val_accuracy: 0.8527 -
lr: 0.0010
Epoch 18/60
495/495 [==============================] - ETA: 0s - loss: 0.3709 -
accuracy: 0.8343
Epoch 18: val_accuracy did not improve from 0.85270
495/495 [==============================] - 269s 543ms/step - loss:
0.3709 - accuracy: 0.8343 - val_loss: 0.3824 - val_accuracy: 0.8388 -
lr: 0.0010
Epoch 19/60
495/495 [==============================] - ETA: 0s - loss: 0.3618 -
accuracy: 0.8394
Epoch 19: val_accuracy did not improve from 0.85270
495/495 [==============================] - 269s 543ms/step - loss:
0.3618 - accuracy: 0.8394 - val_loss: 0.3400 - val_accuracy: 0.8492 -
lr: 0.0010
Epoch 20/60
495/495 [==============================] - ETA: 0s - loss: 0.3517 -
accuracy: 0.8455
Epoch 20: val_accuracy did not improve from 0.85270
495/495 [==============================] - 269s 543ms/step - loss:
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0.3517 - accuracy: 0.8455 - val_loss: 0.3618 - val_accuracy: 0.8444 -
lr: 0.0010
Epoch 21/60
495/495 [==============================] - ETA: 0s - loss: 0.3495 -
accuracy: 0.8455
Epoch 21: val_accuracy improved from 0.85270 to 0.85776, saving model
to saved_models\model_4.h5
495/495 [==============================] - 270s 544ms/step - loss:
0.3495 - accuracy: 0.8455 - val_loss: 0.3197 - val_accuracy: 0.8578 -
lr: 0.0010
Epoch 22/60
495/495 [==============================] - ETA: 0s - loss: 0.3538 -
accuracy: 0.8439
Epoch 22: val_accuracy did not improve from 0.85776
495/495 [==============================] - 269s 543ms/step - loss:
0.3538 - accuracy: 0.8439 - val_loss: 0.3413 - val_accuracy: 0.8527 -
lr: 0.0010
Epoch 23/60
495/495 [==============================] - ETA: 0s - loss: 0.3436 -
accuracy: 0.8467
Epoch 23: val_accuracy did not improve from 0.85776
495/495 [==============================] - 269s 543ms/step - loss:
0.3436 - accuracy: 0.8467 - val_loss: 0.3365 - val_accuracy: 0.8557 -
lr: 0.0010
Epoch 24/60
495/495 [==============================] - ETA: 0s - loss: 0.3369 -
accuracy: 0.8467
Epoch 24: val_accuracy did not improve from 0.85776
495/495 [==============================] - 269s 543ms/step - loss:
0.3369 - accuracy: 0.8467 - val_loss: 0.3344 - val_accuracy: 0.8555 -
lr: 0.0010
Epoch 25/60
495/495 [==============================] - ETA: 0s - loss: 0.3328 -
accuracy: 0.8508
Epoch 25: val_accuracy did not improve from 0.85776
495/495 [==============================] - 268s 542ms/step - loss:
0.3328 - accuracy: 0.8508 - val_loss: 0.3379 - val_accuracy: 0.8482 -
lr: 0.0010
Epoch 26/60
495/495 [==============================] - ETA: 0s - loss: 0.3306 -
accuracy: 0.8530
Epoch 26: val_accuracy improved from 0.85776 to 0.87064, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.3306 - accuracy: 0.8530 - val_loss: 0.3014 - val_accuracy: 0.8706 -
lr: 0.0010
Epoch 27/60
495/495 [==============================] - ETA: 0s - loss: 0.3194 -
accuracy: 0.8568
Epoch 27: val_accuracy improved from 0.87064 to 0.87569, saving model
```

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to saved_models\model_4.h5
495/495 [==============================] - 270s 545ms/step - loss:
0.3194 - accuracy: 0.8568 - val_loss: 0.3107 - val_accuracy: 0.8757 -
lr: 0.0010
Epoch 28/60
495/495 [==============================] - ETA: 0s - loss: 0.3206 -
accuracy: 0.8578
Epoch 28: val_accuracy did not improve from 0.87569
495/495 [==============================] - 269s 543ms/step - loss:
0.3206 - accuracy: 0.8578 - val_loss: 0.3077 - val_accuracy: 0.8719 -
lr: 0.0010
Epoch 29/60
495/495 [==============================] - ETA: 0s - loss: 0.3114 -
accuracy: 0.8621
Epoch 29: val_accuracy did not improve from 0.87569
495/495 [==============================] - 269s 544ms/step - loss:
0.3114 - accuracy: 0.8621 - val_loss: 0.2871 - val_accuracy: 0.8752 -
lr: 0.0010
Epoch 30/60
495/495 [==============================] - ETA: 0s - loss: 0.3113 -
accuracy: 0.8615
Epoch 30: val_accuracy did not improve from 0.87569
495/495 [==============================] - 269s 544ms/step - loss:
0.3113 - accuracy: 0.8615 - val_loss: 0.3100 - val_accuracy: 0.8651 -
lr: 0.0010
Epoch 31/60
495/495 [==============================] - ETA: 0s - loss: 0.3106 -
accuracy: 0.8627
Epoch 31: val_accuracy did not improve from 0.87569
495/495 [==============================] - 269s 544ms/step - loss:
0.3106 - accuracy: 0.8627 - val_loss: 0.2979 - val_accuracy: 0.8744 -
lr: 0.0010
Epoch 32/60
495/495 [==============================] - ETA: 0s - loss: 0.3106 -
accuracy: 0.8650
Epoch 32: val_accuracy improved from 0.87569 to 0.88201, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.3106 - accuracy: 0.8650 - val_loss: 0.2803 - val_accuracy: 0.8820 -
lr: 0.0010
Epoch 33/60
495/495 [==============================] - ETA: 0s - loss: 0.2962 -
accuracy: 0.8711
Epoch 33: val_accuracy did not improve from 0.88201
495/495 [==============================] - 270s 545ms/step - loss:
0.2962 - accuracy: 0.8711 - val_loss: 0.2868 - val_accuracy: 0.8792 -
lr: 0.0010
Epoch 34/60
495/495 [==============================] - ETA: 0s - loss: 0.2985 -
accuracy: 0.8717
```

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Epoch 34: val_accuracy did not improve from 0.88201
495/495 [==============================] - 269s 543ms/step - loss:
0.2985 - accuracy: 0.8717 - val_loss: 0.3445 - val_accuracy: 0.8509 -
lr: 0.0010
Epoch 35/60
495/495 [==============================] - ETA: 0s - loss: 0.2908 -
accuracy: 0.8739
Epoch 35: val_accuracy did not improve from 0.88201
495/495 [==============================] - 269s 544ms/step - loss:
0.2908 - accuracy: 0.8739 - val_loss: 0.2915 - val_accuracy: 0.8765 -
lr: 0.0010
Epoch 36/60
495/495 [==============================] - ETA: 0s - loss: 0.2929 -
accuracy: 0.8755
Epoch 36: val_accuracy did not improve from 0.88201
495/495 [==============================] - 272s 550ms/step - loss:
0.2929 - accuracy: 0.8755 - val_loss: 0.2825 - val_accuracy: 0.8820 -
lr: 0.0010
Epoch 37/60
495/495 [==============================] - ETA: 0s - loss: 0.2870 -
accuracy: 0.8748
Epoch 37: val_accuracy improved from 0.88201 to 0.88403, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 544ms/step - loss:
0.2870 - accuracy: 0.8748 - val_loss: 0.2804 - val_accuracy: 0.8840 -
lr: 0.0010
Epoch 38/60
495/495 [==============================] - ETA: 0s - loss: 0.2829 -
accuracy: 0.8757
Epoch 38: val_accuracy did not improve from 0.88403
495/495 [==============================] - 269s 543ms/step - loss:
0.2829 - accuracy: 0.8757 - val_loss: 0.2763 - val_accuracy: 0.8807 -
lr: 0.0010
Epoch 39/60
495/495 [==============================] - ETA: 0s - loss: 0.2856 -
accuracy: 0.8791
Epoch 39: val_accuracy improved from 0.88403 to 0.89515, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 543ms/step - loss:
0.2856 - accuracy: 0.8791 - val_loss: 0.2585 - val_accuracy: 0.8951 -
lr: 0.0010
Epoch 40/60
495/495 [==============================] - ETA: 0s - loss: 0.2743 -
accuracy: 0.8839
Epoch 40: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2743 - accuracy: 0.8839 - val_loss: 0.2672 - val_accuracy: 0.8883 -
lr: 0.0010
Epoch 41/60
495/495 [==============================] - ETA: 0s - loss: 0.2733 -
```

```
accuracy: 0.8838
Epoch 41: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 544ms/step - loss:
0.2733 - accuracy: 0.8838 - val_loss: 0.2673 - val_accuracy: 0.8909 -
lr: 0.0010
Epoch 42/60
495/495 [==============================] - ETA: 0s - loss: 0.2692 -
accuracy: 0.8849
Epoch 42: val_accuracy did not improve from 0.89515
495/495 [==============================] - 270s 545ms/step - loss:
0.2692 - accuracy: 0.8849 - val_loss: 0.3385 - val_accuracy: 0.8449 -
lr: 0.0010
Epoch 43/60
495/495 [==============================] - ETA: 0s - loss: 0.2750 -
accuracy: 0.8828
Epoch 43: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2750 - accuracy: 0.8828 - val_loss: 0.2841 - val_accuracy: 0.8737 -
lr: 0.0010
Epoch 44/60
495/495 [==============================] - ETA: 0s - loss: 0.2716 -
accuracy: 0.8829
Epoch 44: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 544ms/step - loss:
0.2716 - accuracy: 0.8829 - val_loss: 0.2588 - val_accuracy: 0.8863 -
lr: 0.0010
Epoch 45/60
495/495 [==============================] - ETA: 0s - loss: 0.2701 -
accuracy: 0.8853
Epoch 45: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2701 - accuracy: 0.8853 - val_loss: 0.2889 - val_accuracy: 0.8780 -
lr: 0.0010
Epoch 46/60
495/495 [==============================] - ETA: 0s - loss: 0.2626 -
accuracy: 0.8863
Epoch 46: val_accuracy did not improve from 0.89515
495/495 [==============================] - 270s 544ms/step - loss:
0.2626 - accuracy: 0.8863 - val_loss: 0.2746 - val_accuracy: 0.8906 -
lr: 0.0010
Epoch 47/60
495/495 [==============================] - ETA: 0s - loss: 0.2674 -
accuracy: 0.8879
Epoch 47: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2674 - accuracy: 0.8879 - val_loss: 0.2879 - val_accuracy: 0.8742 -
lr: 0.0010
Epoch 48/60
495/495 [==============================] - ETA: 0s - loss: 0.2588 -
accuracy: 0.8880
```

```
Epoch 48: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2588 - accuracy: 0.8880 - val_loss: 0.3005 - val_accuracy: 0.8765 -
lr: 0.0010
Epoch 49/60
495/495 [==============================] - ETA: 0s - loss: 0.2554 -
accuracy: 0.8899
Epoch 49: val_accuracy did not improve from 0.89515
495/495 [==============================] - 269s 543ms/step - loss:
0.2554 - accuracy: 0.8899 - val_loss: 0.2619 - val_accuracy: 0.8941 -
lr: 0.0010
Epoch 50/60
495/495 [==============================] - ETA: 0s - loss: 0.2276 -
accuracy: 0.9029
Epoch 50: val_accuracy improved from 0.89515 to 0.90652, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 544ms/step - loss:
0.2276 - accuracy: 0.9029 - val_loss: 0.2372 - val_accuracy: 0.9065 -
lr: 1.0000e-04
Epoch 51/60
495/495 [==============================] - ETA: 0s - loss: 0.2165 -
accuracy: 0.9102
Epoch 51: val_accuracy did not improve from 0.90652
495/495 [==============================] - 269s 543ms/step - loss:
0.2165 - accuracy: 0.9102 - val_loss: 0.2394 - val_accuracy: 0.9037 -
lr: 1.0000e-04
Epoch 52/60
495/495 [==============================] - ETA: 0s - loss: 0.2083 -
accuracy: 0.9119
Epoch 52: val_accuracy did not improve from 0.90652
495/495 [==============================] - 269s 544ms/step - loss:
0.2083 - accuracy: 0.9119 - val_loss: 0.2350 - val_accuracy: 0.9058 -
lr: 1.0000e-04
Epoch 53/60
495/495 [==============================] - ETA: 0s - loss: 0.2083 -
accuracy: 0.9116
Epoch 53: val_accuracy did not improve from 0.90652
495/495 [==============================] - 269s 544ms/step - loss:
0.2083 - accuracy: 0.9116 - val_loss: 0.2377 - val_accuracy: 0.9027 -
lr: 1.0000e-04
Epoch 54/60
495/495 [==============================] - ETA: 0s - loss: 0.2071 -
accuracy: 0.9146
Epoch 54: val_accuracy did not improve from 0.90652
495/495 [==============================] - 270s 545ms/step - loss:
0.2071 - accuracy: 0.9146 - val_loss: 0.2350 - val_accuracy: 0.9063 -
lr: 1.0000e-04
Epoch 55/60
495/495 [==============================] - ETA: 0s - loss: 0.2057 -
accuracy: 0.9115
```

```
Epoch 55: val_accuracy did not improve from 0.90652
495/495 [==============================] - 269s 543ms/step - loss:
0.2057 - accuracy: 0.9115 - val_loss: 0.2373 - val_accuracy: 0.9055 -
lr: 1.0000e-04
Epoch 56/60
495/495 [==============================] - ETA: 0s - loss: 0.2018 -
accuracy: 0.9143
Epoch 56: val_accuracy did not improve from 0.90652
495/495 [==============================] - 269s 544ms/step - loss:
0.2018 - accuracy: 0.9143 - val_loss: 0.2392 - val_accuracy: 0.9055 -
lr: 1.0000e-04
Epoch 57/60
495/495 [==============================] - ETA: 0s - loss: 0.1976 -
accuracy: 0.9140
Epoch 57: val_accuracy improved from 0.90652 to 0.90702, saving model
to saved_models\model_4.h5
495/495 [==============================] - 269s 544ms/step - loss:
0.1976 - accuracy: 0.9140 - val_loss: 0.2371 - val_accuracy: 0.9070 -
lr: 1.0000e-04
Epoch 58/60
495/495 [==============================] - ETA: 0s - loss: 0.2001 -
accuracy: 0.9147
Epoch 58: val_accuracy did not improve from 0.90702
495/495 [==============================] - 270s 544ms/step - loss:
0.2001 - accuracy: 0.9147 - val_loss: 0.2322 - val_accuracy: 0.9032 -
lr: 1.0000e-04
Epoch 59/60
495/495 [==============================] - ETA: 0s - loss: 0.1997 -
accuracy: 0.9163
Epoch 59: val_accuracy did not improve from 0.90702
495/495 [==============================] - 270s 544ms/step - loss:
0.1997 - accuracy: 0.9163 - val_loss: 0.2361 - val_accuracy: 0.9058 -
lr: 1.0000e-04
Epoch 60/60
495/495 [==============================] - ETA: 0s - loss: 0.1919 -
accuracy: 0.9221
Epoch 60: val_accuracy did not improve from 0.90702
495/495 [==============================] - 269s 544ms/step - loss:
0.1919 - accuracy: 0.9221 - val_loss: 0.2382 - val_accuracy: 0.9063 -
lr: 1.0000e-04
================================================================================


Found 15827 files belonging to 2 classes.
Found 3958 files belonging to 2 classes.
Training On Fold:  5
Epoch 1/60
495/495 [==============================] - ETA: 0s - loss: 0.6849 -
accuracy: 0.5425
Epoch 1: val_accuracy improved from -inf to 0.58691, saving model to
```

```
saved_models\model_5.h5
495/495 [==============================] - 255s 502ms/step - loss:
0.6849 - accuracy: 0.5425 - val_loss: 0.6691 - val_accuracy: 0.5869 -
lr: 0.0010
Epoch 2/60
495/495 [==============================] - ETA: 0s - loss: 0.6676 -
accuracy: 0.5904
Epoch 2: val_accuracy improved from 0.58691 to 0.63517, saving model
to saved_models\model_5.h5
495/495 [==============================] - 254s 513ms/step - loss:
0.6676 - accuracy: 0.5904 - val_loss: 0.6384 - val_accuracy: 0.6352 -
lr: 0.0010
Epoch 3/60
495/495 [==============================] - ETA: 0s - loss: 0.6259 -
accuracy: 0.6515
Epoch 3: val_accuracy improved from 0.63517 to 0.68115, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.6259 - accuracy: 0.6515 - val_loss: 0.6004 - val_accuracy: 0.6812 -
lr: 0.0010
Epoch 4/60
495/495 [==============================] - ETA: 0s - loss: 0.5794 -
accuracy: 0.6980
Epoch 4: val_accuracy improved from 0.68115 to 0.72612, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.5794 - accuracy: 0.6980 - val_loss: 0.5477 - val_accuracy: 0.7261 -
lr: 0.0010
Epoch 5/60
495/495 [==============================] - ETA: 0s - loss: 0.5567 -
accuracy: 0.7169
Epoch 5: val_accuracy did not improve from 0.72612
495/495 [==============================] - 258s 520ms/step - loss:
0.5567 - accuracy: 0.7169 - val_loss: 0.5430 - val_accuracy: 0.7251 -
lr: 0.0010
Epoch 6/60
495/495 [==============================] - ETA: 0s - loss: 0.5456 -
accuracy: 0.7273
Epoch 6: val_accuracy improved from 0.72612 to 0.74861, saving model
to saved_models\model_5.h5
495/495 [==============================] - 257s 518ms/step - loss:
0.5456 - accuracy: 0.7273 - val_loss: 0.5098 - val_accuracy: 0.7486 -
lr: 0.0010
Epoch 7/60
495/495 [==============================] - ETA: 0s - loss: 0.5311 -
accuracy: 0.7379
Epoch 7: val_accuracy improved from 0.74861 to 0.76049, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 515ms/step - loss:
0.5311 - accuracy: 0.7379 - val_loss: 0.4946 - val_accuracy: 0.7605 -
```

```
lr: 0.0010
Epoch 8/60
495/495 [==============================] - ETA: 0s - loss: 0.5186 -
accuracy: 0.7470
Epoch 8: val_accuracy improved from 0.76049 to 0.76175, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.5186 - accuracy: 0.7470 - val_loss: 0.4831 - val_accuracy: 0.7617 -
lr: 0.0010
Epoch 9/60
495/495 [==============================] - ETA: 0s - loss: 0.5086 -
accuracy: 0.7522
Epoch 9: val_accuracy improved from 0.76175 to 0.77413, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 517ms/step - loss:
0.5086 - accuracy: 0.7522 - val_loss: 0.4815 - val_accuracy: 0.7741 -
lr: 0.0010
Epoch 10/60
495/495 [==============================] - ETA: 0s - loss: 0.4954 -
accuracy: 0.7650
Epoch 10: val_accuracy improved from 0.77413 to 0.77691, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 517ms/step - loss:
0.4954 - accuracy: 0.7650 - val_loss: 0.4670 - val_accuracy: 0.7769 -
lr: 0.0010
Epoch 11/60
495/495 [==============================] - ETA: 0s - loss: 0.4869 -
accuracy: 0.7646
Epoch 11: val_accuracy improved from 0.77691 to 0.77741, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 516ms/step - loss:
0.4869 - accuracy: 0.7646 - val_loss: 0.4601 - val_accuracy: 0.7774 -
lr: 0.0010
Epoch 12/60
495/495 [==============================] - ETA: 0s - loss: 0.4791 -
accuracy: 0.7730
Epoch 12: val_accuracy improved from 0.77741 to 0.79737, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 517ms/step - loss:
0.4791 - accuracy: 0.7730 - val_loss: 0.4372 - val_accuracy: 0.7974 -
lr: 0.0010
Epoch 13/60
495/495 [==============================] - ETA: 0s - loss: 0.4637 -
accuracy: 0.7819
Epoch 13: val_accuracy improved from 0.79737 to 0.80293, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.4637 - accuracy: 0.7819 - val_loss: 0.4219 - val_accuracy: 0.8029 -
lr: 0.0010
Epoch 14/60
```

```
495/495 [==============================] - ETA: 0s - loss: 0.4545 -
accuracy: 0.7866
Epoch 14: val_accuracy improved from 0.80293 to 0.81430, saving model
to saved_models\model_5.h5
495/495 [==============================] - 255s 516ms/step - loss:
0.4545 - accuracy: 0.7866 - val_loss: 0.4001 - val_accuracy: 0.8143 -
lr: 0.0010
Epoch 15/60
495/495 [==============================] - ETA: 0s - loss: 0.4479 -
accuracy: 0.7937
Epoch 15: val_accuracy did not improve from 0.81430
495/495 [==============================] - 256s 517ms/step - loss:
0.4479 - accuracy: 0.7937 - val_loss: 0.4210 - val_accuracy: 0.8090 -
lr: 0.0010
Epoch 16/60
495/495 [==============================] - ETA: 0s - loss: 0.4433 -
accuracy: 0.7947
Epoch 16: val_accuracy improved from 0.81430 to 0.82264, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 517ms/step - loss:
0.4433 - accuracy: 0.7947 - val_loss: 0.3916 - val_accuracy: 0.8226 -
lr: 0.0010
Epoch 17/60
495/495 [==============================] - ETA: 0s - loss: 0.4277 -
accuracy: 0.8021
Epoch 17: val_accuracy improved from 0.82264 to 0.82441, saving model
to saved_models\model_5.h5
495/495 [==============================] - 256s 516ms/step - loss:
0.4277 - accuracy: 0.8021 - val_loss: 0.3935 - val_accuracy: 0.8244 -
lr: 0.0010
Epoch 18/60
495/495 [==============================] - ETA: 0s - loss: 0.4217 -
accuracy: 0.8024
Epoch 18: val_accuracy improved from 0.82441 to 0.83477, saving model
to saved_models\model_5.h5
495/495 [==============================] - 261s 528ms/step - loss:
0.4217 - accuracy: 0.8024 - val_loss: 0.3661 - val_accuracy: 0.8348 -
lr: 0.0010
Epoch 19/60
495/495 [==============================] - ETA: 0s - loss: 0.4152 -
accuracy: 0.8101
Epoch 19: val_accuracy did not improve from 0.83477
495/495 [==============================] - 249s 503ms/step - loss:
0.4152 - accuracy: 0.8101 - val_loss: 0.3779 - val_accuracy: 0.8277 -
lr: 0.0010
Epoch 20/60
495/495 [==============================] - ETA: 0s - loss: 0.4088 -
accuracy: 0.8149
Epoch 20: val_accuracy did not improve from 0.83477
495/495 [==============================] - 249s 503ms/step - loss:
```

```
0.4088 - accuracy: 0.8149 - val_loss: 0.3668 - val_accuracy: 0.8322 -
lr: 0.0010
Epoch 21/60
495/495 [==============================] - ETA: 0s - loss: 0.4022 -
accuracy: 0.8179
Epoch 21: val_accuracy did not improve from 0.83477
495/495 [==============================] - 249s 503ms/step - loss:
0.4022 - accuracy: 0.8179 - val_loss: 0.3864 - val_accuracy: 0.8226 -
lr: 0.0010
Epoch 22/60
495/495 [==============================] - ETA: 0s - loss: 0.3978 -
accuracy: 0.8205
Epoch 22: val_accuracy improved from 0.83477 to 0.83830, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 503ms/step - loss:
0.3978 - accuracy: 0.8205 - val_loss: 0.3589 - val_accuracy: 0.8383 -
lr: 0.0010
Epoch 23/60
495/495 [==============================] - ETA: 0s - loss: 0.3883 -
accuracy: 0.8266
Epoch 23: val_accuracy did not improve from 0.83830
495/495 [==============================] - 249s 503ms/step - loss:
0.3883 - accuracy: 0.8266 - val_loss: 0.3718 - val_accuracy: 0.8373 -
lr: 0.0010
Epoch 24/60
495/495 [==============================] - ETA: 0s - loss: 0.3823 -
accuracy: 0.8276
Epoch 24: val_accuracy improved from 0.83830 to 0.84032, saving model
to saved_models\model_5.h5
495/495 [==============================] - 251s 506ms/step - loss:
0.3823 - accuracy: 0.8276 - val_loss: 0.3600 - val_accuracy: 0.8403 -
lr: 0.0010
Epoch 25/60
495/495 [==============================] - ETA: 0s - loss: 0.3816 -
accuracy: 0.8273
Epoch 25: val_accuracy improved from 0.84032 to 0.84310, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 503ms/step - loss:
0.3816 - accuracy: 0.8273 - val_loss: 0.3525 - val_accuracy: 0.8431 -
lr: 0.0010
Epoch 26/60
495/495 [==============================] - ETA: 0s - loss: 0.3780 -
accuracy: 0.8307
Epoch 26: val_accuracy did not improve from 0.84310
495/495 [==============================] - 250s 504ms/step - loss:
0.3780 - accuracy: 0.8307 - val_loss: 0.3508 - val_accuracy: 0.8401 -
lr: 0.0010
Epoch 27/60
495/495 [==============================] - ETA: 0s - loss: 0.3696 -
accuracy: 0.8357
```

```
Epoch 27: val_accuracy improved from 0.84310 to 0.84487, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 502ms/step - loss:
0.3696 - accuracy: 0.8357 - val_loss: 0.3499 - val_accuracy: 0.8449 -
lr: 0.0010
Epoch 28/60
495/495 [==============================] - ETA: 0s - loss: 0.3665 -
accuracy: 0.8374
Epoch 28: val_accuracy did not improve from 0.84487
495/495 [==============================] - 250s 504ms/step - loss:
0.3665 - accuracy: 0.8374 - val_loss: 0.3604 - val_accuracy: 0.8411 -
lr: 0.0010
Epoch 29/60
495/495 [==============================] - ETA: 0s - loss: 0.3650 -
accuracy: 0.8385
Epoch 29: val_accuracy improved from 0.84487 to 0.84538, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 503ms/step - loss:
0.3650 - accuracy: 0.8385 - val_loss: 0.3390 - val_accuracy: 0.8454 -
lr: 0.0010
Epoch 30/60
495/495 [==============================] - ETA: 0s - loss: 0.3586 -
accuracy: 0.8412
Epoch 30: val_accuracy improved from 0.84538 to 0.85220, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 504ms/step - loss:
0.3586 - accuracy: 0.8412 - val_loss: 0.3328 - val_accuracy: 0.8522 -
lr: 0.0010
Epoch 31/60
495/495 [==============================] - ETA: 0s - loss: 0.3566 -
accuracy: 0.8405
Epoch 31: val_accuracy improved from 0.85220 to 0.85675, saving model
to saved_models\model_5.h5
495/495 [==============================] - 250s 504ms/step - loss:
0.3566 - accuracy: 0.8405 - val_loss: 0.3313 - val_accuracy: 0.8567 -
lr: 0.0010
Epoch 32/60
495/495 [==============================] - ETA: 0s - loss: 0.3508 -
accuracy: 0.8431
Epoch 32: val_accuracy did not improve from 0.85675
495/495 [==============================] - 249s 504ms/step - loss:
0.3508 - accuracy: 0.8431 - val_loss: 0.3286 - val_accuracy: 0.8517 -
lr: 0.0010
Epoch 33/60
495/495 [==============================] - ETA: 0s - loss: 0.3504 -
accuracy: 0.8459
Epoch 33: val_accuracy improved from 0.85675 to 0.86534, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 503ms/step - loss:
0.3504 - accuracy: 0.8459 - val_loss: 0.3175 - val_accuracy: 0.8653 -
```

```
lr: 0.0010
Epoch 34/60
495/495 [==============================] - ETA: 0s - loss: 0.3433 -
accuracy: 0.8489
Epoch 34: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 504ms/step - loss:
0.3433 - accuracy: 0.8489 - val_loss: 0.3574 - val_accuracy: 0.8403 -
lr: 0.0010
Epoch 35/60
495/495 [==============================] - ETA: 0s - loss: 0.3436 -
accuracy: 0.8489
Epoch 35: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 503ms/step - loss:
0.3436 - accuracy: 0.8489 - val_loss: 0.3610 - val_accuracy: 0.8446 -
lr: 0.0010
Epoch 36/60
495/495 [==============================] - ETA: 0s - loss: 0.3351 -
accuracy: 0.8547
Epoch 36: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 504ms/step - loss:
0.3351 - accuracy: 0.8547 - val_loss: 0.3211 - val_accuracy: 0.8555 -
lr: 0.0010
Epoch 37/60
495/495 [==============================] - ETA: 0s - loss: 0.3320 -
accuracy: 0.8523
Epoch 37: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 503ms/step - loss:
0.3320 - accuracy: 0.8523 - val_loss: 0.3314 - val_accuracy: 0.8530 -
lr: 0.0010
Epoch 38/60
495/495 [==============================] - ETA: 0s - loss: 0.3241 -
accuracy: 0.8564
Epoch 38: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 503ms/step - loss:
0.3241 - accuracy: 0.8564 - val_loss: 0.3265 - val_accuracy: 0.8605 -
lr: 0.0010
Epoch 39/60
495/495 [==============================] - ETA: 0s - loss: 0.3271 -
accuracy: 0.8571
Epoch 39: val_accuracy did not improve from 0.86534
495/495 [==============================] - 249s 503ms/step - loss:
0.3271 - accuracy: 0.8571 - val_loss: 0.3200 - val_accuracy: 0.8626 -
lr: 0.0010
Epoch 40/60
495/495 [==============================] - ETA: 0s - loss: 0.3170 -
accuracy: 0.8615
Epoch 40: val_accuracy improved from 0.86534 to 0.87721, saving model
to saved_models\model_5.h5
495/495 [==============================] - 249s 503ms/step - loss:
0.3170 - accuracy: 0.8615 - val_loss: 0.2876 - val_accuracy: 0.8772 -
```

```
lr: 0.0010
Epoch 41/60
495/495 [==============================] - ETA: 0s - loss: 0.3195 -
accuracy: 0.8618
Epoch 41: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 502ms/step - loss:
0.3195 - accuracy: 0.8618 - val_loss: 0.3486 - val_accuracy: 0.8466 -
lr: 0.0010
Epoch 42/60
495/495 [==============================] - ETA: 0s - loss: 0.3167 -
accuracy: 0.8589
Epoch 42: val_accuracy did not improve from 0.87721
495/495 [==============================] - 250s 504ms/step - loss:
0.3167 - accuracy: 0.8589 - val_loss: 0.2896 - val_accuracy: 0.8757 -
lr: 0.0010
Epoch 43/60
495/495 [==============================] - ETA: 0s - loss: 0.3084 -
accuracy: 0.8611
Epoch 43: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 503ms/step - loss:
0.3084 - accuracy: 0.8611 - val_loss: 0.3215 - val_accuracy: 0.8631 -
lr: 0.0010
Epoch 44/60
495/495 [==============================] - ETA: 0s - loss: 0.3118 -
accuracy: 0.8635
Epoch 44: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 502ms/step - loss:
0.3118 - accuracy: 0.8635 - val_loss: 0.2947 - val_accuracy: 0.8714 -
lr: 0.0010
Epoch 45/60
495/495 [==============================] - ETA: 0s - loss: 0.3078 -
accuracy: 0.8667
Epoch 45: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 503ms/step - loss:
0.3078 - accuracy: 0.8667 - val_loss: 0.3112 - val_accuracy: 0.8623 -
lr: 0.0010
Epoch 46/60
495/495 [==============================] - ETA: 0s - loss: 0.3092 -
accuracy: 0.8688
Epoch 46: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 503ms/step - loss:
0.3092 - accuracy: 0.8688 - val_loss: 0.3252 - val_accuracy: 0.8573 -
lr: 0.0010
Epoch 47/60
495/495 [==============================] - ETA: 0s - loss: 0.2976 -
accuracy: 0.8702
Epoch 47: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 503ms/step - loss:
0.2976 - accuracy: 0.8702 - val_loss: 0.2940 - val_accuracy: 0.8754 -
lr: 0.0010
```

```
Epoch 48/60
495/495 [==============================] - ETA: 0s - loss: 0.2940 -
accuracy: 0.8725
Epoch 48: val_accuracy did not improve from 0.87721
495/495 [==============================] - 250s 504ms/step - loss:
0.2940 - accuracy: 0.8725 - val_loss: 0.3080 - val_accuracy: 0.8770 -
lr: 0.0010
Epoch 49/60
495/495 [==============================] - ETA: 0s - loss: 0.2991 -
accuracy: 0.8718
Epoch 49: val_accuracy did not improve from 0.87721
495/495 [==============================] - 249s 504ms/step - loss:
0.2991 - accuracy: 0.8718 - val_loss: 0.3094 - val_accuracy: 0.8696 -
lr: 0.0010
Epoch 50/60
495/495 [==============================] - ETA: 0s - loss: 0.2927 -
accuracy: 0.8759
Epoch 50: val_accuracy did not improve from 0.87721
495/495 [==============================] - 250s 505ms/step - loss:
0.2927 - accuracy: 0.8759 - val_loss: 0.3177 - val_accuracy: 0.8674 -
lr: 0.0010
Epoch 51/60
495/495 [==============================] - ETA: 0s - loss: 0.2654 -
accuracy: 0.8866
Epoch 51: val_accuracy improved from 0.87721 to 0.88327, saving model
to saved_models\model_5.h5
495/495 [==============================] - 250s 505ms/step - loss:
0.2654 - accuracy: 0.8866 - val_loss: 0.2834 - val_accuracy: 0.8833 -
lr: 1.0000e-04
Epoch 52/60
495/495 [==============================] - ETA: 0s - loss: 0.2595 -
accuracy: 0.8905
Epoch 52: val_accuracy did not improve from 0.88327
495/495 [==============================] - 250s 504ms/step - loss:
0.2595 - accuracy: 0.8905 - val_loss: 0.2878 - val_accuracy: 0.8823 -
lr: 1.0000e-04
Epoch 53/60
495/495 [==============================] - ETA: 0s - loss: 0.2515 -
accuracy: 0.8940
Epoch 53: val_accuracy did not improve from 0.88327
495/495 [==============================] - 251s 506ms/step - loss:
0.2515 - accuracy: 0.8940 - val_loss: 0.2933 - val_accuracy: 0.8797 -
lr: 1.0000e-04
Epoch 54/60
495/495 [==============================] - ETA: 0s - loss: 0.2512 -
accuracy: 0.8905
Epoch 54: val_accuracy did not improve from 0.88327
495/495 [==============================] - 250s 505ms/step - loss:
0.2512 - accuracy: 0.8905 - val_loss: 0.2879 - val_accuracy: 0.8825 -
lr: 1.0000e-04
```

```
Epoch 55/60
495/495 [==============================] - ETA: 0s - loss: 0.2450 -
accuracy: 0.8968
Epoch 55: val_accuracy did not improve from 0.88327
495/495 [==============================] - 251s 506ms/step - loss:
0.2450 - accuracy: 0.8968 - val_loss: 0.2910 - val_accuracy: 0.8815 -
lr: 1.0000e-04
Epoch 56/60
495/495 [==============================] - ETA: 0s - loss: 0.2469 -
accuracy: 0.8954
Epoch 56: val_accuracy did not improve from 0.88327
495/495 [==============================] - 251s 506ms/step - loss:
0.2469 - accuracy: 0.8954 - val_loss: 0.2873 - val_accuracy: 0.8833 -
lr: 1.0000e-04
Epoch 57/60
495/495 [==============================] - ETA: 0s - loss: 0.2469 -
accuracy: 0.8969
Epoch 57: val_accuracy did not improve from 0.88327
495/495 [==============================] - 250s 505ms/step - loss:
0.2469 - accuracy: 0.8969 - val_loss: 0.2822 - val_accuracy: 0.8830 -
lr: 1.0000e-04
Epoch 58/60
495/495 [==============================] - ETA: 0s - loss: 0.2410 -
accuracy: 0.8991
Epoch 58: val_accuracy did not improve from 0.88327
495/495 [==============================] - 250s 505ms/step - loss:
0.2410 - accuracy: 0.8991 - val_loss: 0.2942 - val_accuracy: 0.8805 -
lr: 1.0000e-04
Epoch 59/60
495/495 [==============================] - ETA: 0s - loss: 0.2425 -
accuracy: 0.8968
Epoch 59: val_accuracy did not improve from 0.88327
495/495 [==============================] - 250s 506ms/step - loss:
0.2425 - accuracy: 0.8968 - val_loss: 0.2885 - val_accuracy: 0.8815 -
lr: 1.0000e-04
Epoch 60/60
495/495 [==============================] - ETA: 0s - loss: 0.2382 -
accuracy: 0.8996
Epoch 60: val_accuracy did not improve from 0.88327
495/495 [==============================] - 251s 506ms/step - loss:
0.2382 - accuracy: 0.8996 - val_loss: 0.2988 - val_accuracy: 0.8815 -
lr: 1.0000e-04
================================================================================
```

```
print('average loss', np.mean(cv_loss_scores))
print('average accuracy', np.mean(cv_accuracy_scores))
```

```
average loss 0.27686133682727815
average accuracy 0.8873673439025879
```

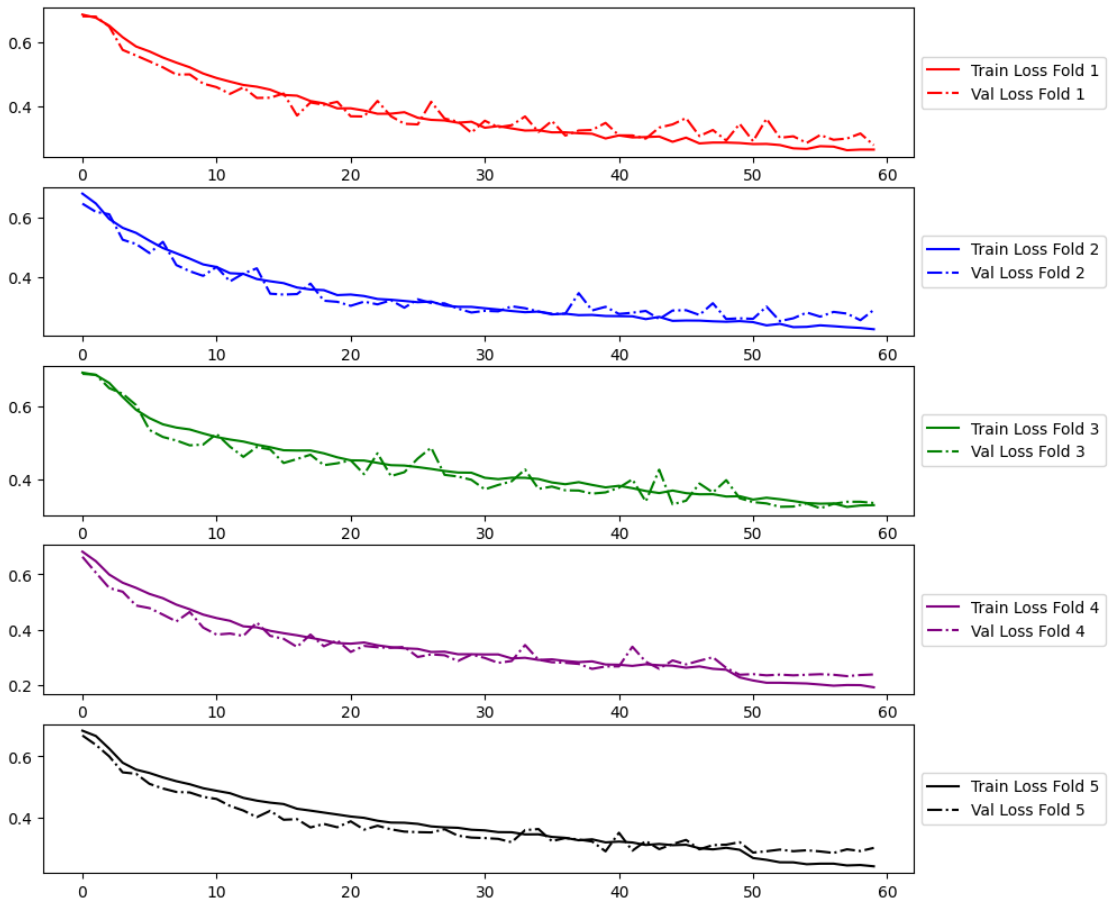
2.5 Plotting Model's Performance:

```
fig, axs = plt.subplots(5)
fig.set_figheight(10)
fig.set_figwidth(10)

axs[0].plot(model_hist[0].history['loss'], color = 'red', label =
'Train Loss Fold 1')
axs[0].plot(model_hist[0].history['val_loss'], color = 'red', label =
'Val Loss Fold 1', linestyle = 'dashdot')
axs[1].plot(model_hist[1].history['loss'], color = 'blue', label =
'Train Loss Fold 2')
axs[1].plot(model_hist[1].history['val_loss'], color = 'blue', label =
'Val Loss Fold 2', linestyle = 'dashdot')
axs[2].plot(model_hist[2].history['loss'], color = 'green', label =
'Train Loss Fold 3')
axs[2].plot(model_hist[2].history['val_loss'], color = 'green', label
= 'Val Loss Fold 3', linestyle = 'dashdot')
axs[3].plot(model_hist[3].history['loss'], color = 'purple', label =
'Train Loss Fold 4')
axs[3].plot(model_hist[3].history['val_loss'], color = 'purple', label
= 'Val Loss Fold 4', linestyle = 'dashdot')
axs[4].plot(model_hist[4].history['loss'], color = 'black', label =
'Train Loss Fold 5')
axs[4].plot(model_hist[4].history['val_loss'], color = 'black', label
= 'Val Loss Fold 5', linestyle = 'dashdot')

axs[0].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[1].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[2].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[3].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[4].legend(loc='center left', bbox_to_anchor=(1, 0.5))


fig.suptitle('Train Loss VS Val Loss', fontsize = 20)
plt.show()
```



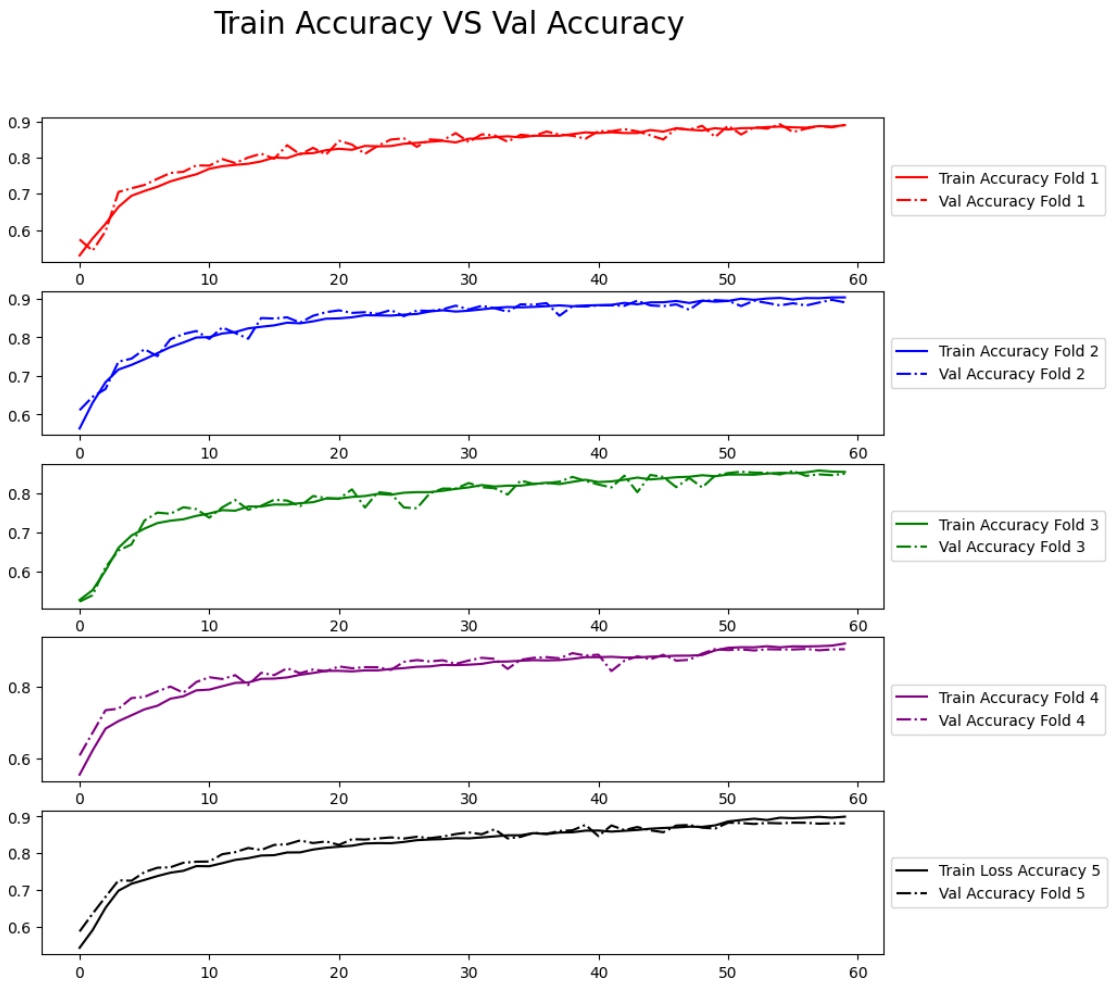

```
fig, axs = plt.subplots(5)
fig.set_figheight(10)
fig.set_figwidth(10)
axs[0].plot(model_hist[0].history['accuracy'], color = 'red', label =
'Train Accuracy Fold 1')
axs[0].plot(model_hist[0].history['val_accuracy'], color = 'red',
label = 'Val Accuracy Fold 1', linestyle = 'dashdot')
axs[1].plot(model_hist[1].history['accuracy'], color = 'blue', label =
'Train Accuracy Fold 2')
axs[1].plot(model_hist[1].history['val_accuracy'], color = 'blue',
label = 'Val Accuracy Fold 2', linestyle = 'dashdot')
axs[2].plot(model_hist[2].history['accuracy'], color = 'green', label
= 'Train Accuracy Fold 3')
axs[2].plot(model_hist[2].history['val_accuracy'], color = 'green',
label = 'Val Accuracy Fold 3', linestyle = 'dashdot')
axs[3].plot(model_hist[3].history['accuracy'], color = 'purple', label
= 'Train Accuracy Fold 4')
axs[3].plot(model_hist[3].history['val_accuracy'], color = 'purple',
label = 'Val Accuracy Fold 4', linestyle = 'dashdot')
```

```
axs[4].plot(model_hist[4].history['accuracy'], color = 'black', label
= 'Train Loss Accuracy 5')
axs[4].plot(model_hist[4].history['val_accuracy'], color = 'black',
label = 'Val Accuracy Fold 5', linestyle = 'dashdot')

axs[0].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[1].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[2].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[3].legend(loc='center left', bbox_to_anchor=(1, 0.5))
axs[4].legend(loc='center left', bbox_to_anchor=(1, 0.5))

fig.suptitle('Train Accuracy VS Val Accuracy', fontsize = 20)

plt.show()
```



3. Evaluating Model's Performance

3.1 Evaluate The Models:

```
test =
tf.keras.utils.image_dataset_from_directory('CatsDogs_Split/test',
image_size=(100,100))
```

```
Found 4947 files belonging to 2 classes.
```

```
Model_Precision = []
Model_Recall = []
Model_Accuracy = []
```

```
pre = Precision()
re = Recall()
acc = BinaryAccuracy()
```

3.1.1 Best Model Fold 1:

```
best_model_f1 = load_model('saved_models/model_'+str(1)+'.h5')
```

```
#Visualizing model's summary:
best_model_f1.summary()
```

```
Model: "sequential_16"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 resizing_16 (Resizing)      (None, 100, 100, 3)       0

 rescaling_16 (Rescaling)    (None, 100, 100, 3)       0

 random_flip_16 (RandomFlip)  (None, 100, 100, 3)      0

 random_rotation_16 (RandomR  (None, 100, 100, 3)      0
 otation)

 random_zoom_16 (RandomZoom)  (None, 100, 100, 3)      0

 conv2d_58 (Conv2D)          (None, 98, 98, 32)        896

 max_pooling2d_58 (MaxPoolin  (None, 49, 49, 32)       0
 g2D)

 conv2d_59 (Conv2D)          (None, 47, 47, 64)        18496

 max_pooling2d_59 (MaxPoolin  (None, 23, 23, 64)       0
 g2D)

 conv2d_60 (Conv2D)          (None, 21, 21, 128)       73856

 max_pooling2d_60 (MaxPoolin  (None, 10, 10, 128)      0
```

```
 g2D)

 conv2d_61 (Conv2D)          (None, 8, 8, 256)         295168

 max_pooling2d_61 (MaxPoolin  (None, 4, 4, 256)        0
 g2D)

 dropout_32 (Dropout)        (None, 4, 4, 256)         0

 flatten_16 (Flatten)        (None, 4096)              0

 dense_32 (Dense)            (None, 128)               524416

 dropout_33 (Dropout)        (None, 128)               0

 dense_33 (Dense)            (None, 1)                 129

=================================================================
Total params: 912,961
Trainable params: 912,961
Non-trainable params: 0
_________________________________________________________________
```

```
for batch in test.as_numpy_iterator():
    X, y = batch
    yhat = best_model_f1.predict(X)
    pre.update_state(y, yhat)
    re.update_state(y, yhat)
    acc.update_state(y, yhat)
```

```
1/1 [==============================] - 0s 68ms/step
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```

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```

```
print(f'Precision:{pre.result().numpy()}, Recall:
{re.result().numpy()}, Accuracy:{acc.result().numpy()}')
```

```
Precision:0.8738595843315125, Recall:0.8919028043746948,
Accuracy:0.8817465305328369
```

```
Model_Precision.append(pre.result().numpy())
Model_Recall.append(re.result().numpy())
Model_Accuracy.append(acc.result().numpy())
```

3.1.2 Best Model Fold 2:

```
best_model_f2 = load_model('saved_models/model_'+str(2)+'.h5')
```

```
for batch in test.as_numpy_iterator():
    X, y = batch
    yhat = best_model_f2.predict(X)
```

```
    pre.update_state(y, yhat)
    re.update_state(y, yhat)
    acc.update_state(y, yhat)

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1/1 [==============================] - 0s 82ms/step
```

```
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1/1 [==============================] - 0s 86ms/step
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1/1 [==============================] - 0s 84ms/step
1/1 [==============================] - 0s 91ms/step
1/1 [==============================] - 0s 83ms/step
1/1 [==============================] - 0s 146ms/step
```

```
print(f'Precision:{pre.result().numpy()}, Recall:
{re.result().numpy()}, Accuracy:{acc.result().numpy()}')
```

```
Precision:0.8775834441184998, Recall:0.8939270973205566,
Accuracy:0.8847786784172058
```

```
Model_Precision.append(pre.result().numpy())
Model_Recall.append(re.result().numpy())
Model_Accuracy.append(acc.result().numpy())
```

3.1.3 Best Model Fold 3:

```
best_model_f3 = load_model('saved_models/model_'+str(3)+'.h5')
```

```
for batch in test.as_numpy_iterator():
    X, y = batch
    yhat = best_model_f3.predict(X)
    pre.update_state(y, yhat)
    re.update_state(y, yhat)
    acc.update_state(y, yhat)
```

```
1/1 [==============================] - 0s 147ms/step
1/1 [==============================] - 0s 84ms/step
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```

```
print(f'Precision:{pre.result().numpy()}, Recall:
{re.result().numpy()}, Accuracy:{acc.result().numpy()}')
```

```
Precision:0.8714653253555298, Recall:0.8921052813529968,
Accuracy:0.8804326057434082
```

```
Model_Precision.append(pre.result().numpy())
Model_Recall.append(re.result().numpy())
Model_Accuracy.append(acc.result().numpy())
```

3.1.4 Best Model Fold 4:

```
best_model_f4 = load_model('saved_models/model_'+str(4)+'.h5')
```

```
for batch in test.as_numpy_iterator():
    X, y = batch
    yhat = best_model_f4.predict(X)
```

```
    pre.update_state(y, yhat)
    re.update_state(y, yhat)
    acc.update_state(y, yhat)

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```

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```

```
print(f'Precision:{pre.result().numpy()}, Recall:
{re.result().numpy()}, Accuracy:{acc.result().numpy()}')
```

```
Precision:0.8751413822174072, Recall:0.8950838446617126,
Accuracy:0.8838545680046082
```

```
Model_Precision.append(pre.result().numpy())
Model_Recall.append(re.result().numpy())
Model_Accuracy.append(acc.result().numpy())
```

3.1.5 Best Model Fold 5:

```
best_model_f5 = load_model('saved_models/model_'+str(5)+'.h5')
```

```
for batch in test.as_numpy_iterator():
    X, y = batch
    yhat = best_model_f5.predict(X)
    pre.update_state(y, yhat)
    re.update_state(y, yhat)
    acc.update_state(y, yhat)
```

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```

```
print(f'Precision:{pre.result().numpy()}, Recall:
{re.result().numpy()}, Accuracy:{acc.result().numpy()}')
```

```
Precision:0.8754870891571045, Recall:0.8995501399040222,
Accuracy:0.8859690427780151
```

```
Model_Precision.append(pre.result().numpy())
Model_Recall.append(re.result().numpy())
Model_Accuracy.append(acc.result().numpy())
```

3.1.6 Average Scores:

```
print('average precision', np.mean(Model_Precision))
print('average recall', np.mean(Model_Recall))
print('average accuracy', np.mean(Model_Accuracy))
```

```
average precision 0.8747074
average recall 0.8945138
average accuracy 0.8833563
```