In [1]:
```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from tensorflow.keras.optimizers import Adam, SGD
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.regularizers import l1_l2
from tensorflow.keras import models, layers
import os
from keras.models import load_model
```

In [2]:
```
ds_train=tf.keras.utils.image_dataset_from_directory("ProjectDir_Pet/train",batch_
```

```
Found 40 files belonging to 2 classes.
```

In [3]:
```
ds_test=tf.keras.utils.image_dataset_from_directory("ProjectDir_Pet/test",batch_si
```

```
Found 20 files belonging to 2 classes.
```

In [4]:
```
def normalize_img(image, label):
  """Normalizes images: `uint8` -> `float32`."""
  return tf.cast(image, tf.float32) / 255., label

ds_train = ds_train.map(
    normalize_img, num_parallel_calls=tf.data.AUTOTUNE)
ds_train = ds_train.cache()
ds_train = ds_train.shuffle(40)
ds_train = ds_train.prefetch(tf.data.AUTOTUNE)
```

In [5]:
```
ds_test = ds_test.map(
    normalize_img, num_parallel_calls=tf.data.AUTOTUNE)
ds_test = ds_test.cache()
ds_test = ds_test.prefetch(tf.data.AUTOTUNE)
```

In [6]:
```
data_augmentation = tf.keras.Sequential([
  layers.RandomFlip("horizontal_and_vertical"),
  layers.RandomRotation(0.2),
])
```

In [7]:
```
model = models.Sequential()
model.add(layers.Input(shape=(256, 256, 3)))
model.add(data_augmentation)
model.add( layers.Conv2D( 32, (5, 5 ), activation = 'tanh',kernel_initializer='glo
model.add(layers.BatchNormalization())
model.add(layers.MaxPooling2D(2,2))
model.add(layers.Conv2D(64, (5, 5 ),kernel_initializer='glorot_uniform', activatio
model.add(layers.BatchNormalization())
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Dropout(0.5))
model.add(layers.Flatten())
model.add(layers.Dense(32,kernel_initializer='he_normal',activation = 'relu'))
model.add(layers.Dropout(0.5))
model.add(layers.BatchNormalization())
model.add(layers.Dense(1,kernel_initializer='he_normal', activation = 'sigmoid'))
```

In [8]:
```
model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 sequential (Sequential)     (None, 256, 256, 3)       0

 conv2d (Conv2D)             (None, 252, 252, 32)      2432

 batch_normalization (BatchN  (None, 252, 252, 32)     128
 ormalization)

 max_pooling2d (MaxPooling2D  (None, 126, 126, 32)     0
 )

 conv2d_1 (Conv2D)           (None, 122, 122, 64)      51264

 batch_normalization_1 (Batc  (None, 122, 122, 64)     256
 hNormalization)

 max_pooling2d_1 (MaxPooling  (None, 61, 61, 64)       0
 2D)

 dropout (Dropout)           (None, 61, 61, 64)        0

 flatten (Flatten)           (None, 238144)            0

 dense (Dense)               (None, 32)                7620640

 dropout_1 (Dropout)         (None, 32)                0

 batch_normalization_2 (Batc  (None, 32)               128
 hNormalization)

 dense_1 (Dense)             (None, 1)                 33

=================================================================
Total params: 7,674,881
Trainable params: 7,674,625
Non-trainable params: 256
_________________________________________________________________
```

In [9]:
```
history = model.compile(
    optimizer = tf.keras.optimizers.Adam(0.00001),
    loss = tf.keras.losses.BinaryCrossentropy(from_logits=False),
    metrics=[tf.keras.metrics.BinaryAccuracy()]
)
```

In [10]:
```
history = model.fit(
    ds_train,
    epochs=100,
    validation_data=ds_test,
)
print('Number of total epochs ran:')
len(history.history['val_binary_accuracy'])
```

```
Epoch 1/100
2/2 [==============================] - 15s 5s/step - loss: 0.7774 - binary_accurac
y: 0.5000 - val_loss: 0.6915 - val_binary_accuracy: 0.5000
Epoch 2/100
2/2 [==============================] - 7s 4s/step - loss: 0.8984 - binary_accurac
y: 0.6000 - val_loss: 0.6921 - val_binary_accuracy: 0.5000
Epoch 3/100
2/2 [==============================] - 7s 4s/step - loss: 0.9741 - binary_accurac
y: 0.4500 - val_loss: 0.6945 - val_binary_accuracy: 0.5500
Epoch 4/100
2/2 [==============================] - 7s 4s/step - loss: 0.8663 - binary_accurac
y: 0.6000 - val_loss: 0.6948 - val_binary_accuracy: 0.5500
Epoch 5/100
2/2 [==============================] - 7s 4s/step - loss: 0.8942 - binary_accurac
y: 0.5000 - val_loss: 0.6947 - val_binary_accuracy: 0.5500
Epoch 6/100
2/2 [==============================] - 7s 4s/step - loss: 1.0278 - binary_accurac
y: 0.4750 - val_loss: 0.6935 - val_binary_accuracy: 0.5500
Epoch 7/100
2/2 [==============================] - 7s 4s/step - loss: 0.8691 - binary_accurac
y: 0.5000 - val_loss: 0.6921 - val_binary_accuracy: 0.5500
Epoch 8/100
2/2 [==============================] - 7s 4s/step - loss: 0.7091 - binary_accurac
y: 0.6250 - val_loss: 0.6924 - val_binary_accuracy: 0.4500
Epoch 9/100
2/2 [==============================] - 7s 4s/step - loss: 0.9679 - binary_accurac
y: 0.4750 - val_loss: 0.6932 - val_binary_accuracy: 0.5000
Epoch 10/100
2/2 [==============================] - 7s 4s/step - loss: 0.7619 - binary_accurac
y: 0.5250 - val_loss: 0.6945 - val_binary_accuracy: 0.5000
Epoch 11/100
2/2 [==============================] - 7s 4s/step - loss: 0.8945 - binary_accurac
y: 0.5750 - val_loss: 0.6958 - val_binary_accuracy: 0.4500
Epoch 12/100
2/2 [==============================] - 7s 4s/step - loss: 0.6255 - binary_accurac
y: 0.7250 - val_loss: 0.6969 - val_binary_accuracy: 0.4500
Epoch 13/100
2/2 [==============================] - 7s 4s/step - loss: 0.6820 - binary_accurac
y: 0.6250 - val_loss: 0.6986 - val_binary_accuracy: 0.5000
Epoch 14/100
2/2 [==============================] - 7s 4s/step - loss: 0.6637 - binary_accurac
y: 0.6500 - val_loss: 0.6998 - val_binary_accuracy: 0.4500
Epoch 15/100
2/2 [==============================] - 7s 4s/step - loss: 0.7669 - binary_accurac
y: 0.6500 - val_loss: 0.7004 - val_binary_accuracy: 0.4500
Epoch 16/100
2/2 [==============================] - 7s 4s/step - loss: 0.6859 - binary_accurac
y: 0.5500 - val_loss: 0.7010 - val_binary_accuracy: 0.4000
Epoch 17/100
2/2 [==============================] - 7s 4s/step - loss: 0.6232 - binary_accurac
y: 0.6750 - val_loss: 0.7015 - val_binary_accuracy: 0.5500
Epoch 18/100
2/2 [==============================] - 7s 4s/step - loss: 0.7900 - binary_accurac
y: 0.5750 - val_loss: 0.7021 - val_binary_accuracy: 0.5000
Epoch 19/100
2/2 [==============================] - 7s 3s/step - loss: 0.7339 - binary_accurac
y: 0.6000 - val_loss: 0.7037 - val_binary_accuracy: 0.5000
Epoch 20/100
2/2 [==============================] - 7s 4s/step - loss: 0.6935 - binary_accurac
y: 0.6750 - val_loss: 0.7056 - val_binary_accuracy: 0.5000
Epoch 21/100
2/2 [==============================] - 7s 4s/step - loss: 0.7322 - binary_accurac
y: 0.5500 - val_loss: 0.7088 - val_binary_accuracy: 0.5000
Epoch 22/100
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.4941 - binary_accurac
y: 0.6750 - val_loss: 0.7111 - val_binary_accuracy: 0.5000
Epoch 23/100
2/2 [==============================] - 7s 4s/step - loss: 0.6559 - binary_accurac
y: 0.6500 - val_loss: 0.7129 - val_binary_accuracy: 0.5000
Epoch 24/100
2/2 [==============================] - 7s 4s/step - loss: 0.5811 - binary_accurac
y: 0.6750 - val_loss: 0.7151 - val_binary_accuracy: 0.5000
Epoch 25/100
2/2 [==============================] - 7s 4s/step - loss: 0.8461 - binary_accurac
y: 0.5500 - val_loss: 0.7180 - val_binary_accuracy: 0.5000
Epoch 26/100
2/2 [==============================] - 7s 4s/step - loss: 0.6504 - binary_accurac
y: 0.6500 - val_loss: 0.7228 - val_binary_accuracy: 0.5000
Epoch 27/100
2/2 [==============================] - 7s 4s/step - loss: 0.7109 - binary_accurac
y: 0.6250 - val_loss: 0.7252 - val_binary_accuracy: 0.5000
Epoch 28/100
2/2 [==============================] - 7s 4s/step - loss: 0.5534 - binary_accurac
y: 0.6750 - val_loss: 0.7296 - val_binary_accuracy: 0.5000
Epoch 29/100
2/2 [==============================] - 7s 4s/step - loss: 0.6965 - binary_accurac
y: 0.6750 - val_loss: 0.7325 - val_binary_accuracy: 0.5000
Epoch 30/100
2/2 [==============================] - 7s 4s/step - loss: 0.4857 - binary_accurac
y: 0.7750 - val_loss: 0.7349 - val_binary_accuracy: 0.5000
Epoch 31/100
2/2 [==============================] - 7s 4s/step - loss: 0.6333 - binary_accurac
y: 0.7250 - val_loss: 0.7368 - val_binary_accuracy: 0.5000
Epoch 32/100
2/2 [==============================] - 7s 4s/step - loss: 0.4380 - binary_accurac
y: 0.7500 - val_loss: 0.7375 - val_binary_accuracy: 0.5000
Epoch 33/100
2/2 [==============================] - 8s 4s/step - loss: 0.5092 - binary_accurac
y: 0.8000 - val_loss: 0.7365 - val_binary_accuracy: 0.5000
Epoch 34/100
2/2 [==============================] - 7s 4s/step - loss: 0.4927 - binary_accurac
y: 0.6500 - val_loss: 0.7368 - val_binary_accuracy: 0.5000
Epoch 35/100
2/2 [==============================] - 7s 4s/step - loss: 0.5457 - binary_accurac
y: 0.7250 - val_loss: 0.7365 - val_binary_accuracy: 0.5000
Epoch 36/100
2/2 [==============================] - 8s 5s/step - loss: 0.4374 - binary_accurac
y: 0.8000 - val_loss: 0.7373 - val_binary_accuracy: 0.5000
Epoch 37/100
2/2 [==============================] - 7s 4s/step - loss: 0.5041 - binary_accurac
y: 0.8000 - val_loss: 0.7385 - val_binary_accuracy: 0.5000
Epoch 38/100
2/2 [==============================] - 7s 4s/step - loss: 0.4828 - binary_accurac
y: 0.7250 - val_loss: 0.7401 - val_binary_accuracy: 0.5000
Epoch 39/100
2/2 [==============================] - 5s 2s/step - loss: 0.7077 - binary_accurac
y: 0.6750 - val_loss: 0.7416 - val_binary_accuracy: 0.5000
Epoch 40/100
2/2 [==============================] - 4s 2s/step - loss: 0.6088 - binary_accurac
y: 0.6750 - val_loss: 0.7411 - val_binary_accuracy: 0.5000
Epoch 41/100
2/2 [==============================] - 6s 3s/step - loss: 0.5542 - binary_accurac
y: 0.7250 - val_loss: 0.7419 - val_binary_accuracy: 0.5000
Epoch 42/100
2/2 [==============================] - 6s 3s/step - loss: 0.6280 - binary_accurac
y: 0.6750 - val_loss: 0.7428 - val_binary_accuracy: 0.5000
Epoch 43/100
2/2 [==============================] - 8s 4s/step - loss: 0.7498 - binary_accurac
```

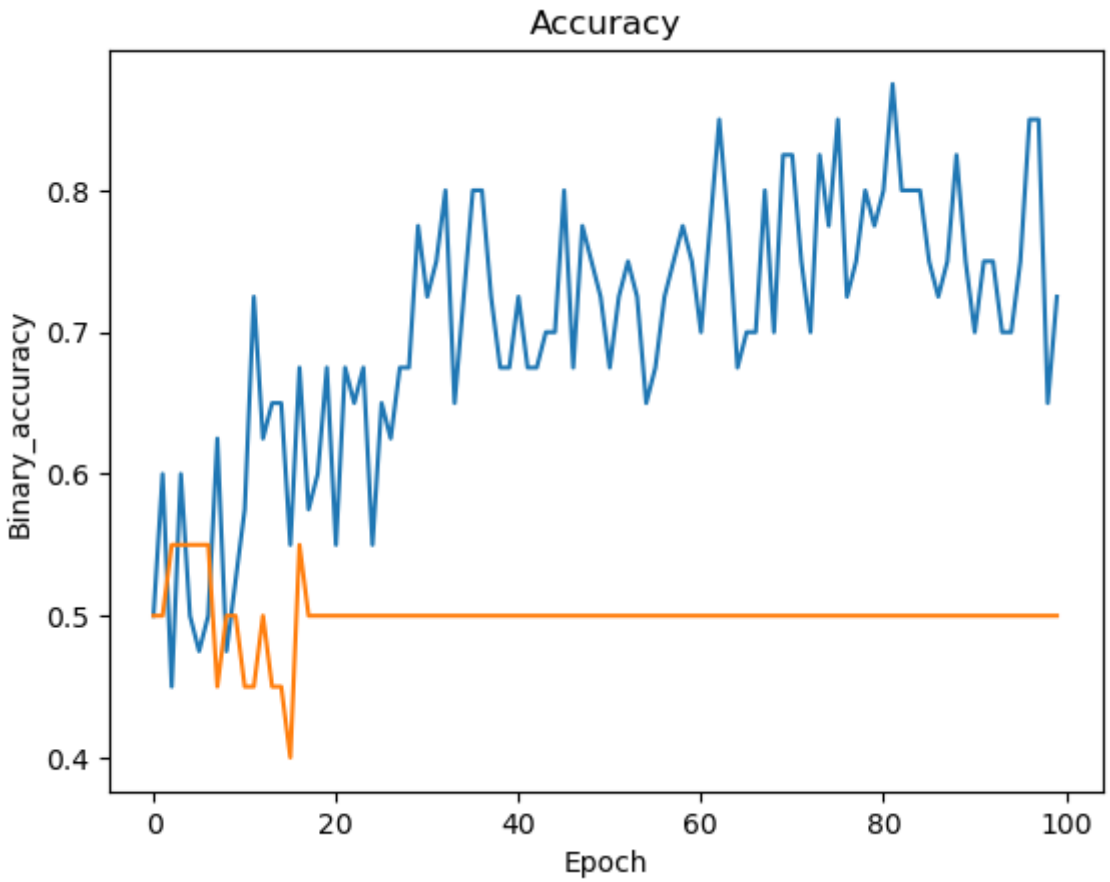
```
y: 0.6750 - val_loss: 0.7438 - val_binary_accuracy: 0.5000
Epoch 44/100
2/2 [==============================] - 8s 4s/step - loss: 0.5277 - binary_accurac
y: 0.7000 - val_loss: 0.7445 - val_binary_accuracy: 0.5000
Epoch 45/100
2/2 [==============================] - 8s 4s/step - loss: 0.5302 - binary_accurac
y: 0.7000 - val_loss: 0.7436 - val_binary_accuracy: 0.5000
Epoch 46/100
2/2 [==============================] - 7s 4s/step - loss: 0.4929 - binary_accurac
y: 0.8000 - val_loss: 0.7434 - val_binary_accuracy: 0.5000
Epoch 47/100
2/2 [==============================] - 8s 4s/step - loss: 0.5503 - binary_accurac
y: 0.6750 - val_loss: 0.7427 - val_binary_accuracy: 0.5000
Epoch 48/100
2/2 [==============================] - 7s 4s/step - loss: 0.5031 - binary_accurac
y: 0.7750 - val_loss: 0.7440 - val_binary_accuracy: 0.5000
Epoch 49/100
2/2 [==============================] - 8s 4s/step - loss: 0.4144 - binary_accurac
y: 0.7500 - val_loss: 0.7436 - val_binary_accuracy: 0.5000
Epoch 50/100
2/2 [==============================] - 8s 4s/step - loss: 0.6048 - binary_accurac
y: 0.7250 - val_loss: 0.7430 - val_binary_accuracy: 0.5000
Epoch 51/100
2/2 [==============================] - 7s 4s/step - loss: 0.6283 - binary_accurac
y: 0.6750 - val_loss: 0.7437 - val_binary_accuracy: 0.5000
Epoch 52/100
2/2 [==============================] - 7s 4s/step - loss: 0.5294 - binary_accurac
y: 0.7250 - val_loss: 0.7452 - val_binary_accuracy: 0.5000
Epoch 53/100
2/2 [==============================] - 7s 4s/step - loss: 0.6039 - binary_accurac
y: 0.7500 - val_loss: 0.7452 - val_binary_accuracy: 0.5000
Epoch 54/100
2/2 [==============================] - 7s 4s/step - loss: 0.5721 - binary_accurac
y: 0.7250 - val_loss: 0.7460 - val_binary_accuracy: 0.5000
Epoch 55/100
2/2 [==============================] - 7s 4s/step - loss: 0.5536 - binary_accurac
y: 0.6500 - val_loss: 0.7465 - val_binary_accuracy: 0.5000
Epoch 56/100
2/2 [==============================] - 7s 4s/step - loss: 0.5979 - binary_accurac
y: 0.6750 - val_loss: 0.7479 - val_binary_accuracy: 0.5000
Epoch 57/100
2/2 [==============================] - 7s 4s/step - loss: 0.5562 - binary_accurac
y: 0.7250 - val_loss: 0.7513 - val_binary_accuracy: 0.5000
Epoch 58/100
2/2 [==============================] - 7s 4s/step - loss: 0.5635 - binary_accurac
y: 0.7500 - val_loss: 0.7547 - val_binary_accuracy: 0.5000
Epoch 59/100
2/2 [==============================] - 7s 4s/step - loss: 0.5144 - binary_accurac
y: 0.7750 - val_loss: 0.7559 - val_binary_accuracy: 0.5000
Epoch 60/100
2/2 [==============================] - 8s 5s/step - loss: 0.4566 - binary_accurac
y: 0.7500 - val_loss: 0.7585 - val_binary_accuracy: 0.5000
Epoch 61/100
2/2 [==============================] - 7s 4s/step - loss: 0.4978 - binary_accurac
y: 0.7000 - val_loss: 0.7592 - val_binary_accuracy: 0.5000
Epoch 62/100
2/2 [==============================] - 7s 4s/step - loss: 0.4815 - binary_accurac
y: 0.7750 - val_loss: 0.7600 - val_binary_accuracy: 0.5000
Epoch 63/100
2/2 [==============================] - 7s 4s/step - loss: 0.4239 - binary_accurac
y: 0.8500 - val_loss: 0.7635 - val_binary_accuracy: 0.5000
Epoch 64/100
2/2 [==============================] - 7s 4s/step - loss: 0.4680 - binary_accurac
y: 0.7750 - val_loss: 0.7660 - val_binary_accuracy: 0.5000
```

```
Epoch 65/100
2/2 [==============================] - 7s 4s/step - loss: 0.5494 - binary_accurac
y: 0.6750 - val_loss: 0.7719 - val_binary_accuracy: 0.5000
Epoch 66/100
2/2 [==============================] - 7s 3s/step - loss: 0.5553 - binary_accurac
y: 0.7000 - val_loss: 0.7750 - val_binary_accuracy: 0.5000
Epoch 67/100
2/2 [==============================] - 7s 4s/step - loss: 0.5534 - binary_accurac
y: 0.7000 - val_loss: 0.7767 - val_binary_accuracy: 0.5000
Epoch 68/100
2/2 [==============================] - 7s 4s/step - loss: 0.4881 - binary_accurac
y: 0.8000 - val_loss: 0.7806 - val_binary_accuracy: 0.5000
Epoch 69/100
2/2 [==============================] - 7s 4s/step - loss: 0.5340 - binary_accurac
y: 0.7000 - val_loss: 0.7856 - val_binary_accuracy: 0.5000
Epoch 70/100
2/2 [==============================] - 7s 4s/step - loss: 0.3927 - binary_accurac
y: 0.8250 - val_loss: 0.7916 - val_binary_accuracy: 0.5000
Epoch 71/100
2/2 [==============================] - 7s 4s/step - loss: 0.4020 - binary_accurac
y: 0.8250 - val_loss: 0.7982 - val_binary_accuracy: 0.5000
Epoch 72/100
2/2 [==============================] - 7s 4s/step - loss: 0.4601 - binary_accurac
y: 0.7500 - val_loss: 0.8052 - val_binary_accuracy: 0.5000
Epoch 73/100
2/2 [==============================] - 7s 4s/step - loss: 0.5106 - binary_accurac
y: 0.7000 - val_loss: 0.8101 - val_binary_accuracy: 0.5000
Epoch 74/100
2/2 [==============================] - 7s 4s/step - loss: 0.4787 - binary_accurac
y: 0.8250 - val_loss: 0.8137 - val_binary_accuracy: 0.5000
Epoch 75/100
2/2 [==============================] - 7s 4s/step - loss: 0.4859 - binary_accurac
y: 0.7750 - val_loss: 0.8187 - val_binary_accuracy: 0.5000
Epoch 76/100
2/2 [==============================] - 7s 4s/step - loss: 0.3549 - binary_accurac
y: 0.8500 - val_loss: 0.8239 - val_binary_accuracy: 0.5000
Epoch 77/100
2/2 [==============================] - 7s 4s/step - loss: 0.4926 - binary_accurac
y: 0.7250 - val_loss: 0.8319 - val_binary_accuracy: 0.5000
Epoch 78/100
2/2 [==============================] - 7s 4s/step - loss: 0.5190 - binary_accurac
y: 0.7500 - val_loss: 0.8346 - val_binary_accuracy: 0.5000
Epoch 79/100
2/2 [==============================] - 7s 4s/step - loss: 0.3822 - binary_accurac
y: 0.8000 - val_loss: 0.8367 - val_binary_accuracy: 0.5000
Epoch 80/100
2/2 [==============================] - 7s 4s/step - loss: 0.4906 - binary_accurac
y: 0.7750 - val_loss: 0.8413 - val_binary_accuracy: 0.5000
Epoch 81/100
2/2 [==============================] - 7s 4s/step - loss: 0.4784 - binary_accurac
y: 0.8000 - val_loss: 0.8423 - val_binary_accuracy: 0.5000
Epoch 82/100
2/2 [==============================] - 7s 4s/step - loss: 0.3673 - binary_accurac
y: 0.8750 - val_loss: 0.8400 - val_binary_accuracy: 0.5000
Epoch 83/100
2/2 [==============================] - 7s 4s/step - loss: 0.4348 - binary_accurac
y: 0.8000 - val_loss: 0.8424 - val_binary_accuracy: 0.5000
Epoch 84/100
2/2 [==============================] - 7s 4s/step - loss: 0.4637 - binary_accurac
y: 0.8000 - val_loss: 0.8430 - val_binary_accuracy: 0.5000
Epoch 85/100
2/2 [==============================] - 7s 4s/step - loss: 0.4938 - binary_accurac
y: 0.8000 - val_loss: 0.8440 - val_binary_accuracy: 0.5000
Epoch 86/100
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.5863 - binary_accurac
y: 0.7500 - val_loss: 0.8446 - val_binary_accuracy: 0.5000
Epoch 87/100
2/2 [==============================] - 7s 4s/step - loss: 0.5317 - binary_accurac
y: 0.7250 - val_loss: 0.8470 - val_binary_accuracy: 0.5000
Epoch 88/100
2/2 [==============================] - 7s 4s/step - loss: 0.3909 - binary_accurac
y: 0.7500 - val_loss: 0.8453 - val_binary_accuracy: 0.5000
Epoch 89/100
2/2 [==============================] - 7s 4s/step - loss: 0.3639 - binary_accurac
y: 0.8250 - val_loss: 0.8456 - val_binary_accuracy: 0.5000
Epoch 90/100
2/2 [==============================] - 7s 4s/step - loss: 0.5108 - binary_accurac
y: 0.7500 - val_loss: 0.8540 - val_binary_accuracy: 0.5000
Epoch 91/100
2/2 [==============================] - 7s 4s/step - loss: 0.5057 - binary_accurac
y: 0.7000 - val_loss: 0.8596 - val_binary_accuracy: 0.5000
Epoch 92/100
2/2 [==============================] - 7s 4s/step - loss: 0.4267 - binary_accurac
y: 0.7500 - val_loss: 0.8628 - val_binary_accuracy: 0.5000
Epoch 93/100
2/2 [==============================] - 7s 4s/step - loss: 0.4567 - binary_accurac
y: 0.7500 - val_loss: 0.8682 - val_binary_accuracy: 0.5000
Epoch 94/100
2/2 [==============================] - 7s 4s/step - loss: 0.4224 - binary_accurac
y: 0.7000 - val_loss: 0.8713 - val_binary_accuracy: 0.5000
Epoch 95/100
2/2 [==============================] - 7s 4s/step - loss: 0.5221 - binary_accurac
y: 0.7000 - val_loss: 0.8755 - val_binary_accuracy: 0.5000
Epoch 96/100
2/2 [==============================] - 7s 4s/step - loss: 0.4613 - binary_accurac
y: 0.7500 - val_loss: 0.8803 - val_binary_accuracy: 0.5000
Epoch 97/100
2/2 [==============================] - 7s 4s/step - loss: 0.4814 - binary_accurac
y: 0.8500 - val_loss: 0.8810 - val_binary_accuracy: 0.5000
Epoch 98/100
2/2 [==============================] - 7s 4s/step - loss: 0.3951 - binary_accurac
y: 0.8500 - val_loss: 0.8842 - val_binary_accuracy: 0.5000
Epoch 99/100
2/2 [==============================] - 7s 4s/step - loss: 0.4974 - binary_accurac
y: 0.6500 - val_loss: 0.8882 - val_binary_accuracy: 0.5000
Epoch 100/100
2/2 [==============================] - 7s 4s/step - loss: 0.5018 - binary_accurac
y: 0.7250 - val_loss: 0.8891 - val_binary_accuracy: 0.5000
Number of total epochs ran:
```

Out[10]:
```
100
```

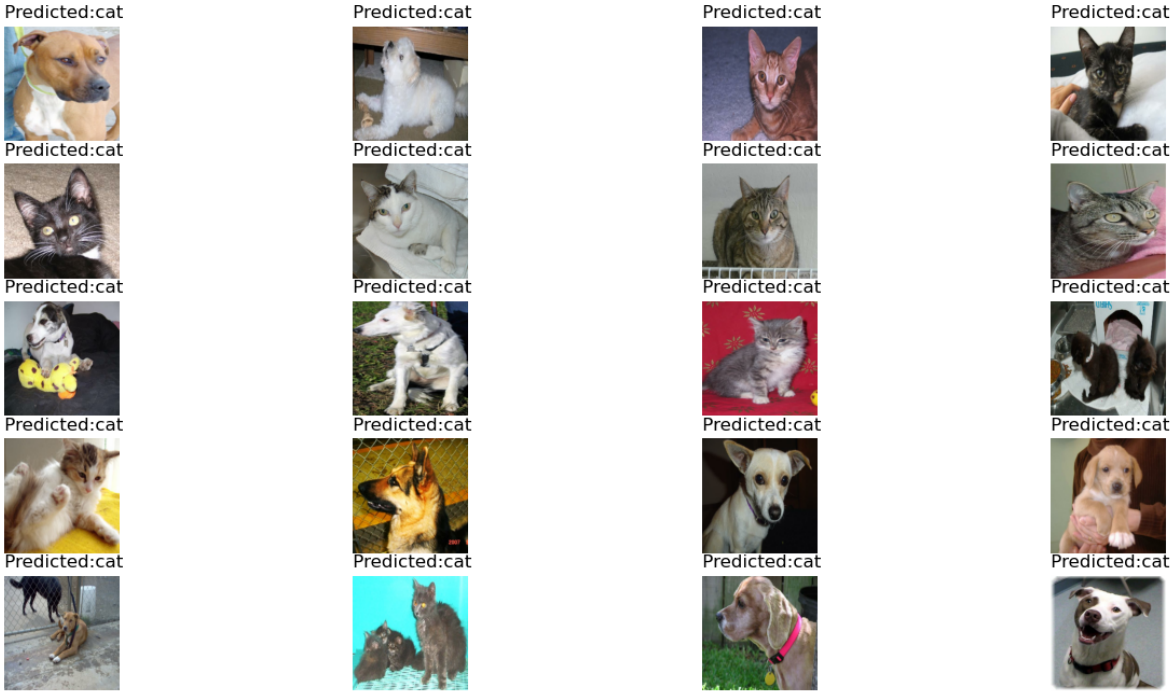
In [11]:
```
import matplotlib.pyplot as plt
epochs= range(1, 100+1)
plt.plot(history.history['binary_accuracy'])
plt.plot(history.history['val_binary_accuracy'])
plt.title('Accuracy')
plt.ylabel('Binary_accuracy')
plt.xlabel('Epoch')
plt.show()
```



In [12]:
```
import matplotlib.pyplot as plt

class_name=['cat', 'dog']
```

In [13]:
```
for images, labels in ds_test.take(20):
    predictions = model.predict(images)

def image_print(i, prediction_arr, img):
    prediction_label = int(prediction_arr[i] >0.5) #1 if greater than 0.5, 0 if les
    plt.imshow(img[i])
    plt.title(f'\n Predicted:{class_name[prediction_label]}')
    plt.axis('off')

fig, axes = plt.subplots(4,5, figsize=(16,8))
for i in range(20):#since there are 20 images
    plt.subplot(5,4, i+1)
    image_print(i, predictions, images)
plt.show()
```

```
1/1 [==============================] - 1s 753ms/step
```



10 out of 20 predictions are wrong, all the cats are categorised correct, but all the dog images are also categorised as cat

In [14]:
```
history = model.compile(
    optimizer = tf.keras.optimizers.Adam(0.00001),
    #loss='binary_crossentropy',
    #metrics=['accuracy']
    loss = tf.keras.losses.BinaryCrossentropy(from_logits=False),
    metrics=[tf.keras.metrics.BinaryAccuracy()]
)
```

In [15]:
```
history = model.fit(
    ds_train,
    epochs=200,
    validation_data=ds_test,
)
print('Number of total epochs ran:')
len(history.history['val_binary_accuracy'])
```

```
Epoch 1/200
2/2 [==============================] - 12s 4s/step - loss: 0.3550 - binary_accurac
y: 0.8250 - val_loss: 0.8916 - val_binary_accuracy: 0.5000
Epoch 2/200
2/2 [==============================] - 7s 4s/step - loss: 0.4473 - binary_accurac
y: 0.7500 - val_loss: 0.8919 - val_binary_accuracy: 0.5000
Epoch 3/200
2/2 [==============================] - 7s 4s/step - loss: 0.4661 - binary_accurac
y: 0.8000 - val_loss: 0.8826 - val_binary_accuracy: 0.5000
Epoch 4/200
2/2 [==============================] - 7s 4s/step - loss: 0.3523 - binary_accurac
y: 0.8500 - val_loss: 0.8717 - val_binary_accuracy: 0.5000
Epoch 5/200
2/2 [==============================] - 7s 4s/step - loss: 0.3802 - binary_accurac
y: 0.8250 - val_loss: 0.8594 - val_binary_accuracy: 0.5000
Epoch 6/200
2/2 [==============================] - 7s 4s/step - loss: 0.5586 - binary_accurac
y: 0.7500 - val_loss: 0.8570 - val_binary_accuracy: 0.5000
Epoch 7/200
2/2 [==============================] - 7s 4s/step - loss: 0.4335 - binary_accurac
y: 0.8000 - val_loss: 0.8526 - val_binary_accuracy: 0.5000
Epoch 8/200
2/2 [==============================] - 7s 4s/step - loss: 0.4629 - binary_accurac
y: 0.7500 - val_loss: 0.8500 - val_binary_accuracy: 0.5000
Epoch 9/200
2/2 [==============================] - 7s 4s/step - loss: 0.4496 - binary_accurac
y: 0.7500 - val_loss: 0.8445 - val_binary_accuracy: 0.5000
Epoch 10/200
2/2 [==============================] - 7s 4s/step - loss: 0.3320 - binary_accurac
y: 0.8750 - val_loss: 0.8352 - val_binary_accuracy: 0.5000
Epoch 11/200
2/2 [==============================] - 7s 4s/step - loss: 0.5004 - binary_accurac
y: 0.6750 - val_loss: 0.8287 - val_binary_accuracy: 0.5000
Epoch 12/200
2/2 [==============================] - 7s 4s/step - loss: 0.5478 - binary_accurac
y: 0.7500 - val_loss: 0.8258 - val_binary_accuracy: 0.5000
Epoch 13/200
2/2 [==============================] - 7s 4s/step - loss: 0.3355 - binary_accurac
y: 0.8500 - val_loss: 0.8217 - val_binary_accuracy: 0.5000
Epoch 14/200
2/2 [==============================] - 7s 4s/step - loss: 0.4701 - binary_accurac
y: 0.8000 - val_loss: 0.8237 - val_binary_accuracy: 0.5000
Epoch 15/200
2/2 [==============================] - 7s 4s/step - loss: 0.3899 - binary_accurac
y: 0.8250 - val_loss: 0.8251 - val_binary_accuracy: 0.5000
Epoch 16/200
2/2 [==============================] - 7s 4s/step - loss: 0.3896 - binary_accurac
y: 0.8000 - val_loss: 0.8263 - val_binary_accuracy: 0.5000
Epoch 17/200
2/2 [==============================] - 7s 4s/step - loss: 0.4193 - binary_accurac
y: 0.7750 - val_loss: 0.8279 - val_binary_accuracy: 0.5000
Epoch 18/200
2/2 [==============================] - 7s 4s/step - loss: 0.3771 - binary_accurac
y: 0.7750 - val_loss: 0.8267 - val_binary_accuracy: 0.5000
Epoch 19/200
2/2 [==============================] - 7s 4s/step - loss: 0.3876 - binary_accurac
y: 0.8000 - val_loss: 0.8262 - val_binary_accuracy: 0.5000
Epoch 20/200
2/2 [==============================] - 7s 4s/step - loss: 0.3151 - binary_accurac
y: 0.8750 - val_loss: 0.8196 - val_binary_accuracy: 0.5000
Epoch 21/200
2/2 [==============================] - 7s 4s/step - loss: 0.3257 - binary_accurac
y: 0.8000 - val_loss: 0.8169 - val_binary_accuracy: 0.5000
Epoch 22/200
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.4172 - binary_accurac
y: 0.7750 - val_loss: 0.8125 - val_binary_accuracy: 0.5000
Epoch 23/200
2/2 [==============================] - 7s 4s/step - loss: 0.5296 - binary_accurac
y: 0.7750 - val_loss: 0.8054 - val_binary_accuracy: 0.5500
Epoch 24/200
2/2 [==============================] - 7s 4s/step - loss: 0.4049 - binary_accurac
y: 0.8500 - val_loss: 0.7992 - val_binary_accuracy: 0.5500
Epoch 25/200
2/2 [==============================] - 7s 4s/step - loss: 0.4807 - binary_accurac
y: 0.7000 - val_loss: 0.7919 - val_binary_accuracy: 0.5500
Epoch 26/200
2/2 [==============================] - 7s 4s/step - loss: 0.3768 - binary_accurac
y: 0.8750 - val_loss: 0.7902 - val_binary_accuracy: 0.5500
Epoch 27/200
2/2 [==============================] - 7s 4s/step - loss: 0.3259 - binary_accurac
y: 0.8500 - val_loss: 0.7893 - val_binary_accuracy: 0.5500
Epoch 28/200
2/2 [==============================] - 7s 4s/step - loss: 0.3003 - binary_accurac
y: 0.9500 - val_loss: 0.7886 - val_binary_accuracy: 0.5500
Epoch 29/200
2/2 [==============================] - 7s 4s/step - loss: 0.3403 - binary_accurac
y: 0.8500 - val_loss: 0.7908 - val_binary_accuracy: 0.5500
Epoch 30/200
2/2 [==============================] - 7s 4s/step - loss: 0.4199 - binary_accurac
y: 0.7500 - val_loss: 0.7926 - val_binary_accuracy: 0.5500
Epoch 31/200
2/2 [==============================] - 7s 4s/step - loss: 0.4148 - binary_accurac
y: 0.8000 - val_loss: 0.7937 - val_binary_accuracy: 0.5500
Epoch 32/200
2/2 [==============================] - 7s 4s/step - loss: 0.3251 - binary_accurac
y: 0.8750 - val_loss: 0.7952 - val_binary_accuracy: 0.5500
Epoch 33/200
2/2 [==============================] - 7s 4s/step - loss: 0.4881 - binary_accurac
y: 0.8250 - val_loss: 0.7985 - val_binary_accuracy: 0.5500
Epoch 34/200
2/2 [==============================] - 7s 4s/step - loss: 0.5203 - binary_accurac
y: 0.8250 - val_loss: 0.7963 - val_binary_accuracy: 0.5500
Epoch 35/200
2/2 [==============================] - 7s 4s/step - loss: 0.4707 - binary_accurac
y: 0.6500 - val_loss: 0.7936 - val_binary_accuracy: 0.5500
Epoch 36/200
2/2 [==============================] - 7s 4s/step - loss: 0.3442 - binary_accurac
y: 0.8250 - val_loss: 0.7908 - val_binary_accuracy: 0.5500
Epoch 37/200
2/2 [==============================] - 7s 4s/step - loss: 0.3647 - binary_accurac
y: 0.8500 - val_loss: 0.7886 - val_binary_accuracy: 0.5500
Epoch 38/200
2/2 [==============================] - 7s 4s/step - loss: 0.4311 - binary_accurac
y: 0.7750 - val_loss: 0.7889 - val_binary_accuracy: 0.5500
Epoch 39/200
2/2 [==============================] - 7s 4s/step - loss: 0.4215 - binary_accurac
y: 0.8250 - val_loss: 0.7859 - val_binary_accuracy: 0.5500
Epoch 40/200
2/2 [==============================] - 7s 4s/step - loss: 0.4600 - binary_accurac
y: 0.8000 - val_loss: 0.7847 - val_binary_accuracy: 0.5500
Epoch 41/200
2/2 [==============================] - 7s 4s/step - loss: 0.4139 - binary_accurac
y: 0.8000 - val_loss: 0.7811 - val_binary_accuracy: 0.5500
Epoch 42/200
2/2 [==============================] - 7s 4s/step - loss: 0.3320 - binary_accurac
y: 0.8250 - val_loss: 0.7781 - val_binary_accuracy: 0.5500
Epoch 43/200
2/2 [==============================] - 7s 4s/step - loss: 0.4091 - binary_accurac
```

```
y: 0.8250 - val_loss: 0.7768 - val_binary_accuracy: 0.5500
Epoch 44/200
2/2 [==============================] - 7s 4s/step - loss: 0.2690 - binary_accurac
y: 0.9750 - val_loss: 0.7749 - val_binary_accuracy: 0.5500
Epoch 45/200
2/2 [==============================] - 7s 4s/step - loss: 0.4462 - binary_accurac
y: 0.8000 - val_loss: 0.7700 - val_binary_accuracy: 0.5500
Epoch 46/200
2/2 [==============================] - 7s 4s/step - loss: 0.3983 - binary_accurac
y: 0.8000 - val_loss: 0.7631 - val_binary_accuracy: 0.5000
Epoch 47/200
2/2 [==============================] - 7s 4s/step - loss: 0.3435 - binary_accurac
y: 0.8500 - val_loss: 0.7568 - val_binary_accuracy: 0.5000
Epoch 48/200
2/2 [==============================] - 7s 4s/step - loss: 0.3512 - binary_accurac
y: 0.8250 - val_loss: 0.7568 - val_binary_accuracy: 0.5000
Epoch 49/200
2/2 [==============================] - 9s 5s/step - loss: 0.3015 - binary_accurac
y: 0.9000 - val_loss: 0.7601 - val_binary_accuracy: 0.5000
Epoch 50/200
2/2 [==============================] - 7s 4s/step - loss: 0.3017 - binary_accurac
y: 0.9000 - val_loss: 0.7616 - val_binary_accuracy: 0.5000
Epoch 51/200
2/2 [==============================] - 7s 4s/step - loss: 0.3062 - binary_accurac
y: 0.8750 - val_loss: 0.7649 - val_binary_accuracy: 0.5000
Epoch 52/200
2/2 [==============================] - 7s 4s/step - loss: 0.3916 - binary_accurac
y: 0.8750 - val_loss: 0.7668 - val_binary_accuracy: 0.5000
Epoch 53/200
2/2 [==============================] - 7s 4s/step - loss: 0.3287 - binary_accurac
y: 0.9000 - val_loss: 0.7690 - val_binary_accuracy: 0.5000
Epoch 54/200
2/2 [==============================] - 8s 4s/step - loss: 0.3580 - binary_accurac
y: 0.8250 - val_loss: 0.7701 - val_binary_accuracy: 0.5000
Epoch 55/200
2/2 [==============================] - 8s 4s/step - loss: 0.3720 - binary_accurac
y: 0.8250 - val_loss: 0.7711 - val_binary_accuracy: 0.5000
Epoch 56/200
2/2 [==============================] - 7s 4s/step - loss: 0.4168 - binary_accurac
y: 0.8250 - val_loss: 0.7694 - val_binary_accuracy: 0.5000
Epoch 57/200
2/2 [==============================] - 8s 4s/step - loss: 0.3375 - binary_accurac
y: 0.8250 - val_loss: 0.7672 - val_binary_accuracy: 0.5000
Epoch 58/200
2/2 [==============================] - 8s 4s/step - loss: 0.3823 - binary_accurac
y: 0.8500 - val_loss: 0.7693 - val_binary_accuracy: 0.5000
Epoch 59/200
2/2 [==============================] - 10s 5s/step - loss: 0.4663 - binary_accurac
y: 0.8000 - val_loss: 0.7658 - val_binary_accuracy: 0.5000
Epoch 60/200
2/2 [==============================] - 9s 5s/step - loss: 0.3235 - binary_accurac
y: 0.9000 - val_loss: 0.7614 - val_binary_accuracy: 0.5000
Epoch 61/200
2/2 [==============================] - 9s 5s/step - loss: 0.4399 - binary_accurac
y: 0.8500 - val_loss: 0.7549 - val_binary_accuracy: 0.5000
Epoch 62/200
2/2 [==============================] - 8s 4s/step - loss: 0.2890 - binary_accurac
y: 0.9250 - val_loss: 0.7486 - val_binary_accuracy: 0.5000
Epoch 63/200
2/2 [==============================] - 8s 4s/step - loss: 0.2751 - binary_accurac
y: 0.8750 - val_loss: 0.7448 - val_binary_accuracy: 0.5000
Epoch 64/200
2/2 [==============================] - 7s 4s/step - loss: 0.2979 - binary_accurac
y: 0.9000 - val_loss: 0.7429 - val_binary_accuracy: 0.5000
```

```
Epoch 65/200
2/2 [==============================] - 7s 4s/step - loss: 0.3688 - binary_accurac
y: 0.8750 - val_loss: 0.7379 - val_binary_accuracy: 0.5000
Epoch 66/200
2/2 [==============================] - 7s 4s/step - loss: 0.3622 - binary_accurac
y: 0.8000 - val_loss: 0.7326 - val_binary_accuracy: 0.5000
Epoch 67/200
2/2 [==============================] - 8s 4s/step - loss: 0.3762 - binary_accurac
y: 0.8750 - val_loss: 0.7301 - val_binary_accuracy: 0.5000
Epoch 68/200
2/2 [==============================] - 7s 4s/step - loss: 0.3646 - binary_accurac
y: 0.8500 - val_loss: 0.7303 - val_binary_accuracy: 0.5000
Epoch 69/200
2/2 [==============================] - 7s 4s/step - loss: 0.3633 - binary_accurac
y: 0.8250 - val_loss: 0.7273 - val_binary_accuracy: 0.5000
Epoch 70/200
2/2 [==============================] - 7s 4s/step - loss: 0.4036 - binary_accurac
y: 0.8500 - val_loss: 0.7202 - val_binary_accuracy: 0.5000
Epoch 71/200
2/2 [==============================] - 7s 4s/step - loss: 0.2896 - binary_accurac
y: 0.9250 - val_loss: 0.7170 - val_binary_accuracy: 0.5000
Epoch 72/200
2/2 [==============================] - 7s 4s/step - loss: 0.3712 - binary_accurac
y: 0.8000 - val_loss: 0.7163 - val_binary_accuracy: 0.5000
Epoch 73/200
2/2 [==============================] - 7s 4s/step - loss: 0.4060 - binary_accurac
y: 0.7750 - val_loss: 0.7175 - val_binary_accuracy: 0.5000
Epoch 74/200
2/2 [==============================] - 7s 4s/step - loss: 0.3569 - binary_accurac
y: 0.8500 - val_loss: 0.7158 - val_binary_accuracy: 0.5000
Epoch 75/200
2/2 [==============================] - 7s 4s/step - loss: 0.3023 - binary_accurac
y: 0.8750 - val_loss: 0.7129 - val_binary_accuracy: 0.5000
Epoch 76/200
2/2 [==============================] - 7s 4s/step - loss: 0.3067 - binary_accurac
y: 0.9000 - val_loss: 0.7104 - val_binary_accuracy: 0.4500
Epoch 77/200
2/2 [==============================] - 7s 4s/step - loss: 0.3335 - binary_accurac
y: 0.9500 - val_loss: 0.7046 - val_binary_accuracy: 0.5000
Epoch 78/200
2/2 [==============================] - 7s 4s/step - loss: 0.3158 - binary_accurac
y: 0.9000 - val_loss: 0.6996 - val_binary_accuracy: 0.5000
Epoch 79/200
2/2 [==============================] - 7s 4s/step - loss: 0.3405 - binary_accurac
y: 0.8000 - val_loss: 0.6923 - val_binary_accuracy: 0.5000
Epoch 80/200
2/2 [==============================] - 7s 4s/step - loss: 0.3123 - binary_accurac
y: 0.8750 - val_loss: 0.6859 - val_binary_accuracy: 0.5000
Epoch 81/200
2/2 [==============================] - 7s 4s/step - loss: 0.3224 - binary_accurac
y: 0.9000 - val_loss: 0.6811 - val_binary_accuracy: 0.5000
Epoch 82/200
2/2 [==============================] - 7s 4s/step - loss: 0.2873 - binary_accurac
y: 0.9250 - val_loss: 0.6812 - val_binary_accuracy: 0.5000
Epoch 83/200
2/2 [==============================] - 8s 4s/step - loss: 0.2516 - binary_accurac
y: 0.9000 - val_loss: 0.6795 - val_binary_accuracy: 0.5500
Epoch 84/200
2/2 [==============================] - 7s 4s/step - loss: 0.4073 - binary_accurac
y: 0.7500 - val_loss: 0.6791 - val_binary_accuracy: 0.5500
Epoch 85/200
2/2 [==============================] - 7s 4s/step - loss: 0.3948 - binary_accurac
y: 0.8250 - val_loss: 0.6793 - val_binary_accuracy: 0.5500
Epoch 86/200
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.3565 - binary_accurac
y: 0.8250 - val_loss: 0.6804 - val_binary_accuracy: 0.5500
Epoch 87/200
2/2 [==============================] - 7s 4s/step - loss: 0.2645 - binary_accurac
y: 0.9000 - val_loss: 0.6788 - val_binary_accuracy: 0.5500
Epoch 88/200
2/2 [==============================] - 7s 4s/step - loss: 0.3901 - binary_accurac
y: 0.8250 - val_loss: 0.6794 - val_binary_accuracy: 0.5500
Epoch 89/200
2/2 [==============================] - 7s 4s/step - loss: 0.3021 - binary_accurac
y: 0.8500 - val_loss: 0.6788 - val_binary_accuracy: 0.5500
Epoch 90/200
2/2 [==============================] - 5s 2s/step - loss: 0.2711 - binary_accurac
y: 0.8500 - val_loss: 0.6793 - val_binary_accuracy: 0.5500
Epoch 91/200
2/2 [==============================] - 6s 4s/step - loss: 0.2986 - binary_accurac
y: 0.8500 - val_loss: 0.6814 - val_binary_accuracy: 0.5500
Epoch 92/200
2/2 [==============================] - 7s 4s/step - loss: 0.3286 - binary_accurac
y: 0.8250 - val_loss: 0.6798 - val_binary_accuracy: 0.5500
Epoch 93/200
2/2 [==============================] - 7s 4s/step - loss: 0.2401 - binary_accurac
y: 0.9000 - val_loss: 0.6801 - val_binary_accuracy: 0.5500
Epoch 94/200
2/2 [==============================] - 7s 4s/step - loss: 0.2731 - binary_accurac
y: 0.9000 - val_loss: 0.6791 - val_binary_accuracy: 0.5500
Epoch 95/200
2/2 [==============================] - 7s 4s/step - loss: 0.2067 - binary_accurac
y: 0.9250 - val_loss: 0.6792 - val_binary_accuracy: 0.5500
Epoch 96/200
2/2 [==============================] - 7s 4s/step - loss: 0.3355 - binary_accurac
y: 0.8250 - val_loss: 0.6809 - val_binary_accuracy: 0.5000
Epoch 97/200
2/2 [==============================] - 7s 4s/step - loss: 0.2588 - binary_accurac
y: 0.9750 - val_loss: 0.6788 - val_binary_accuracy: 0.5500
Epoch 98/200
2/2 [==============================] - 7s 4s/step - loss: 0.4067 - binary_accurac
y: 0.8000 - val_loss: 0.6782 - val_binary_accuracy: 0.5000
Epoch 99/200
2/2 [==============================] - 7s 4s/step - loss: 0.2452 - binary_accurac
y: 0.9500 - val_loss: 0.6723 - val_binary_accuracy: 0.5500
Epoch 100/200
2/2 [==============================] - 7s 4s/step - loss: 0.3000 - binary_accurac
y: 0.9250 - val_loss: 0.6675 - val_binary_accuracy: 0.5500
Epoch 101/200
2/2 [==============================] - 7s 4s/step - loss: 0.2389 - binary_accurac
y: 0.9500 - val_loss: 0.6674 - val_binary_accuracy: 0.5500
Epoch 102/200
2/2 [==============================] - 7s 4s/step - loss: 0.3086 - binary_accurac
y: 0.8750 - val_loss: 0.6642 - val_binary_accuracy: 0.5500
Epoch 103/200
2/2 [==============================] - 7s 4s/step - loss: 0.2966 - binary_accurac
y: 0.8500 - val_loss: 0.6619 - val_binary_accuracy: 0.5500
Epoch 104/200
2/2 [==============================] - 7s 4s/step - loss: 0.2870 - binary_accurac
y: 0.8500 - val_loss: 0.6608 - val_binary_accuracy: 0.5500
Epoch 105/200
2/2 [==============================] - 7s 4s/step - loss: 0.2560 - binary_accurac
y: 0.9000 - val_loss: 0.6596 - val_binary_accuracy: 0.5500
Epoch 106/200
2/2 [==============================] - 7s 4s/step - loss: 0.3632 - binary_accurac
y: 0.8250 - val_loss: 0.6585 - val_binary_accuracy: 0.5500
Epoch 107/200
2/2 [==============================] - 7s 4s/step - loss: 0.3163 - binary_accurac
```

```
y: 0.8750 - val_loss: 0.6568 - val_binary_accuracy: 0.5500
Epoch 108/200
2/2 [==============================] - 7s 4s/step - loss: 0.3041 - binary_accurac
y: 0.9250 - val_loss: 0.6582 - val_binary_accuracy: 0.5500
Epoch 109/200
2/2 [==============================] - 7s 4s/step - loss: 0.2898 - binary_accurac
y: 0.8750 - val_loss: 0.6630 - val_binary_accuracy: 0.5500
Epoch 110/200
2/2 [==============================] - 7s 4s/step - loss: 0.3200 - binary_accurac
y: 0.8500 - val_loss: 0.6652 - val_binary_accuracy: 0.5500
Epoch 111/200
2/2 [==============================] - 7s 4s/step - loss: 0.3701 - binary_accurac
y: 0.8000 - val_loss: 0.6672 - val_binary_accuracy: 0.5500
Epoch 112/200
2/2 [==============================] - 7s 4s/step - loss: 0.3979 - binary_accurac
y: 0.8250 - val_loss: 0.6697 - val_binary_accuracy: 0.5500
Epoch 113/200
2/2 [==============================] - 7s 4s/step - loss: 0.2725 - binary_accurac
y: 0.9000 - val_loss: 0.6726 - val_binary_accuracy: 0.5000
Epoch 114/200
2/2 [==============================] - 7s 4s/step - loss: 0.2533 - binary_accurac
y: 0.9250 - val_loss: 0.6753 - val_binary_accuracy: 0.5000
Epoch 115/200
2/2 [==============================] - 7s 4s/step - loss: 0.3329 - binary_accurac
y: 0.8000 - val_loss: 0.6806 - val_binary_accuracy: 0.5000
Epoch 116/200
2/2 [==============================] - 7s 4s/step - loss: 0.2441 - binary_accurac
y: 0.9250 - val_loss: 0.6840 - val_binary_accuracy: 0.5000
Epoch 117/200
2/2 [==============================] - 7s 4s/step - loss: 0.2629 - binary_accurac
y: 0.9500 - val_loss: 0.6823 - val_binary_accuracy: 0.5000
Epoch 118/200
2/2 [==============================] - 7s 4s/step - loss: 0.2875 - binary_accurac
y: 0.9500 - val_loss: 0.6814 - val_binary_accuracy: 0.5000
Epoch 119/200
2/2 [==============================] - 7s 4s/step - loss: 0.2560 - binary_accurac
y: 0.9000 - val_loss: 0.6790 - val_binary_accuracy: 0.5000
Epoch 120/200
2/2 [==============================] - 7s 4s/step - loss: 0.2812 - binary_accurac
y: 0.8500 - val_loss: 0.6769 - val_binary_accuracy: 0.5000
Epoch 121/200
2/2 [==============================] - 7s 4s/step - loss: 0.3113 - binary_accurac
y: 0.8750 - val_loss: 0.6748 - val_binary_accuracy: 0.5000
Epoch 122/200
2/2 [==============================] - 7s 4s/step - loss: 0.2605 - binary_accurac
y: 0.9250 - val_loss: 0.6702 - val_binary_accuracy: 0.5000
Epoch 123/200
2/2 [==============================] - 7s 4s/step - loss: 0.3202 - binary_accurac
y: 0.9000 - val_loss: 0.6629 - val_binary_accuracy: 0.5000
Epoch 124/200
2/2 [==============================] - 7s 4s/step - loss: 0.2974 - binary_accurac
y: 0.8500 - val_loss: 0.6597 - val_binary_accuracy: 0.5500
Epoch 125/200
2/2 [==============================] - 7s 4s/step - loss: 0.2479 - binary_accurac
y: 0.8750 - val_loss: 0.6598 - val_binary_accuracy: 0.5500
Epoch 126/200
2/2 [==============================] - 7s 4s/step - loss: 0.3067 - binary_accurac
y: 0.8250 - val_loss: 0.6615 - val_binary_accuracy: 0.5500
Epoch 127/200
2/2 [==============================] - 7s 4s/step - loss: 0.3194 - binary_accurac
y: 0.8500 - val_loss: 0.6643 - val_binary_accuracy: 0.5500
Epoch 128/200
2/2 [==============================] - 7s 4s/step - loss: 0.3079 - binary_accurac
y: 0.8500 - val_loss: 0.6653 - val_binary_accuracy: 0.5500
```

```
Epoch 129/200
2/2 [==============================] - 7s 4s/step - loss: 0.3067 - binary_accurac
y: 0.8750 - val_loss: 0.6665 - val_binary_accuracy: 0.5000
Epoch 130/200
2/2 [==============================] - 7s 4s/step - loss: 0.2911 - binary_accurac
y: 0.9000 - val_loss: 0.6690 - val_binary_accuracy: 0.5000
Epoch 131/200
2/2 [==============================] - 7s 4s/step - loss: 0.3337 - binary_accurac
y: 0.8000 - val_loss: 0.6682 - val_binary_accuracy: 0.5500
Epoch 132/200
2/2 [==============================] - 7s 4s/step - loss: 0.3013 - binary_accurac
y: 0.8500 - val_loss: 0.6714 - val_binary_accuracy: 0.5000
Epoch 133/200
2/2 [==============================] - 7s 4s/step - loss: 0.3228 - binary_accurac
y: 0.8750 - val_loss: 0.6740 - val_binary_accuracy: 0.5000
Epoch 134/200
2/2 [==============================] - 7s 4s/step - loss: 0.2597 - binary_accurac
y: 0.8750 - val_loss: 0.6762 - val_binary_accuracy: 0.5000
Epoch 135/200
2/2 [==============================] - 7s 4s/step - loss: 0.2626 - binary_accurac
y: 0.9250 - val_loss: 0.6814 - val_binary_accuracy: 0.5500
Epoch 136/200
2/2 [==============================] - 7s 4s/step - loss: 0.3193 - binary_accurac
y: 0.9000 - val_loss: 0.6873 - val_binary_accuracy: 0.5500
Epoch 137/200
2/2 [==============================] - 7s 4s/step - loss: 0.2852 - binary_accurac
y: 0.9500 - val_loss: 0.6906 - val_binary_accuracy: 0.5500
Epoch 138/200
2/2 [==============================] - 7s 4s/step - loss: 0.2631 - binary_accurac
y: 0.9000 - val_loss: 0.6932 - val_binary_accuracy: 0.5500
Epoch 139/200
2/2 [==============================] - 7s 4s/step - loss: 0.2466 - binary_accurac
y: 0.9250 - val_loss: 0.6964 - val_binary_accuracy: 0.5500
Epoch 140/200
2/2 [==============================] - 7s 4s/step - loss: 0.3334 - binary_accurac
y: 0.8750 - val_loss: 0.7028 - val_binary_accuracy: 0.5500
Epoch 141/200
2/2 [==============================] - 5s 2s/step - loss: 0.2391 - binary_accurac
y: 0.8750 - val_loss: 0.7080 - val_binary_accuracy: 0.5500
Epoch 142/200
2/2 [==============================] - 4s 2s/step - loss: 0.2772 - binary_accurac
y: 0.9250 - val_loss: 0.7146 - val_binary_accuracy: 0.5500
Epoch 143/200
2/2 [==============================] - 4s 2s/step - loss: 0.2712 - binary_accurac
y: 0.8750 - val_loss: 0.7209 - val_binary_accuracy: 0.5500
Epoch 144/200
2/2 [==============================] - 7s 3s/step - loss: 0.2254 - binary_accurac
y: 0.9500 - val_loss: 0.7274 - val_binary_accuracy: 0.5000
Epoch 145/200
2/2 [==============================] - 7s 4s/step - loss: 0.3197 - binary_accurac
y: 0.9000 - val_loss: 0.7327 - val_binary_accuracy: 0.5000
Epoch 146/200
2/2 [==============================] - 7s 4s/step - loss: 0.2419 - binary_accurac
y: 0.9500 - val_loss: 0.7355 - val_binary_accuracy: 0.5000
Epoch 147/200
2/2 [==============================] - 7s 4s/step - loss: 0.2630 - binary_accurac
y: 0.9250 - val_loss: 0.7364 - val_binary_accuracy: 0.5500
Epoch 148/200
2/2 [==============================] - 7s 4s/step - loss: 0.2362 - binary_accurac
y: 0.9250 - val_loss: 0.7357 - val_binary_accuracy: 0.5500
Epoch 149/200
2/2 [==============================] - 7s 4s/step - loss: 0.3206 - binary_accurac
y: 0.9250 - val_loss: 0.7293 - val_binary_accuracy: 0.5500
Epoch 150/200
```

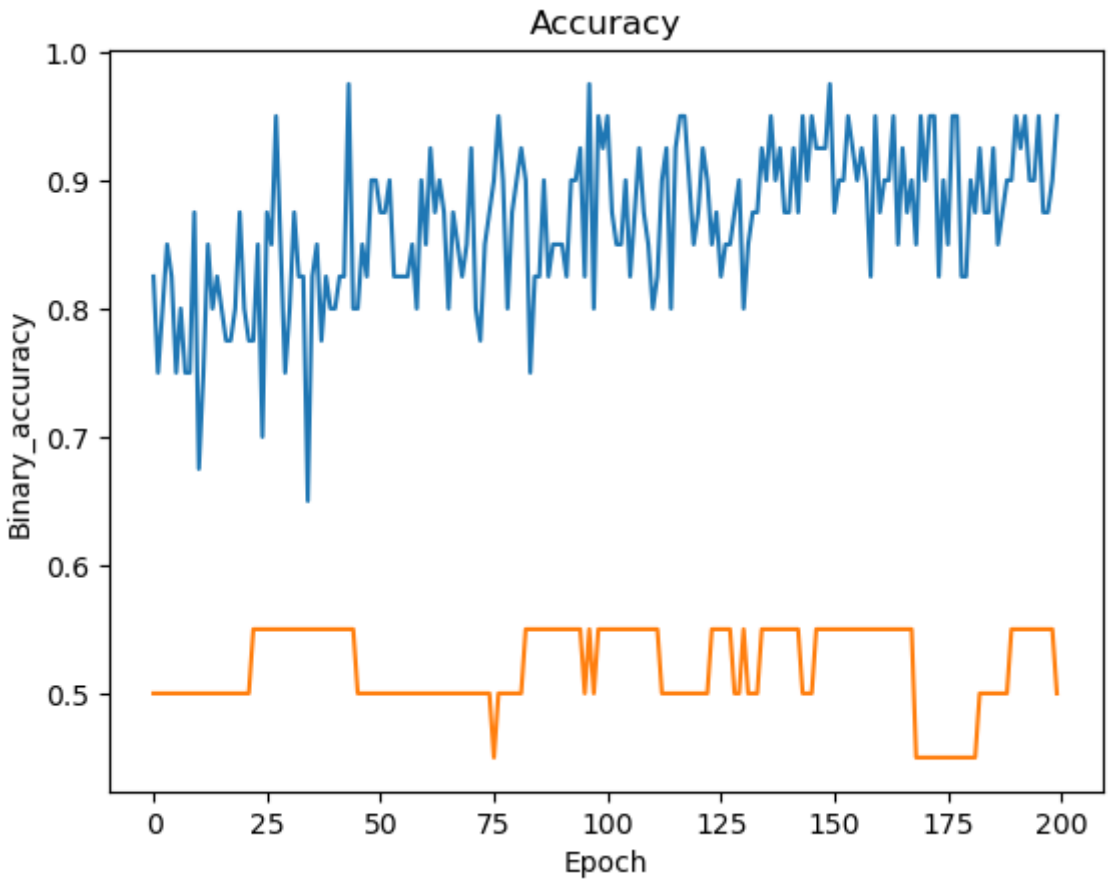
```
2/2 [==============================] - 7s 4s/step - loss: 0.2255 - binary_accurac
y: 0.9750 - val_loss: 0.7246 - val_binary_accuracy: 0.5500
Epoch 151/200
2/2 [==============================] - 7s 4s/step - loss: 0.2848 - binary_accurac
y: 0.8750 - val_loss: 0.7217 - val_binary_accuracy: 0.5500
Epoch 152/200
2/2 [==============================] - 7s 4s/step - loss: 0.2615 - binary_accurac
y: 0.9000 - val_loss: 0.7221 - val_binary_accuracy: 0.5500
Epoch 153/200
2/2 [==============================] - 7s 4s/step - loss: 0.2471 - binary_accurac
y: 0.9000 - val_loss: 0.7218 - val_binary_accuracy: 0.5500
Epoch 154/200
2/2 [==============================] - 7s 4s/step - loss: 0.2339 - binary_accurac
y: 0.9500 - val_loss: 0.7180 - val_binary_accuracy: 0.5500
Epoch 155/200
2/2 [==============================] - 7s 4s/step - loss: 0.2802 - binary_accurac
y: 0.9250 - val_loss: 0.7189 - val_binary_accuracy: 0.5500
Epoch 156/200
2/2 [==============================] - 7s 4s/step - loss: 0.2607 - binary_accurac
y: 0.9000 - val_loss: 0.7234 - val_binary_accuracy: 0.5500
Epoch 157/200
2/2 [==============================] - 7s 4s/step - loss: 0.2408 - binary_accurac
y: 0.9250 - val_loss: 0.7256 - val_binary_accuracy: 0.5500
Epoch 158/200
2/2 [==============================] - 7s 4s/step - loss: 0.2747 - binary_accurac
y: 0.9000 - val_loss: 0.7179 - val_binary_accuracy: 0.5500
Epoch 159/200
2/2 [==============================] - 7s 4s/step - loss: 0.3619 - binary_accurac
y: 0.8250 - val_loss: 0.7125 - val_binary_accuracy: 0.5500
Epoch 160/200
2/2 [==============================] - 7s 4s/step - loss: 0.2348 - binary_accurac
y: 0.9500 - val_loss: 0.7095 - val_binary_accuracy: 0.5500
Epoch 161/200
2/2 [==============================] - 7s 4s/step - loss: 0.3249 - binary_accurac
y: 0.8750 - val_loss: 0.7070 - val_binary_accuracy: 0.5500
Epoch 162/200
2/2 [==============================] - 7s 4s/step - loss: 0.3002 - binary_accurac
y: 0.9000 - val_loss: 0.7052 - val_binary_accuracy: 0.5500
Epoch 163/200
2/2 [==============================] - 7s 4s/step - loss: 0.2434 - binary_accurac
y: 0.9000 - val_loss: 0.7015 - val_binary_accuracy: 0.5500
Epoch 164/200
2/2 [==============================] - 7s 4s/step - loss: 0.2114 - binary_accurac
y: 0.9500 - val_loss: 0.6998 - val_binary_accuracy: 0.5500
Epoch 165/200
2/2 [==============================] - 7s 4s/step - loss: 0.3264 - binary_accurac
y: 0.8500 - val_loss: 0.6999 - val_binary_accuracy: 0.5500
Epoch 166/200
2/2 [==============================] - 7s 4s/step - loss: 0.2380 - binary_accurac
y: 0.9250 - val_loss: 0.7026 - val_binary_accuracy: 0.5500
Epoch 167/200
2/2 [==============================] - 7s 4s/step - loss: 0.2796 - binary_accurac
y: 0.8750 - val_loss: 0.7109 - val_binary_accuracy: 0.5500
Epoch 168/200
2/2 [==============================] - 7s 4s/step - loss: 0.2530 - binary_accurac
y: 0.9000 - val_loss: 0.7198 - val_binary_accuracy: 0.5500
Epoch 169/200
2/2 [==============================] - 7s 4s/step - loss: 0.3924 - binary_accurac
y: 0.8500 - val_loss: 0.7286 - val_binary_accuracy: 0.4500
Epoch 170/200
2/2 [==============================] - 7s 4s/step - loss: 0.2504 - binary_accurac
y: 0.9500 - val_loss: 0.7401 - val_binary_accuracy: 0.4500
Epoch 171/200
2/2 [==============================] - 7s 4s/step - loss: 0.3316 - binary_accurac
```

```
y: 0.9000 - val_loss: 0.7519 - val_binary_accuracy: 0.4500
Epoch 172/200
2/2 [==============================] - 7s 4s/step - loss: 0.2489 - binary_accurac
y: 0.9500 - val_loss: 0.7630 - val_binary_accuracy: 0.4500
Epoch 173/200
2/2 [==============================] - 7s 4s/step - loss: 0.2050 - binary_accurac
y: 0.9500 - val_loss: 0.7756 - val_binary_accuracy: 0.4500
Epoch 174/200
2/2 [==============================] - 7s 4s/step - loss: 0.3272 - binary_accurac
y: 0.8250 - val_loss: 0.7823 - val_binary_accuracy: 0.4500
Epoch 175/200
2/2 [==============================] - 7s 4s/step - loss: 0.2650 - binary_accurac
y: 0.9000 - val_loss: 0.7879 - val_binary_accuracy: 0.4500
Epoch 176/200
2/2 [==============================] - 7s 4s/step - loss: 0.2908 - binary_accurac
y: 0.8500 - val_loss: 0.7940 - val_binary_accuracy: 0.4500
Epoch 177/200
2/2 [==============================] - 7s 4s/step - loss: 0.2724 - binary_accurac
y: 0.9500 - val_loss: 0.7984 - val_binary_accuracy: 0.4500
Epoch 178/200
2/2 [==============================] - 7s 4s/step - loss: 0.2578 - binary_accurac
y: 0.9500 - val_loss: 0.7999 - val_binary_accuracy: 0.4500
Epoch 179/200
2/2 [==============================] - 7s 4s/step - loss: 0.3806 - binary_accurac
y: 0.8250 - val_loss: 0.8049 - val_binary_accuracy: 0.4500
Epoch 180/200
2/2 [==============================] - 7s 4s/step - loss: 0.3886 - binary_accurac
y: 0.8250 - val_loss: 0.8033 - val_binary_accuracy: 0.4500
Epoch 181/200
2/2 [==============================] - 7s 4s/step - loss: 0.2342 - binary_accurac
y: 0.9000 - val_loss: 0.8001 - val_binary_accuracy: 0.4500
Epoch 182/200
2/2 [==============================] - 7s 4s/step - loss: 0.3075 - binary_accurac
y: 0.8750 - val_loss: 0.7915 - val_binary_accuracy: 0.4500
Epoch 183/200
2/2 [==============================] - 7s 4s/step - loss: 0.2382 - binary_accurac
y: 0.9250 - val_loss: 0.7873 - val_binary_accuracy: 0.5000
Epoch 184/200
2/2 [==============================] - 7s 4s/step - loss: 0.2889 - binary_accurac
y: 0.8750 - val_loss: 0.7847 - val_binary_accuracy: 0.5000
Epoch 185/200
2/2 [==============================] - 7s 4s/step - loss: 0.2842 - binary_accurac
y: 0.8750 - val_loss: 0.7828 - val_binary_accuracy: 0.5000
Epoch 186/200
2/2 [==============================] - 7s 4s/step - loss: 0.2610 - binary_accurac
y: 0.9250 - val_loss: 0.7807 - val_binary_accuracy: 0.5000
Epoch 187/200
2/2 [==============================] - 7s 4s/step - loss: 0.2922 - binary_accurac
y: 0.8500 - val_loss: 0.7749 - val_binary_accuracy: 0.5000
Epoch 188/200
2/2 [==============================] - 7s 4s/step - loss: 0.2927 - binary_accurac
y: 0.8750 - val_loss: 0.7716 - val_binary_accuracy: 0.5000
Epoch 189/200
2/2 [==============================] - 7s 4s/step - loss: 0.2376 - binary_accurac
y: 0.9000 - val_loss: 0.7725 - val_binary_accuracy: 0.5000
Epoch 190/200
2/2 [==============================] - 7s 4s/step - loss: 0.2411 - binary_accurac
y: 0.9000 - val_loss: 0.7766 - val_binary_accuracy: 0.5500
Epoch 191/200
2/2 [==============================] - 7s 4s/step - loss: 0.2045 - binary_accurac
y: 0.9500 - val_loss: 0.7804 - val_binary_accuracy: 0.5500
Epoch 192/200
2/2 [==============================] - 7s 4s/step - loss: 0.3310 - binary_accurac
y: 0.9250 - val_loss: 0.7837 - val_binary_accuracy: 0.5500
```

```
Epoch 193/200
2/2 [==============================] - 7s 4s/step - loss: 0.2675 - binary_accurac
y: 0.9500 - val_loss: 0.7809 - val_binary_accuracy: 0.5500
Epoch 194/200
2/2 [==============================] - 7s 4s/step - loss: 0.2777 - binary_accurac
y: 0.9000 - val_loss: 0.7823 - val_binary_accuracy: 0.5500
Epoch 195/200
2/2 [==============================] - 7s 4s/step - loss: 0.3038 - binary_accurac
y: 0.9000 - val_loss: 0.7857 - val_binary_accuracy: 0.5500
Epoch 196/200
2/2 [==============================] - 7s 4s/step - loss: 0.2229 - binary_accurac
y: 0.9500 - val_loss: 0.7887 - val_binary_accuracy: 0.5500
Epoch 197/200
2/2 [==============================] - 7s 4s/step - loss: 0.2567 - binary_accurac
y: 0.8750 - val_loss: 0.7881 - val_binary_accuracy: 0.5500
Epoch 198/200
2/2 [==============================] - 7s 4s/step - loss: 0.2571 - binary_accurac
y: 0.8750 - val_loss: 0.7868 - val_binary_accuracy: 0.5500
Epoch 199/200
2/2 [==============================] - 7s 4s/step - loss: 0.2481 - binary_accurac
y: 0.9000 - val_loss: 0.7852 - val_binary_accuracy: 0.5500
Epoch 200/200
2/2 [==============================] - 7s 4s/step - loss: 0.1947 - binary_accurac
y: 0.9500 - val_loss: 0.7821 - val_binary_accuracy: 0.5000
Number of total epochs ran:
```

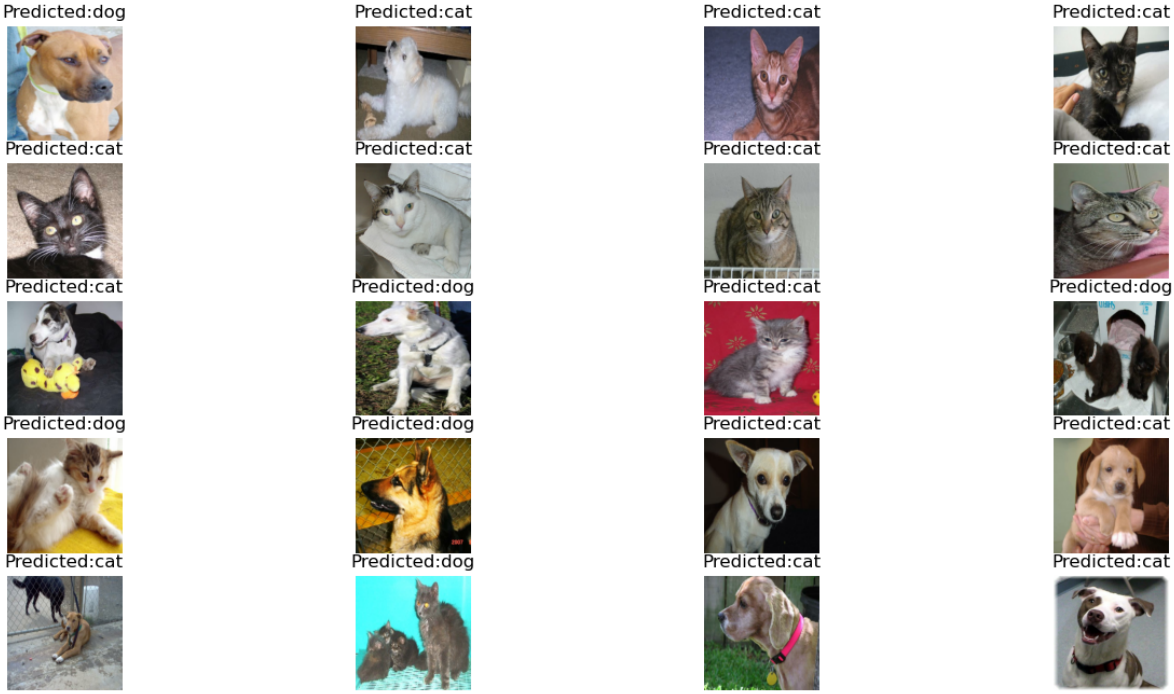
Out[15]:
```
200
```

In [16]:
```
import matplotlib.pyplot as plt
epochs= range(1, 200+1)
plt.plot(history.history['binary_accuracy'])
plt.plot(history.history['val_binary_accuracy'])
plt.title('Accuracy')
plt.ylabel('Binary_accuracy')
plt.xlabel('Epoch')
plt.show()
```



In [17]:
```
for images, labels in ds_test.take(20):
    predictions = model.predict(images)

def image_print(i, prediction_arr, img):
    prediction_label = int(prediction_arr[i] >0.5) #1 if greater than 0.5, 0 if les
    plt.imshow(img[i])
    plt.title(f'Predicted:{class_name[prediction_label]}')
    plt.axis('off')

fig, axes = plt.subplots(4,5, figsize=(16,8))
for i in range(20):#since there are 20 images
    plt.subplot(5,4, i+1)
    image_print(i, predictions, images)
plt.show()
```

```
1/1 [==============================] - 1s 899ms/step
```



9 out of 20 predictions are wrong

In [18]:
```
history = model.compile(
    optimizer = tf.keras.optimizers.Adam(0.00001),
    #loss='binary_crossentropy',
    #metrics=['accuracy']
    loss = tf.keras.losses.BinaryCrossentropy(from_logits=False),
    metrics=[tf.keras.metrics.BinaryAccuracy()]
)
```

In [19]:
```
history = model.fit(
    ds_train,
    epochs=300,
    validation_data=ds_test,
)
print('Number of total epochs ran:')
len(history.history['val_binary_accuracy'])
```

```
Epoch 1/300
2/2 [==============================] - 15s 5s/step - loss: 0.2450 - binary_accurac
y: 0.9250 - val_loss: 0.7926 - val_binary_accuracy: 0.5000
Epoch 2/300
2/2 [==============================] - 8s 4s/step - loss: 0.2166 - binary_accurac
y: 0.9250 - val_loss: 0.7853 - val_binary_accuracy: 0.4500
Epoch 3/300
2/2 [==============================] - 7s 4s/step - loss: 0.2279 - binary_accurac
y: 0.9500 - val_loss: 0.7859 - val_binary_accuracy: 0.4500
Epoch 4/300
2/2 [==============================] - 8s 4s/step - loss: 0.2603 - binary_accurac
y: 0.9750 - val_loss: 0.7794 - val_binary_accuracy: 0.5000
Epoch 5/300
2/2 [==============================] - 8s 4s/step - loss: 0.2978 - binary_accurac
y: 0.8500 - val_loss: 0.7759 - val_binary_accuracy: 0.5000
Epoch 6/300
2/2 [==============================] - 8s 4s/step - loss: 0.2675 - binary_accurac
y: 0.9250 - val_loss: 0.7694 - val_binary_accuracy: 0.5500
Epoch 7/300
2/2 [==============================] - 8s 4s/step - loss: 0.2626 - binary_accurac
y: 0.9250 - val_loss: 0.7675 - val_binary_accuracy: 0.5500
Epoch 8/300
2/2 [==============================] - 7s 4s/step - loss: 0.2581 - binary_accurac
y: 0.9250 - val_loss: 0.7631 - val_binary_accuracy: 0.5500
Epoch 9/300
2/2 [==============================] - 8s 4s/step - loss: 0.2542 - binary_accurac
y: 0.9250 - val_loss: 0.7657 - val_binary_accuracy: 0.5500
Epoch 10/300
2/2 [==============================] - 7s 4s/step - loss: 0.1965 - binary_accurac
y: 0.9250 - val_loss: 0.7654 - val_binary_accuracy: 0.5500
Epoch 11/300
2/2 [==============================] - 7s 4s/step - loss: 0.2626 - binary_accurac
y: 0.9250 - val_loss: 0.7690 - val_binary_accuracy: 0.5500
Epoch 12/300
2/2 [==============================] - 7s 4s/step - loss: 0.2480 - binary_accurac
y: 0.9000 - val_loss: 0.7784 - val_binary_accuracy: 0.5500
Epoch 13/300
2/2 [==============================] - 7s 4s/step - loss: 0.2111 - binary_accurac
y: 0.9500 - val_loss: 0.7886 - val_binary_accuracy: 0.5500
Epoch 14/300
2/2 [==============================] - 7s 4s/step - loss: 0.2846 - binary_accurac
y: 0.9000 - val_loss: 0.7983 - val_binary_accuracy: 0.5500
Epoch 15/300
2/2 [==============================] - 7s 4s/step - loss: 0.2917 - binary_accurac
y: 0.8500 - val_loss: 0.8089 - val_binary_accuracy: 0.5500
Epoch 16/300
2/2 [==============================] - 8s 4s/step - loss: 0.2072 - binary_accurac
y: 0.9250 - val_loss: 0.8198 - val_binary_accuracy: 0.6000
Epoch 17/300
2/2 [==============================] - 7s 4s/step - loss: 0.2769 - binary_accurac
y: 0.9250 - val_loss: 0.8301 - val_binary_accuracy: 0.6000
Epoch 18/300
2/2 [==============================] - 7s 4s/step - loss: 0.2694 - binary_accurac
y: 0.9250 - val_loss: 0.8387 - val_binary_accuracy: 0.6000
Epoch 19/300
2/2 [==============================] - 7s 4s/step - loss: 0.2392 - binary_accurac
y: 0.9500 - val_loss: 0.8451 - val_binary_accuracy: 0.6000
Epoch 20/300
2/2 [==============================] - 7s 4s/step - loss: 0.2389 - binary_accurac
y: 0.9250 - val_loss: 0.8502 - val_binary_accuracy: 0.6000
Epoch 21/300
2/2 [==============================] - 7s 4s/step - loss: 0.2072 - binary_accurac
y: 0.9500 - val_loss: 0.8554 - val_binary_accuracy: 0.6000
Epoch 22/300
```

```
2/2 [==============================] - 8s 4s/step - loss: 0.3066 - binary_accurac
y: 0.9000 - val_loss: 0.8625 - val_binary_accuracy: 0.6000
Epoch 23/300
2/2 [==============================] - 7s 4s/step - loss: 0.2116 - binary_accurac
y: 0.9000 - val_loss: 0.8673 - val_binary_accuracy: 0.5500
Epoch 24/300
2/2 [==============================] - 7s 4s/step - loss: 0.2825 - binary_accurac
y: 0.8750 - val_loss: 0.8724 - val_binary_accuracy: 0.5500
Epoch 25/300
2/2 [==============================] - 8s 4s/step - loss: 0.2079 - binary_accurac
y: 0.9250 - val_loss: 0.8749 - val_binary_accuracy: 0.5500
Epoch 26/300
2/2 [==============================] - 8s 4s/step - loss: 0.2700 - binary_accurac
y: 0.9000 - val_loss: 0.8803 - val_binary_accuracy: 0.5500
Epoch 27/300
2/2 [==============================] - 7s 4s/step - loss: 0.2211 - binary_accurac
y: 0.9000 - val_loss: 0.8826 - val_binary_accuracy: 0.5500
Epoch 28/300
2/2 [==============================] - 7s 4s/step - loss: 0.2321 - binary_accurac
y: 0.9000 - val_loss: 0.8897 - val_binary_accuracy: 0.5000
Epoch 29/300
2/2 [==============================] - 7s 4s/step - loss: 0.2086 - binary_accurac
y: 0.9500 - val_loss: 0.8952 - val_binary_accuracy: 0.5000
Epoch 30/300
2/2 [==============================] - 7s 4s/step - loss: 0.2842 - binary_accurac
y: 0.9000 - val_loss: 0.9003 - val_binary_accuracy: 0.5000
Epoch 31/300
2/2 [==============================] - 7s 4s/step - loss: 0.2093 - binary_accurac
y: 0.9250 - val_loss: 0.9054 - val_binary_accuracy: 0.5000
Epoch 32/300
2/2 [==============================] - 7s 4s/step - loss: 0.2650 - binary_accurac
y: 0.9500 - val_loss: 0.9086 - val_binary_accuracy: 0.5000
Epoch 33/300
2/2 [==============================] - 7s 4s/step - loss: 0.1706 - binary_accurac
y: 0.9500 - val_loss: 0.9085 - val_binary_accuracy: 0.5000
Epoch 34/300
2/2 [==============================] - 7s 4s/step - loss: 0.2575 - binary_accurac
y: 0.9000 - val_loss: 0.9112 - val_binary_accuracy: 0.5000
Epoch 35/300
2/2 [==============================] - 7s 4s/step - loss: 0.3030 - binary_accurac
y: 0.8500 - val_loss: 0.9144 - val_binary_accuracy: 0.5000
Epoch 36/300
2/2 [==============================] - 7s 4s/step - loss: 0.1971 - binary_accurac
y: 0.9750 - val_loss: 0.9175 - val_binary_accuracy: 0.5000
Epoch 37/300
2/2 [==============================] - 7s 4s/step - loss: 0.2378 - binary_accurac
y: 0.9000 - val_loss: 0.9206 - val_binary_accuracy: 0.5000
Epoch 38/300
2/2 [==============================] - 7s 4s/step - loss: 0.2406 - binary_accurac
y: 0.9250 - val_loss: 0.9218 - val_binary_accuracy: 0.5000
Epoch 39/300
2/2 [==============================] - 7s 4s/step - loss: 0.2575 - binary_accurac
y: 0.9000 - val_loss: 0.9225 - val_binary_accuracy: 0.5000
Epoch 40/300
2/2 [==============================] - 7s 4s/step - loss: 0.1763 - binary_accurac
y: 0.9500 - val_loss: 0.9223 - val_binary_accuracy: 0.5000
Epoch 41/300
2/2 [==============================] - 7s 4s/step - loss: 0.2414 - binary_accurac
y: 0.9500 - val_loss: 0.9205 - val_binary_accuracy: 0.5000
Epoch 42/300
2/2 [==============================] - 7s 4s/step - loss: 0.3022 - binary_accurac
y: 0.9000 - val_loss: 0.9256 - val_binary_accuracy: 0.5000
Epoch 43/300
2/2 [==============================] - 7s 4s/step - loss: 0.2668 - binary_accurac
```

```
y: 0.8750 - val_loss: 0.9285 - val_binary_accuracy: 0.5000
Epoch 44/300
2/2 [==============================] - 7s 4s/step - loss: 0.1862 - binary_accurac
y: 0.9750 - val_loss: 0.9276 - val_binary_accuracy: 0.5000
Epoch 45/300
2/2 [==============================] - 7s 4s/step - loss: 0.2041 - binary_accurac
y: 0.9500 - val_loss: 0.9254 - val_binary_accuracy: 0.5000
Epoch 46/300
2/2 [==============================] - 7s 4s/step - loss: 0.2076 - binary_accurac
y: 0.9500 - val_loss: 0.9143 - val_binary_accuracy: 0.5000
Epoch 47/300
2/2 [==============================] - 7s 4s/step - loss: 0.2387 - binary_accurac
y: 0.9250 - val_loss: 0.9076 - val_binary_accuracy: 0.5500
Epoch 48/300
2/2 [==============================] - 7s 4s/step - loss: 0.2850 - binary_accurac
y: 0.9000 - val_loss: 0.9037 - val_binary_accuracy: 0.5500
Epoch 49/300
2/2 [==============================] - 7s 4s/step - loss: 0.2308 - binary_accurac
y: 0.9250 - val_loss: 0.9023 - val_binary_accuracy: 0.5500
Epoch 50/300
2/2 [==============================] - 7s 4s/step - loss: 0.2152 - binary_accurac
y: 0.9500 - val_loss: 0.9025 - val_binary_accuracy: 0.5500
Epoch 51/300
2/2 [==============================] - 7s 4s/step - loss: 0.2594 - binary_accurac
y: 0.9000 - val_loss: 0.9053 - val_binary_accuracy: 0.5500
Epoch 52/300
2/2 [==============================] - 7s 4s/step - loss: 0.2298 - binary_accurac
y: 0.9500 - val_loss: 0.9089 - val_binary_accuracy: 0.5500
Epoch 53/300
2/2 [==============================] - 7s 4s/step - loss: 0.1923 - binary_accurac
y: 0.9500 - val_loss: 0.9127 - val_binary_accuracy: 0.5500
Epoch 54/300
2/2 [==============================] - 7s 4s/step - loss: 0.2157 - binary_accurac
y: 0.9250 - val_loss: 0.9182 - val_binary_accuracy: 0.5500
Epoch 55/300
2/2 [==============================] - 7s 4s/step - loss: 0.2445 - binary_accurac
y: 0.9250 - val_loss: 0.9172 - val_binary_accuracy: 0.5500
Epoch 56/300
2/2 [==============================] - 7s 4s/step - loss: 0.2473 - binary_accurac
y: 0.9500 - val_loss: 0.9193 - val_binary_accuracy: 0.5500
Epoch 57/300
2/2 [==============================] - 7s 4s/step - loss: 0.1891 - binary_accurac
y: 1.0000 - val_loss: 0.9228 - val_binary_accuracy: 0.5500
Epoch 58/300
2/2 [==============================] - 7s 4s/step - loss: 0.2631 - binary_accurac
y: 0.9250 - val_loss: 0.9302 - val_binary_accuracy: 0.5500
Epoch 59/300
2/2 [==============================] - 7s 4s/step - loss: 0.2712 - binary_accurac
y: 0.8250 - val_loss: 0.9275 - val_binary_accuracy: 0.6000
Epoch 60/300
2/2 [==============================] - 7s 4s/step - loss: 0.2119 - binary_accurac
y: 0.9500 - val_loss: 0.9248 - val_binary_accuracy: 0.6000
Epoch 61/300
2/2 [==============================] - 7s 4s/step - loss: 0.1969 - binary_accurac
y: 0.9250 - val_loss: 0.9271 - val_binary_accuracy: 0.6000
Epoch 62/300
2/2 [==============================] - 7s 4s/step - loss: 0.2019 - binary_accurac
y: 0.9750 - val_loss: 0.9303 - val_binary_accuracy: 0.6000
Epoch 63/300
2/2 [==============================] - 7s 4s/step - loss: 0.2603 - binary_accurac
y: 0.9000 - val_loss: 0.9366 - val_binary_accuracy: 0.6000
Epoch 64/300
2/2 [==============================] - 7s 4s/step - loss: 0.2206 - binary_accurac
y: 0.9250 - val_loss: 0.9443 - val_binary_accuracy: 0.6000
```

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Epoch 65/300
2/2 [==============================] - 7s 4s/step - loss: 0.2691 - binary_accurac
y: 0.8750 - val_loss: 0.9428 - val_binary_accuracy: 0.6000
Epoch 66/300
2/2 [==============================] - 7s 4s/step - loss: 0.2023 - binary_accurac
y: 0.9500 - val_loss: 0.9341 - val_binary_accuracy: 0.6000
Epoch 67/300
2/2 [==============================] - 7s 4s/step - loss: 0.1777 - binary_accurac
y: 0.9750 - val_loss: 0.9263 - val_binary_accuracy: 0.6000
Epoch 68/300
2/2 [==============================] - 7s 4s/step - loss: 0.2050 - binary_accurac
y: 0.9250 - val_loss: 0.9165 - val_binary_accuracy: 0.6000
Epoch 69/300
2/2 [==============================] - 7s 4s/step - loss: 0.1772 - binary_accurac
y: 0.9750 - val_loss: 0.9093 - val_binary_accuracy: 0.6000
Epoch 70/300
2/2 [==============================] - 7s 4s/step - loss: 0.2026 - binary_accurac
y: 0.9750 - val_loss: 0.9052 - val_binary_accuracy: 0.6000
Epoch 71/300
2/2 [==============================] - 7s 4s/step - loss: 0.2570 - binary_accurac
y: 0.9250 - val_loss: 0.9031 - val_binary_accuracy: 0.6000
Epoch 72/300
2/2 [==============================] - 7s 4s/step - loss: 0.2188 - binary_accurac
y: 0.9000 - val_loss: 0.9019 - val_binary_accuracy: 0.6000
Epoch 73/300
2/2 [==============================] - 7s 4s/step - loss: 0.2397 - binary_accurac
y: 0.9250 - val_loss: 0.9049 - val_binary_accuracy: 0.6000
Epoch 74/300
2/2 [==============================] - 7s 4s/step - loss: 0.2559 - binary_accurac
y: 0.8750 - val_loss: 0.9074 - val_binary_accuracy: 0.6000
Epoch 75/300
2/2 [==============================] - 7s 4s/step - loss: 0.1994 - binary_accurac
y: 0.9250 - val_loss: 0.9063 - val_binary_accuracy: 0.6000
Epoch 76/300
2/2 [==============================] - 7s 4s/step - loss: 0.2348 - binary_accurac
y: 0.9000 - val_loss: 0.9036 - val_binary_accuracy: 0.6000
Epoch 77/300
2/2 [==============================] - 7s 4s/step - loss: 0.2699 - binary_accurac
y: 0.9000 - val_loss: 0.9103 - val_binary_accuracy: 0.6000
Epoch 78/300
2/2 [==============================] - 7s 4s/step - loss: 0.1907 - binary_accurac
y: 0.9750 - val_loss: 0.9132 - val_binary_accuracy: 0.6000
Epoch 79/300
2/2 [==============================] - 7s 4s/step - loss: 0.1705 - binary_accurac
y: 0.9750 - val_loss: 0.9138 - val_binary_accuracy: 0.6000
Epoch 80/300
2/2 [==============================] - 7s 4s/step - loss: 0.2067 - binary_accurac
y: 0.9750 - val_loss: 0.9115 - val_binary_accuracy: 0.6000
Epoch 81/300
2/2 [==============================] - 7s 4s/step - loss: 0.2114 - binary_accurac
y: 0.9500 - val_loss: 0.9095 - val_binary_accuracy: 0.6000
Epoch 82/300
2/2 [==============================] - 7s 4s/step - loss: 0.2381 - binary_accurac
y: 0.9250 - val_loss: 0.9090 - val_binary_accuracy: 0.6000
Epoch 83/300
2/2 [==============================] - 7s 4s/step - loss: 0.2084 - binary_accurac
y: 0.9500 - val_loss: 0.9087 - val_binary_accuracy: 0.6000
Epoch 84/300
2/2 [==============================] - 7s 4s/step - loss: 0.2388 - binary_accurac
y: 0.8750 - val_loss: 0.9084 - val_binary_accuracy: 0.6000
Epoch 85/300
2/2 [==============================] - 7s 4s/step - loss: 0.2016 - binary_accurac
y: 0.9500 - val_loss: 0.9089 - val_binary_accuracy: 0.6000
Epoch 86/300
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.1904 - binary_accurac
y: 0.9250 - val_loss: 0.9118 - val_binary_accuracy: 0.6000
Epoch 87/300
2/2 [==============================] - 7s 3s/step - loss: 0.2401 - binary_accurac
y: 0.9000 - val_loss: 0.9124 - val_binary_accuracy: 0.6000
Epoch 88/300
2/2 [==============================] - 7s 4s/step - loss: 0.1487 - binary_accurac
y: 0.9750 - val_loss: 0.9138 - val_binary_accuracy: 0.6500
Epoch 89/300
2/2 [==============================] - 7s 4s/step - loss: 0.1885 - binary_accurac
y: 0.9500 - val_loss: 0.9169 - val_binary_accuracy: 0.6500
Epoch 90/300
2/2 [==============================] - 7s 3s/step - loss: 0.2008 - binary_accurac
y: 0.9000 - val_loss: 0.9220 - val_binary_accuracy: 0.6500
Epoch 91/300
2/2 [==============================] - 7s 4s/step - loss: 0.2010 - binary_accurac
y: 0.9500 - val_loss: 0.9285 - val_binary_accuracy: 0.6500
Epoch 92/300
2/2 [==============================] - 7s 4s/step - loss: 0.1946 - binary_accurac
y: 0.9750 - val_loss: 0.9389 - val_binary_accuracy: 0.6500
Epoch 93/300
2/2 [==============================] - 7s 4s/step - loss: 0.2283 - binary_accurac
y: 0.9250 - val_loss: 0.9535 - val_binary_accuracy: 0.6500
Epoch 94/300
2/2 [==============================] - 7s 4s/step - loss: 0.2754 - binary_accurac
y: 0.9000 - val_loss: 0.9760 - val_binary_accuracy: 0.6000
Epoch 95/300
2/2 [==============================] - 7s 3s/step - loss: 0.2196 - binary_accurac
y: 0.9750 - val_loss: 0.9979 - val_binary_accuracy: 0.5500
Epoch 96/300
2/2 [==============================] - 7s 4s/step - loss: 0.2376 - binary_accurac
y: 0.9250 - val_loss: 1.0154 - val_binary_accuracy: 0.5000
Epoch 97/300
2/2 [==============================] - 7s 4s/step - loss: 0.2187 - binary_accurac
y: 0.9250 - val_loss: 1.0308 - val_binary_accuracy: 0.5000
Epoch 98/300
2/2 [==============================] - 7s 4s/step - loss: 0.2150 - binary_accurac
y: 0.9250 - val_loss: 1.0419 - val_binary_accuracy: 0.5000
Epoch 99/300
2/2 [==============================] - 7s 4s/step - loss: 0.2309 - binary_accurac
y: 0.9500 - val_loss: 1.0527 - val_binary_accuracy: 0.5000
Epoch 100/300
2/2 [==============================] - 7s 4s/step - loss: 0.1644 - binary_accurac
y: 0.9750 - val_loss: 1.0624 - val_binary_accuracy: 0.5000
Epoch 101/300
2/2 [==============================] - 7s 4s/step - loss: 0.1926 - binary_accurac
y: 0.9250 - val_loss: 1.0682 - val_binary_accuracy: 0.5000
Epoch 102/300
2/2 [==============================] - 7s 4s/step - loss: 0.3004 - binary_accurac
y: 0.9000 - val_loss: 1.0695 - val_binary_accuracy: 0.5000
Epoch 103/300
2/2 [==============================] - 7s 4s/step - loss: 0.2137 - binary_accurac
y: 0.9000 - val_loss: 1.0616 - val_binary_accuracy: 0.5000
Epoch 104/300
2/2 [==============================] - 7s 3s/step - loss: 0.1934 - binary_accurac
y: 0.9750 - val_loss: 1.0522 - val_binary_accuracy: 0.5000
Epoch 105/300
2/2 [==============================] - 7s 4s/step - loss: 0.2222 - binary_accurac
y: 0.9500 - val_loss: 1.0437 - val_binary_accuracy: 0.5500
Epoch 106/300
2/2 [==============================] - 7s 4s/step - loss: 0.1666 - binary_accurac
y: 0.9750 - val_loss: 1.0307 - val_binary_accuracy: 0.5500
Epoch 107/300
2/2 [==============================] - 7s 4s/step - loss: 0.1711 - binary_accurac
```

```
y: 0.9750 - val_loss: 1.0201 - val_binary_accuracy: 0.6000
Epoch 108/300
2/2 [==============================] - 7s 4s/step - loss: 0.1814 - binary_accurac
y: 0.9500 - val_loss: 1.0140 - val_binary_accuracy: 0.6000
Epoch 109/300
2/2 [==============================] - 7s 4s/step - loss: 0.2237 - binary_accurac
y: 0.9250 - val_loss: 1.0070 - val_binary_accuracy: 0.6500
Epoch 110/300
2/2 [==============================] - 7s 4s/step - loss: 0.2329 - binary_accurac
y: 0.9500 - val_loss: 1.0055 - val_binary_accuracy: 0.6500
Epoch 111/300
2/2 [==============================] - 7s 4s/step - loss: 0.1808 - binary_accurac
y: 0.9750 - val_loss: 1.0088 - val_binary_accuracy: 0.6500
Epoch 112/300
2/2 [==============================] - 7s 4s/step - loss: 0.2366 - binary_accurac
y: 0.9250 - val_loss: 1.0117 - val_binary_accuracy: 0.6000
Epoch 113/300
2/2 [==============================] - 7s 4s/step - loss: 0.2270 - binary_accurac
y: 0.9250 - val_loss: 1.0211 - val_binary_accuracy: 0.6000
Epoch 114/300
2/2 [==============================] - 7s 4s/step - loss: 0.2172 - binary_accurac
y: 0.9250 - val_loss: 1.0299 - val_binary_accuracy: 0.6000
Epoch 115/300
2/2 [==============================] - 7s 4s/step - loss: 0.1820 - binary_accurac
y: 0.9750 - val_loss: 1.0395 - val_binary_accuracy: 0.6000
Epoch 116/300
2/2 [==============================] - 7s 4s/step - loss: 0.1776 - binary_accurac
y: 0.9500 - val_loss: 1.0450 - val_binary_accuracy: 0.5000
Epoch 117/300
2/2 [==============================] - 7s 4s/step - loss: 0.2515 - binary_accurac
y: 0.9000 - val_loss: 1.0479 - val_binary_accuracy: 0.5000
Epoch 118/300
2/2 [==============================] - 7s 4s/step - loss: 0.1983 - binary_accurac
y: 0.9750 - val_loss: 1.0451 - val_binary_accuracy: 0.5000
Epoch 119/300
2/2 [==============================] - 7s 4s/step - loss: 0.1882 - binary_accurac
y: 0.9500 - val_loss: 1.0435 - val_binary_accuracy: 0.5000
Epoch 120/300
2/2 [==============================] - 7s 4s/step - loss: 0.1528 - binary_accurac
y: 1.0000 - val_loss: 1.0421 - val_binary_accuracy: 0.5000
Epoch 121/300
2/2 [==============================] - 7s 4s/step - loss: 0.1490 - binary_accurac
y: 0.9750 - val_loss: 1.0420 - val_binary_accuracy: 0.5000
Epoch 122/300
2/2 [==============================] - 7s 4s/step - loss: 0.1947 - binary_accurac
y: 0.9500 - val_loss: 1.0430 - val_binary_accuracy: 0.5000
Epoch 123/300
2/2 [==============================] - 7s 4s/step - loss: 0.2110 - binary_accurac
y: 0.9750 - val_loss: 1.0465 - val_binary_accuracy: 0.5000
Epoch 124/300
2/2 [==============================] - 7s 4s/step - loss: 0.2115 - binary_accurac
y: 0.9500 - val_loss: 1.0474 - val_binary_accuracy: 0.5000
Epoch 125/300
2/2 [==============================] - 7s 4s/step - loss: 0.2313 - binary_accurac
y: 0.9000 - val_loss: 1.0473 - val_binary_accuracy: 0.5000
Epoch 126/300
2/2 [==============================] - 7s 4s/step - loss: 0.1144 - binary_accurac
y: 1.0000 - val_loss: 1.0408 - val_binary_accuracy: 0.5000
Epoch 127/300
2/2 [==============================] - 7s 4s/step - loss: 0.2193 - binary_accurac
y: 0.9250 - val_loss: 1.0349 - val_binary_accuracy: 0.5000
Epoch 128/300
2/2 [==============================] - 7s 4s/step - loss: 0.1514 - binary_accurac
y: 1.0000 - val_loss: 1.0260 - val_binary_accuracy: 0.5000
```

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Epoch 129/300
2/2 [==============================] - 7s 4s/step - loss: 0.2694 - binary_accurac
y: 0.9500 - val_loss: 1.0260 - val_binary_accuracy: 0.5000
Epoch 130/300
2/2 [==============================] - 7s 4s/step - loss: 0.2464 - binary_accurac
y: 0.9000 - val_loss: 1.0273 - val_binary_accuracy: 0.5000
Epoch 131/300
2/2 [==============================] - 7s 4s/step - loss: 0.1789 - binary_accurac
y: 0.9750 - val_loss: 1.0297 - val_binary_accuracy: 0.5000
Epoch 132/300
2/2 [==============================] - 7s 4s/step - loss: 0.1940 - binary_accurac
y: 0.9750 - val_loss: 1.0306 - val_binary_accuracy: 0.6000
Epoch 133/300
2/2 [==============================] - 7s 4s/step - loss: 0.1866 - binary_accurac
y: 0.9750 - val_loss: 1.0314 - val_binary_accuracy: 0.6000
Epoch 134/300
2/2 [==============================] - 7s 4s/step - loss: 0.2404 - binary_accurac
y: 0.9250 - val_loss: 1.0336 - val_binary_accuracy: 0.5500
Epoch 135/300
2/2 [==============================] - 7s 4s/step - loss: 0.2354 - binary_accurac
y: 0.9500 - val_loss: 1.0289 - val_binary_accuracy: 0.5500
Epoch 136/300
2/2 [==============================] - 7s 4s/step - loss: 0.2017 - binary_accurac
y: 0.9500 - val_loss: 1.0205 - val_binary_accuracy: 0.5500
Epoch 137/300
2/2 [==============================] - 7s 4s/step - loss: 0.1909 - binary_accurac
y: 0.9750 - val_loss: 1.0153 - val_binary_accuracy: 0.5500
Epoch 138/300
2/2 [==============================] - 7s 4s/step - loss: 0.2535 - binary_accurac
y: 0.9000 - val_loss: 1.0048 - val_binary_accuracy: 0.6000
Epoch 139/300
2/2 [==============================] - 7s 4s/step - loss: 0.1954 - binary_accurac
y: 0.9750 - val_loss: 0.9960 - val_binary_accuracy: 0.6000
Epoch 140/300
2/2 [==============================] - 7s 4s/step - loss: 0.1563 - binary_accurac
y: 1.0000 - val_loss: 0.9955 - val_binary_accuracy: 0.6000
Epoch 141/300
2/2 [==============================] - 7s 4s/step - loss: 0.1875 - binary_accurac
y: 0.9500 - val_loss: 0.9953 - val_binary_accuracy: 0.6000
Epoch 142/300
2/2 [==============================] - 7s 4s/step - loss: 0.2374 - binary_accurac
y: 0.9500 - val_loss: 0.9908 - val_binary_accuracy: 0.6000
Epoch 143/300
2/2 [==============================] - 7s 4s/step - loss: 0.2338 - binary_accurac
y: 0.9000 - val_loss: 0.9915 - val_binary_accuracy: 0.6000
Epoch 144/300
2/2 [==============================] - 7s 4s/step - loss: 0.1642 - binary_accurac
y: 0.9500 - val_loss: 0.9977 - val_binary_accuracy: 0.6000
Epoch 145/300
2/2 [==============================] - 7s 4s/step - loss: 0.1833 - binary_accurac
y: 0.9250 - val_loss: 1.0051 - val_binary_accuracy: 0.6000
Epoch 146/300
2/2 [==============================] - 7s 4s/step - loss: 0.2433 - binary_accurac
y: 0.9500 - val_loss: 1.0127 - val_binary_accuracy: 0.6000
Epoch 147/300
2/2 [==============================] - 7s 4s/step - loss: 0.2341 - binary_accurac
y: 0.9000 - val_loss: 1.0160 - val_binary_accuracy: 0.6000
Epoch 148/300
2/2 [==============================] - 7s 4s/step - loss: 0.2261 - binary_accurac
y: 0.9500 - val_loss: 1.0186 - val_binary_accuracy: 0.6000
Epoch 149/300
2/2 [==============================] - 7s 4s/step - loss: 0.1757 - binary_accurac
y: 0.9750 - val_loss: 1.0273 - val_binary_accuracy: 0.6000
Epoch 150/300
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.1450 - binary_accurac
y: 1.0000 - val_loss: 1.0365 - val_binary_accuracy: 0.6000
Epoch 151/300
2/2 [==============================] - 7s 4s/step - loss: 0.1804 - binary_accurac
y: 0.9750 - val_loss: 1.0455 - val_binary_accuracy: 0.6000
Epoch 152/300
2/2 [==============================] - 7s 4s/step - loss: 0.1888 - binary_accurac
y: 0.9500 - val_loss: 1.0533 - val_binary_accuracy: 0.5500
Epoch 153/300
2/2 [==============================] - 7s 4s/step - loss: 0.1571 - binary_accurac
y: 0.9750 - val_loss: 1.0642 - val_binary_accuracy: 0.5000
Epoch 154/300
2/2 [==============================] - 7s 4s/step - loss: 0.1995 - binary_accurac
y: 0.9500 - val_loss: 1.0709 - val_binary_accuracy: 0.5000
Epoch 155/300
2/2 [==============================] - 7s 4s/step - loss: 0.1725 - binary_accurac
y: 0.9750 - val_loss: 1.0742 - val_binary_accuracy: 0.5000
Epoch 156/300
2/2 [==============================] - 7s 4s/step - loss: 0.2245 - binary_accurac
y: 0.9000 - val_loss: 1.0780 - val_binary_accuracy: 0.5000
Epoch 157/300
2/2 [==============================] - 7s 4s/step - loss: 0.1947 - binary_accurac
y: 0.9750 - val_loss: 1.0771 - val_binary_accuracy: 0.5000
Epoch 158/300
2/2 [==============================] - 7s 4s/step - loss: 0.1633 - binary_accurac
y: 0.9750 - val_loss: 1.0757 - val_binary_accuracy: 0.5000
Epoch 159/300
2/2 [==============================] - 7s 4s/step - loss: 0.1900 - binary_accurac
y: 0.9000 - val_loss: 1.0753 - val_binary_accuracy: 0.5000
Epoch 160/300
2/2 [==============================] - 7s 4s/step - loss: 0.1927 - binary_accurac
y: 0.9500 - val_loss: 1.0729 - val_binary_accuracy: 0.5000
Epoch 161/300
2/2 [==============================] - 7s 4s/step - loss: 0.1787 - binary_accurac
y: 0.9750 - val_loss: 1.0679 - val_binary_accuracy: 0.5000
Epoch 162/300
2/2 [==============================] - 7s 4s/step - loss: 0.2072 - binary_accurac
y: 0.9500 - val_loss: 1.0662 - val_binary_accuracy: 0.5500
Epoch 163/300
2/2 [==============================] - 7s 4s/step - loss: 0.2242 - binary_accurac
y: 0.9250 - val_loss: 1.0669 - val_binary_accuracy: 0.5500
Epoch 164/300
2/2 [==============================] - 7s 4s/step - loss: 0.2186 - binary_accurac
y: 0.9500 - val_loss: 1.0675 - val_binary_accuracy: 0.6000
Epoch 165/300
2/2 [==============================] - 7s 4s/step - loss: 0.2010 - binary_accurac
y: 1.0000 - val_loss: 1.0707 - val_binary_accuracy: 0.6000
Epoch 166/300
2/2 [==============================] - 7s 4s/step - loss: 0.1906 - binary_accurac
y: 0.9500 - val_loss: 1.0731 - val_binary_accuracy: 0.6000
Epoch 167/300
2/2 [==============================] - 7s 4s/step - loss: 0.2667 - binary_accurac
y: 0.9250 - val_loss: 1.0822 - val_binary_accuracy: 0.5500
Epoch 168/300
2/2 [==============================] - 7s 4s/step - loss: 0.1784 - binary_accurac
y: 0.9750 - val_loss: 1.0949 - val_binary_accuracy: 0.5500
Epoch 169/300
2/2 [==============================] - 7s 4s/step - loss: 0.1810 - binary_accurac
y: 1.0000 - val_loss: 1.1062 - val_binary_accuracy: 0.5500
Epoch 170/300
2/2 [==============================] - 7s 4s/step - loss: 0.2210 - binary_accurac
y: 0.9250 - val_loss: 1.1168 - val_binary_accuracy: 0.5500
Epoch 171/300
2/2 [==============================] - 7s 4s/step - loss: 0.1942 - binary_accurac
```

```
y: 1.0000 - val_loss: 1.1224 - val_binary_accuracy: 0.5500
Epoch 172/300
2/2 [==============================] - 7s 4s/step - loss: 0.2081 - binary_accurac
y: 0.9250 - val_loss: 1.1298 - val_binary_accuracy: 0.5500
Epoch 173/300
2/2 [==============================] - 7s 4s/step - loss: 0.2082 - binary_accurac
y: 0.9750 - val_loss: 1.1384 - val_binary_accuracy: 0.5500
Epoch 174/300
2/2 [==============================] - 7s 4s/step - loss: 0.1943 - binary_accurac
y: 0.9750 - val_loss: 1.1390 - val_binary_accuracy: 0.5500
Epoch 175/300
2/2 [==============================] - 7s 4s/step - loss: 0.2909 - binary_accurac
y: 0.9000 - val_loss: 1.1407 - val_binary_accuracy: 0.5500
Epoch 176/300
2/2 [==============================] - 7s 4s/step - loss: 0.2695 - binary_accurac
y: 0.9250 - val_loss: 1.1464 - val_binary_accuracy: 0.5500
Epoch 177/300
2/2 [==============================] - 7s 4s/step - loss: 0.2052 - binary_accurac
y: 0.9250 - val_loss: 1.1481 - val_binary_accuracy: 0.5500
Epoch 178/300
2/2 [==============================] - 7s 4s/step - loss: 0.2166 - binary_accurac
y: 0.9500 - val_loss: 1.1434 - val_binary_accuracy: 0.5500
Epoch 179/300
2/2 [==============================] - 7s 4s/step - loss: 0.1529 - binary_accurac
y: 0.9750 - val_loss: 1.1390 - val_binary_accuracy: 0.5500
Epoch 180/300
2/2 [==============================] - 7s 4s/step - loss: 0.1461 - binary_accurac
y: 0.9750 - val_loss: 1.1340 - val_binary_accuracy: 0.6000
Epoch 181/300
2/2 [==============================] - 7s 4s/step - loss: 0.2040 - binary_accurac
y: 0.9250 - val_loss: 1.1331 - val_binary_accuracy: 0.6000
Epoch 182/300
2/2 [==============================] - 7s 4s/step - loss: 0.1555 - binary_accurac
y: 0.9750 - val_loss: 1.1386 - val_binary_accuracy: 0.6000
Epoch 183/300
2/2 [==============================] - 7s 4s/step - loss: 0.1849 - binary_accurac
y: 0.9750 - val_loss: 1.1446 - val_binary_accuracy: 0.6000
Epoch 184/300
2/2 [==============================] - 7s 4s/step - loss: 0.2174 - binary_accurac
y: 0.9750 - val_loss: 1.1520 - val_binary_accuracy: 0.6000
Epoch 185/300
2/2 [==============================] - 7s 4s/step - loss: 0.2066 - binary_accurac
y: 0.9500 - val_loss: 1.1568 - val_binary_accuracy: 0.6000
Epoch 186/300
2/2 [==============================] - 7s 4s/step - loss: 0.1738 - binary_accurac
y: 0.9500 - val_loss: 1.1580 - val_binary_accuracy: 0.6000
Epoch 187/300
2/2 [==============================] - 7s 4s/step - loss: 0.1568 - binary_accurac
y: 1.0000 - val_loss: 1.1605 - val_binary_accuracy: 0.6000
Epoch 188/300
2/2 [==============================] - 7s 4s/step - loss: 0.1674 - binary_accurac
y: 1.0000 - val_loss: 1.1652 - val_binary_accuracy: 0.5500
Epoch 189/300
2/2 [==============================] - 7s 4s/step - loss: 0.2121 - binary_accurac
y: 0.9750 - val_loss: 1.1657 - val_binary_accuracy: 0.5500
Epoch 190/300
2/2 [==============================] - 7s 4s/step - loss: 0.1424 - binary_accurac
y: 1.0000 - val_loss: 1.1696 - val_binary_accuracy: 0.5500
Epoch 191/300
2/2 [==============================] - 7s 4s/step - loss: 0.2405 - binary_accurac
y: 0.9500 - val_loss: 1.1727 - val_binary_accuracy: 0.5500
Epoch 192/300
2/2 [==============================] - 7s 4s/step - loss: 0.1629 - binary_accurac
y: 0.9750 - val_loss: 1.1714 - val_binary_accuracy: 0.5500
```

```
Epoch 193/300
2/2 [==============================] - 7s 4s/step - loss: 0.2041 - binary_accurac
y: 0.9500 - val_loss: 1.1640 - val_binary_accuracy: 0.5500
Epoch 194/300
2/2 [==============================] - 7s 4s/step - loss: 0.1437 - binary_accurac
y: 1.0000 - val_loss: 1.1565 - val_binary_accuracy: 0.6000
Epoch 195/300
2/2 [==============================] - 7s 4s/step - loss: 0.2139 - binary_accurac
y: 0.9250 - val_loss: 1.1503 - val_binary_accuracy: 0.6000
Epoch 196/300
2/2 [==============================] - 7s 4s/step - loss: 0.1740 - binary_accurac
y: 1.0000 - val_loss: 1.1483 - val_binary_accuracy: 0.6000
Epoch 197/300
2/2 [==============================] - 7s 4s/step - loss: 0.1397 - binary_accurac
y: 0.9500 - val_loss: 1.1406 - val_binary_accuracy: 0.6000
Epoch 198/300
2/2 [==============================] - 7s 4s/step - loss: 0.1802 - binary_accurac
y: 0.9750 - val_loss: 1.1356 - val_binary_accuracy: 0.6000
Epoch 199/300
2/2 [==============================] - 7s 4s/step - loss: 0.2263 - binary_accurac
y: 0.9250 - val_loss: 1.1307 - val_binary_accuracy: 0.6000
Epoch 200/300
2/2 [==============================] - 7s 4s/step - loss: 0.1494 - binary_accurac
y: 0.9750 - val_loss: 1.1229 - val_binary_accuracy: 0.6000
Epoch 201/300
2/2 [==============================] - 7s 4s/step - loss: 0.1445 - binary_accurac
y: 1.0000 - val_loss: 1.1176 - val_binary_accuracy: 0.6000
Epoch 202/300
2/2 [==============================] - 7s 4s/step - loss: 0.2064 - binary_accurac
y: 0.9250 - val_loss: 1.1125 - val_binary_accuracy: 0.6000
Epoch 203/300
2/2 [==============================] - 7s 4s/step - loss: 0.1487 - binary_accurac
y: 0.9750 - val_loss: 1.1091 - val_binary_accuracy: 0.6000
Epoch 204/300
2/2 [==============================] - 7s 4s/step - loss: 0.1528 - binary_accurac
y: 0.9500 - val_loss: 1.1072 - val_binary_accuracy: 0.6000
Epoch 205/300
2/2 [==============================] - 7s 4s/step - loss: 0.2150 - binary_accurac
y: 0.9500 - val_loss: 1.1092 - val_binary_accuracy: 0.6000
Epoch 206/300
2/2 [==============================] - 7s 4s/step - loss: 0.1641 - binary_accurac
y: 0.9500 - val_loss: 1.1159 - val_binary_accuracy: 0.6000
Epoch 207/300
2/2 [==============================] - 7s 4s/step - loss: 0.2036 - binary_accurac
y: 0.9500 - val_loss: 1.1208 - val_binary_accuracy: 0.6000
Epoch 208/300
2/2 [==============================] - 7s 4s/step - loss: 0.1891 - binary_accurac
y: 0.9750 - val_loss: 1.1263 - val_binary_accuracy: 0.6000
Epoch 209/300
2/2 [==============================] - 7s 4s/step - loss: 0.2099 - binary_accurac
y: 0.9750 - val_loss: 1.1328 - val_binary_accuracy: 0.5500
Epoch 210/300
2/2 [==============================] - 7s 4s/step - loss: 0.1787 - binary_accurac
y: 0.9500 - val_loss: 1.1375 - val_binary_accuracy: 0.5500
Epoch 211/300
2/2 [==============================] - 7s 4s/step - loss: 0.1846 - binary_accurac
y: 0.9250 - val_loss: 1.1395 - val_binary_accuracy: 0.5500
Epoch 212/300
2/2 [==============================] - 7s 4s/step - loss: 0.1681 - binary_accurac
y: 0.9750 - val_loss: 1.1403 - val_binary_accuracy: 0.5500
Epoch 213/300
2/2 [==============================] - 7s 4s/step - loss: 0.1663 - binary_accurac
y: 1.0000 - val_loss: 1.1407 - val_binary_accuracy: 0.5500
Epoch 214/300
```

```
2/2 [==============================] - 7s 4s/step - loss: 0.1707 - binary_accurac
y: 0.9500 - val_loss: 1.1379 - val_binary_accuracy: 0.5500
Epoch 215/300
2/2 [==============================] - 7s 4s/step - loss: 0.2494 - binary_accurac
y: 0.9000 - val_loss: 1.1367 - val_binary_accuracy: 0.5500
Epoch 216/300
2/2 [==============================] - 7s 4s/step - loss: 0.2125 - binary_accurac
y: 0.9500 - val_loss: 1.1352 - val_binary_accuracy: 0.5500
Epoch 217/300
2/2 [==============================] - 7s 4s/step - loss: 0.1376 - binary_accurac
y: 0.9750 - val_loss: 1.1364 - val_binary_accuracy: 0.5500
Epoch 218/300
2/2 [==============================] - 7s 4s/step - loss: 0.2021 - binary_accurac
y: 0.9500 - val_loss: 1.1403 - val_binary_accuracy: 0.5500
Epoch 219/300
2/2 [==============================] - 7s 4s/step - loss: 0.1908 - binary_accurac
y: 0.9250 - val_loss: 1.1457 - val_binary_accuracy: 0.5500
Epoch 220/300
2/2 [==============================] - 7s 4s/step - loss: 0.1575 - binary_accurac
y: 0.9500 - val_loss: 1.1444 - val_binary_accuracy: 0.5500
Epoch 221/300
2/2 [==============================] - 7s 4s/step - loss: 0.2304 - binary_accurac
y: 0.9250 - val_loss: 1.1431 - val_binary_accuracy: 0.5500
Epoch 222/300
2/2 [==============================] - 7s 4s/step - loss: 0.1516 - binary_accurac
y: 0.9750 - val_loss: 1.1395 - val_binary_accuracy: 0.5500
Epoch 223/300
2/2 [==============================] - 7s 4s/step - loss: 0.2442 - binary_accurac
y: 0.9500 - val_loss: 1.1288 - val_binary_accuracy: 0.5500
Epoch 224/300
2/2 [==============================] - 7s 4s/step - loss: 0.1646 - binary_accurac
y: 0.9750 - val_loss: 1.1163 - val_binary_accuracy: 0.6000
Epoch 225/300
2/2 [==============================] - 7s 4s/step - loss: 0.2136 - binary_accurac
y: 0.9250 - val_loss: 1.1100 - val_binary_accuracy: 0.6000
Epoch 226/300
2/2 [==============================] - 7s 4s/step - loss: 0.1668 - binary_accurac
y: 0.9750 - val_loss: 1.1046 - val_binary_accuracy: 0.6000
Epoch 227/300
2/2 [==============================] - 7s 4s/step - loss: 0.1612 - binary_accurac
y: 0.9500 - val_loss: 1.1028 - val_binary_accuracy: 0.6000
Epoch 228/300
2/2 [==============================] - 7s 4s/step - loss: 0.1379 - binary_accurac
y: 1.0000 - val_loss: 1.0991 - val_binary_accuracy: 0.6000
Epoch 229/300
2/2 [==============================] - 7s 4s/step - loss: 0.1576 - binary_accurac
y: 0.9750 - val_loss: 1.0959 - val_binary_accuracy: 0.6000
Epoch 230/300
2/2 [==============================] - 7s 4s/step - loss: 0.1465 - binary_accurac
y: 0.9500 - val_loss: 1.0920 - val_binary_accuracy: 0.6000
Epoch 231/300
2/2 [==============================] - 7s 4s/step - loss: 0.1705 - binary_accurac
y: 0.9750 - val_loss: 1.0911 - val_binary_accuracy: 0.6000
Epoch 232/300
2/2 [==============================] - 7s 4s/step - loss: 0.1726 - binary_accurac
y: 1.0000 - val_loss: 1.0888 - val_binary_accuracy: 0.6000
Epoch 233/300
2/2 [==============================] - 7s 4s/step - loss: 0.1587 - binary_accurac
y: 0.9750 - val_loss: 1.0888 - val_binary_accuracy: 0.6000
Epoch 234/300
2/2 [==============================] - 7s 4s/step - loss: 0.2259 - binary_accurac
y: 0.9500 - val_loss: 1.0958 - val_binary_accuracy: 0.6500
Epoch 235/300
2/2 [==============================] - 7s 4s/step - loss: 0.1887 - binary_accurac
```

```
y: 0.9250 - val_loss: 1.1063 - val_binary_accuracy: 0.5500
Epoch 236/300
2/2 [==============================] - 7s 3s/step - loss: 0.1829 - binary_accurac
y: 0.9500 - val_loss: 1.1155 - val_binary_accuracy: 0.5500
Epoch 237/300
2/2 [==============================] - 7s 3s/step - loss: 0.1411 - binary_accurac
y: 1.0000 - val_loss: 1.1204 - val_binary_accuracy: 0.5500
Epoch 238/300
2/2 [==============================] - 7s 4s/step - loss: 0.2062 - binary_accurac
y: 0.9250 - val_loss: 1.1261 - val_binary_accuracy: 0.5500
Epoch 239/300
2/2 [==============================] - 7s 4s/step - loss: 0.1579 - binary_accurac
y: 1.0000 - val_loss: 1.1269 - val_binary_accuracy: 0.5500
Epoch 240/300
2/2 [==============================] - 7s 4s/step - loss: 0.1491 - binary_accurac
y: 0.9750 - val_loss: 1.1291 - val_binary_accuracy: 0.5500
Epoch 241/300
2/2 [==============================] - 6s 3s/step - loss: 0.1559 - binary_accurac
y: 0.9500 - val_loss: 1.1327 - val_binary_accuracy: 0.5500
Epoch 242/300
2/2 [==============================] - 4s 2s/step - loss: 0.1437 - binary_accurac
y: 1.0000 - val_loss: 1.1362 - val_binary_accuracy: 0.5500
Epoch 243/300
2/2 [==============================] - 4s 2s/step - loss: 0.1482 - binary_accurac
y: 0.9500 - val_loss: 1.1393 - val_binary_accuracy: 0.5500
Epoch 244/300
2/2 [==============================] - 4s 2s/step - loss: 0.1779 - binary_accurac
y: 0.9750 - val_loss: 1.1416 - val_binary_accuracy: 0.5500
Epoch 245/300
2/2 [==============================] - 3s 2s/step - loss: 0.1700 - binary_accurac
y: 0.9750 - val_loss: 1.1461 - val_binary_accuracy: 0.5500
Epoch 246/300
2/2 [==============================] - 3s 2s/step - loss: 0.1737 - binary_accurac
y: 0.9250 - val_loss: 1.1502 - val_binary_accuracy: 0.5500
Epoch 247/300
2/2 [==============================] - 3s 2s/step - loss: 0.1552 - binary_accurac
y: 1.0000 - val_loss: 1.1552 - val_binary_accuracy: 0.5500
Epoch 248/300
2/2 [==============================] - 4s 2s/step - loss: 0.2034 - binary_accurac
y: 0.9500 - val_loss: 1.1605 - val_binary_accuracy: 0.5500
Epoch 249/300
2/2 [==============================] - 4s 2s/step - loss: 0.1864 - binary_accurac
y: 0.9250 - val_loss: 1.1590 - val_binary_accuracy: 0.5500
Epoch 250/300
2/2 [==============================] - 3s 2s/step - loss: 0.1661 - binary_accurac
y: 0.9750 - val_loss: 1.1534 - val_binary_accuracy: 0.5500
Epoch 251/300
2/2 [==============================] - 3s 2s/step - loss: 0.1618 - binary_accurac
y: 0.9750 - val_loss: 1.1438 - val_binary_accuracy: 0.5500
Epoch 252/300
2/2 [==============================] - 4s 2s/step - loss: 0.1790 - binary_accurac
y: 0.9750 - val_loss: 1.1327 - val_binary_accuracy: 0.5500
Epoch 253/300
2/2 [==============================] - 4s 2s/step - loss: 0.2066 - binary_accurac
y: 0.9500 - val_loss: 1.1232 - val_binary_accuracy: 0.5500
Epoch 254/300
2/2 [==============================] - 4s 2s/step - loss: 0.2018 - binary_accurac
y: 0.9250 - val_loss: 1.1189 - val_binary_accuracy: 0.5500
Epoch 255/300
2/2 [==============================] - 3s 2s/step - loss: 0.2007 - binary_accurac
y: 0.9250 - val_loss: 1.1167 - val_binary_accuracy: 0.6000
Epoch 256/300
2/2 [==============================] - 3s 2s/step - loss: 0.2114 - binary_accurac
y: 0.9250 - val_loss: 1.1202 - val_binary_accuracy: 0.6000
```

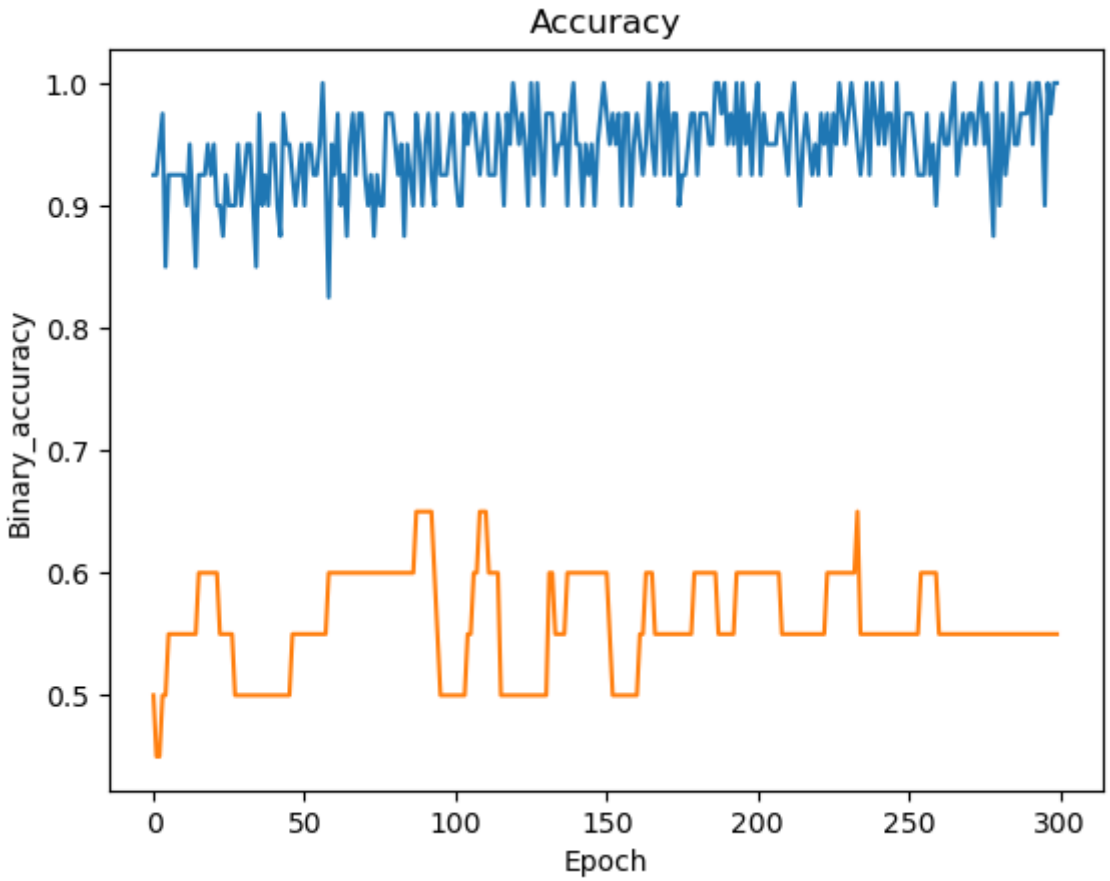
```
Epoch 257/300
2/2 [==============================] - 4s 2s/step - loss: 0.1578 - binary_accurac
y: 0.9750 - val_loss: 1.1249 - val_binary_accuracy: 0.6000
Epoch 258/300
2/2 [==============================] - 4s 2s/step - loss: 0.2002 - binary_accurac
y: 0.9250 - val_loss: 1.1324 - val_binary_accuracy: 0.6000
Epoch 259/300
2/2 [==============================] - 3s 2s/step - loss: 0.1702 - binary_accurac
y: 0.9500 - val_loss: 1.1379 - val_binary_accuracy: 0.6000
Epoch 260/300
2/2 [==============================] - 3s 2s/step - loss: 0.2395 - binary_accurac
y: 0.9000 - val_loss: 1.1426 - val_binary_accuracy: 0.6000
Epoch 261/300
2/2 [==============================] - 3s 2s/step - loss: 0.1933 - binary_accurac
y: 0.9500 - val_loss: 1.1501 - val_binary_accuracy: 0.5500
Epoch 262/300
2/2 [==============================] - 4s 2s/step - loss: 0.1556 - binary_accurac
y: 0.9750 - val_loss: 1.1553 - val_binary_accuracy: 0.5500
Epoch 263/300
2/2 [==============================] - 4s 2s/step - loss: 0.2024 - binary_accurac
y: 0.9500 - val_loss: 1.1603 - val_binary_accuracy: 0.5500
Epoch 264/300
2/2 [==============================] - 3s 2s/step - loss: 0.1849 - binary_accurac
y: 0.9500 - val_loss: 1.1645 - val_binary_accuracy: 0.5500
Epoch 265/300
2/2 [==============================] - 3s 2s/step - loss: 0.1777 - binary_accurac
y: 0.9750 - val_loss: 1.1587 - val_binary_accuracy: 0.5500
Epoch 266/300
2/2 [==============================] - 4s 2s/step - loss: 0.1806 - binary_accurac
y: 1.0000 - val_loss: 1.1552 - val_binary_accuracy: 0.5500
Epoch 267/300
2/2 [==============================] - 4s 2s/step - loss: 0.1786 - binary_accurac
y: 0.9250 - val_loss: 1.1509 - val_binary_accuracy: 0.5500
Epoch 268/300
2/2 [==============================] - 3s 2s/step - loss: 0.1790 - binary_accurac
y: 0.9500 - val_loss: 1.1523 - val_binary_accuracy: 0.5500
Epoch 269/300
2/2 [==============================] - 3s 2s/step - loss: 0.1600 - binary_accurac
y: 0.9750 - val_loss: 1.1497 - val_binary_accuracy: 0.5500
Epoch 270/300
2/2 [==============================] - 4s 2s/step - loss: 0.1693 - binary_accurac
y: 0.9500 - val_loss: 1.1464 - val_binary_accuracy: 0.5500
Epoch 271/300
2/2 [==============================] - 4s 2s/step - loss: 0.1709 - binary_accurac
y: 0.9750 - val_loss: 1.1428 - val_binary_accuracy: 0.5500
Epoch 272/300
2/2 [==============================] - 4s 2s/step - loss: 0.1882 - binary_accurac
y: 0.9750 - val_loss: 1.1424 - val_binary_accuracy: 0.5500
Epoch 273/300
2/2 [==============================] - 3s 2s/step - loss: 0.1955 - binary_accurac
y: 0.9500 - val_loss: 1.1477 - val_binary_accuracy: 0.5500
Epoch 274/300
2/2 [==============================] - 3s 2s/step - loss: 0.1596 - binary_accurac
y: 0.9750 - val_loss: 1.1537 - val_binary_accuracy: 0.5500
Epoch 275/300
2/2 [==============================] - 4s 2s/step - loss: 0.1413 - binary_accurac
y: 1.0000 - val_loss: 1.1596 - val_binary_accuracy: 0.5500
Epoch 276/300
2/2 [==============================] - 4s 2s/step - loss: 0.1653 - binary_accurac
y: 0.9500 - val_loss: 1.1642 - val_binary_accuracy: 0.5500
Epoch 277/300
2/2 [==============================] - 3s 2s/step - loss: 0.1440 - binary_accurac
y: 0.9750 - val_loss: 1.1670 - val_binary_accuracy: 0.5500
Epoch 278/300
```

```
2/2 [==============================] - 3s 2s/step - loss: 0.1662 - binary_accurac
y: 0.9250 - val_loss: 1.1719 - val_binary_accuracy: 0.5500
Epoch 279/300
2/2 [==============================] - 3s 2s/step - loss: 0.1996 - binary_accurac
y: 0.8750 - val_loss: 1.1695 - val_binary_accuracy: 0.5500
Epoch 280/300
2/2 [==============================] - 4s 2s/step - loss: 0.1169 - binary_accurac
y: 1.0000 - val_loss: 1.1662 - val_binary_accuracy: 0.5500
Epoch 281/300
2/2 [==============================] - 4s 2s/step - loss: 0.1980 - binary_accurac
y: 0.9000 - val_loss: 1.1581 - val_binary_accuracy: 0.5500
Epoch 282/300
2/2 [==============================] - 3s 2s/step - loss: 0.1510 - binary_accurac
y: 0.9750 - val_loss: 1.1469 - val_binary_accuracy: 0.5500
Epoch 283/300
2/2 [==============================] - 3s 2s/step - loss: 0.2275 - binary_accurac
y: 0.9250 - val_loss: 1.1405 - val_binary_accuracy: 0.5500
Epoch 284/300
2/2 [==============================] - 4s 2s/step - loss: 0.1764 - binary_accurac
y: 0.9500 - val_loss: 1.1356 - val_binary_accuracy: 0.5500
Epoch 285/300
2/2 [==============================] - 4s 2s/step - loss: 0.1563 - binary_accurac
y: 1.0000 - val_loss: 1.1321 - val_binary_accuracy: 0.5500
Epoch 286/300
2/2 [==============================] - 3s 2s/step - loss: 0.1611 - binary_accurac
y: 0.9500 - val_loss: 1.1302 - val_binary_accuracy: 0.5500
Epoch 287/300
2/2 [==============================] - 3s 2s/step - loss: 0.1848 - binary_accurac
y: 0.9500 - val_loss: 1.1271 - val_binary_accuracy: 0.5500
Epoch 288/300
2/2 [==============================] - 4s 2s/step - loss: 0.1637 - binary_accurac
y: 0.9750 - val_loss: 1.1252 - val_binary_accuracy: 0.5500
Epoch 289/300
2/2 [==============================] - 4s 2s/step - loss: 0.1681 - binary_accurac
y: 0.9750 - val_loss: 1.1271 - val_binary_accuracy: 0.5500
Epoch 290/300
2/2 [==============================] - 4s 2s/step - loss: 0.1720 - binary_accurac
y: 0.9750 - val_loss: 1.1276 - val_binary_accuracy: 0.5500
Epoch 291/300
2/2 [==============================] - 3s 2s/step - loss: 0.1635 - binary_accurac
y: 1.0000 - val_loss: 1.1277 - val_binary_accuracy: 0.5500
Epoch 292/300
2/2 [==============================] - 3s 2s/step - loss: 0.1792 - binary_accurac
y: 0.9500 - val_loss: 1.1330 - val_binary_accuracy: 0.5500
Epoch 293/300
2/2 [==============================] - 4s 2s/step - loss: 0.1396 - binary_accurac
y: 1.0000 - val_loss: 1.1403 - val_binary_accuracy: 0.5500
Epoch 294/300
2/2 [==============================] - 4s 2s/step - loss: 0.1677 - binary_accurac
y: 1.0000 - val_loss: 1.1448 - val_binary_accuracy: 0.5500
Epoch 295/300
2/2 [==============================] - 3s 2s/step - loss: 0.1365 - binary_accurac
y: 0.9750 - val_loss: 1.1479 - val_binary_accuracy: 0.5500
Epoch 296/300
2/2 [==============================] - 3s 2s/step - loss: 0.2298 - binary_accurac
y: 0.9000 - val_loss: 1.1504 - val_binary_accuracy: 0.5500
Epoch 297/300
2/2 [==============================] - 3s 2s/step - loss: 0.1574 - binary_accurac
y: 1.0000 - val_loss: 1.1500 - val_binary_accuracy: 0.5500
Epoch 298/300
2/2 [==============================] - 4s 2s/step - loss: 0.1688 - binary_accurac
y: 0.9750 - val_loss: 1.1527 - val_binary_accuracy: 0.5500
Epoch 299/300
2/2 [==============================] - 4s 2s/step - loss: 0.1719 - binary_accurac
```

```
y: 1.0000 - val_loss: 1.1615 - val_binary_accuracy: 0.5500
Epoch 300/300
2/2 [==============================] - 3s 2s/step - loss: 0.1301 - binary_accurac
y: 1.0000 - val_loss: 1.1700 - val_binary_accuracy: 0.5500
Number of total epochs ran:
```

Out[19]:
```
300
```

In [20]:
```
import matplotlib.pyplot as plt
epochs= range(1, 300+1)
plt.plot(history.history['binary_accuracy'])
plt.plot(history.history['val_binary_accuracy'])
plt.title('Accuracy')
plt.ylabel('Binary_accuracy')
plt.xlabel('Epoch')
plt.show()
```

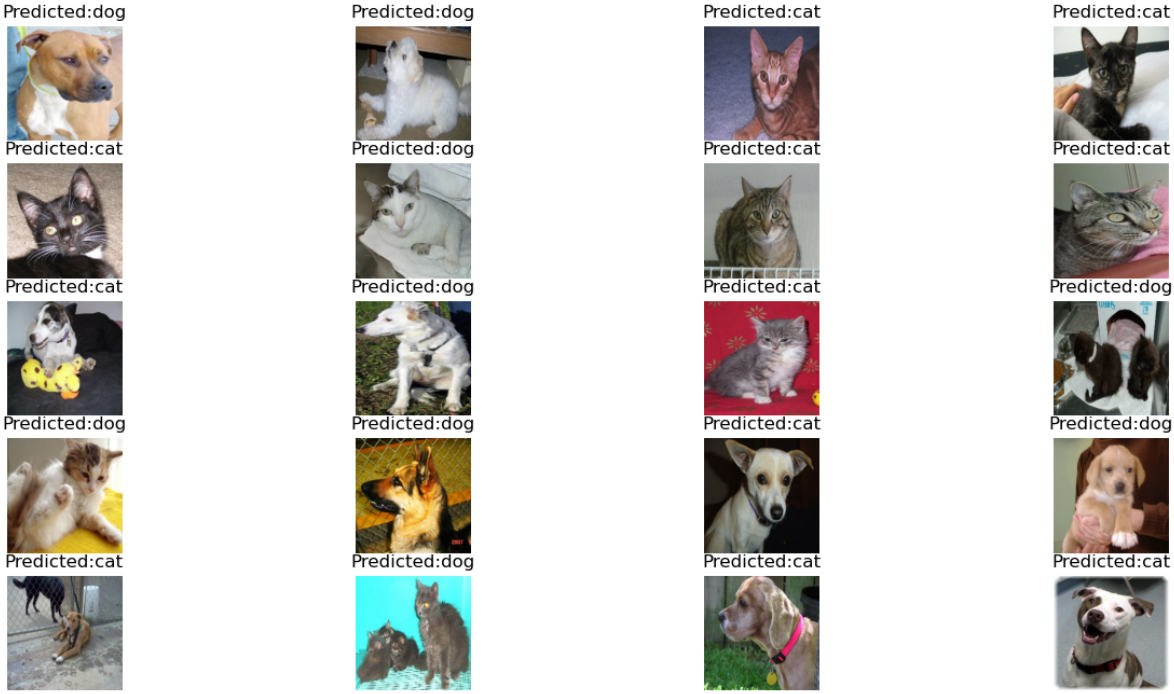


In [21]:
```
for images, labels in ds_test.take(20):
    predictions = model.predict(images)

def image_print(i, prediction_arr, img):
    prediction_label = int(prediction_arr[i] >0.5) #1 if greater than 0.5, 0 if les
    plt.imshow(img[i])
    plt.title(f'Predicted:{class_name[prediction_label]}')
    plt.axis('off')

fig, axes = plt.subplots(4,5, figsize=(16,8))
for i in range(20):#since there are 20 images
    plt.subplot(5,4, i+1)
    image_print(i, predictions, images)
plt.show()
```

```
1/1 [==============================] - 0s 364ms/step
```



7 out of 20 predictions are wrong

In [ ]: