In [4]:
```
import os,shutil
original_dataset_dir='D:/Deeplearning/datasets/dogs-vs-cats'
base_dir='D:/Deeplearning/datasets/catdog1'
os.mkdir(base_dir)
train_dir=os.path.join(base_dir,'train')
os.mkdir(train_dir)
validation_dir=os.path.join(base_dir,'validation')
os.mkdir(validation_dir)
test_dir=os.path.join(base_dir,'test')
os.mkdir(test_dir)
train_cats_dir=os.path.join(train_dir,'cats')
os.mkdir(train_cats_dir)
train_dogs_dir=os.path.join(train_dir,'dogs')
os.mkdir(train_dogs_dir)
validation_cats_dir=os.path.join(validation_dir,'cats')
os.mkdir(validation_cats_dir)
validation_dogs_dir=os.path.join(validation_dir,'dogs')
os.mkdir(validation_dogs_dir)
test_cats_dir=os.path.join(test_dir,'cats')
os.mkdir(test_cats_dir)
test_dogs_dir=os.path.join(test_dir,'dogs')
os.mkdir(test_dogs_dir)
fnames=['cat.{}.jpg'.format(i) for i in range(1000)]
```

```
---------------------------------------------------------------------------
FileExistsError                           Traceback (most recent call last)
<ipython-input-4-12cf540c0013> in <module>
      2 original_dataset_dir='D:/Deeplearning/datasets/dogs-vs-cats'
      3 base_dir='D:/Deeplearning/datasets/catdog1'
----> 4 os.mkdir(base_dir)
      5 train_dir=os.path.join(base_dir,'train')
      6 os.mkdir(train_dir)

FileExistsError: [WinError 183] Cannot create a file when that file already e
xists: 'D:/Deeplearning/datasets/catdog1'
```

In [5]:
```
train_dir=os.path.join(base_dir,'train')
validation_dir=os.path.join(base_dir,'validation')
train_cats_dir=os.path.join(train_dir,'cats')
test_dir=os.path.join(base_dir,'test')
validation_cats_dir=os.path.join(validation_dir,'cats')
train_dogs_dir=os.path.join(train_dir,'dogs')
validation_dogs_dir=os.path.join(validation_dir,'dogs')
test_cats_dir=os.path.join(test_dir,'cats')
test_dogs_dir=os.path.join(test_dir,'dogs')
```

In [ ]:

In [ ]:

In [6]:
```
print('total training cat images:',len(os.listdir(train_cats_dir)))
print('total training dog images:',len(os.listdir(train_dogs_dir)))
print('total validation cat images:',len(os.listdir(validation_cats_dir)))
print('total validationdog images:',len(os.listdir(validation_dogs_dir)))
print('total test cat images:',len(os.listdir(test_cats_dir)))
print('total test dog images:',len(os.listdir(test_dogs_dir)))
```

```
total training cat images: 1000
total training dog images: 1000
total validation cat images: 500
total validationdog images: 500
total test cat images: 500
total test dog images: 500
```

In [7]:
```
from keras import layers
from keras import models
model=models.Sequential()
model.add(layers.Conv2D(32,(3,3),activation='relu',
input_shape=(150,150,3)))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(64,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(128,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(128,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Flatten())
model.add(layers.Dense(512,activation='relu'))
model.add(layers.Dense(1,activation='sigmoid'))
```

```
Using TensorFlow backend.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:66: The name tf.get_default_graph is deprecated. Pl
ease use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:541: The name tf.placeholder is deprecated. Please
use tf.compat.v1.placeholder instead.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:4432: The name tf.random_uniform is deprecated. Ple
ase use tf.random.uniform instead.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:4267: The name tf.nn.max_pool is deprecated. Please
use tf.nn.max_pool2d instead.
```

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

```
Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_1 (Conv2D)            (None, 148, 148, 32)      896
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 74, 74, 32)        0
_________________________________________________________________
conv2d_2 (Conv2D)            (None, 72, 72, 64)        18496
_________________________________________________________________
max_pooling2d_2 (MaxPooling2 (None, 36, 36, 64)        0
_________________________________________________________________
conv2d_3 (Conv2D)            (None, 34, 34, 128)       73856
_________________________________________________________________
max_pooling2d_3 (MaxPooling2 (None, 17, 17, 128)       0
_________________________________________________________________
conv2d_4 (Conv2D)            (None, 15, 15, 128)       147584
_________________________________________________________________
max_pooling2d_4 (MaxPooling2 (None, 7, 7, 128)         0
_________________________________________________________________
flatten_1 (Flatten)          (None, 6272)              0
_________________________________________________________________
dense_1 (Dense)              (None, 512)               3211776
_________________________________________________________________
dense_2 (Dense)              (None, 1)                 513
=================================================================
Total params: 3,453,121
Trainable params: 3,453,121
Non-trainable params: 0
_________________________________________________________________
```

In [9]:
```
from keras import optimizers
model.compile(loss='binary_crossentropy',
optimizer=optimizers.RMSprop(lr=1e-4),
metrics=['acc'])
```

```
WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\opti
mizers.py:793: The name tf.train.Optimizer is deprecated. Please use tf.compa
t.v1.train.Optimizer instead.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:3657: The name tf.log is deprecated. Please use tf.
math.log instead.

WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\tensorflow
\python\ops\nn_impl.py:180: add_dispatch_support.<locals>.wrapper (from tenso
rflow.python.ops.array_ops) is deprecated and will be removed in a future ver
sion.
Instructions for updating:
Use tf.where in 2.0, which has the same broadcast rule as np.where
```

In [14]:
```
from keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255)
test_datagen=ImageDataGenerator(rescale=1./255)
train_generator=train_datagen.flow_from_directory(
train_dir,
target_size=(150,150),
batch_size=20,
class_mode='binary')
validation_generator=test_datagen.flow_from_directory(
validation_dir,
    target_size=(150,150),
batch_size=20,
class_mode='binary')
```

```
Found 2000 images belonging to 2 classes.
Found 1000 images belonging to 2 classes.
```

In [15]:
```
for data_batch,labels_batch in train_generator:
    print('databatchshape:',data_batch.shape)
    print('labelsbatchshape:',labels_batch.shape)
    break
```

```
databatchshape: (20, 150, 150, 3)
labelsbatchshape: (20,)
```

In [16]:
```
history=model.fit_generator(
train_generator,
steps_per_epoch=10,
epochs=5,
validation_data=validation_generator,
validation_steps=50)
```

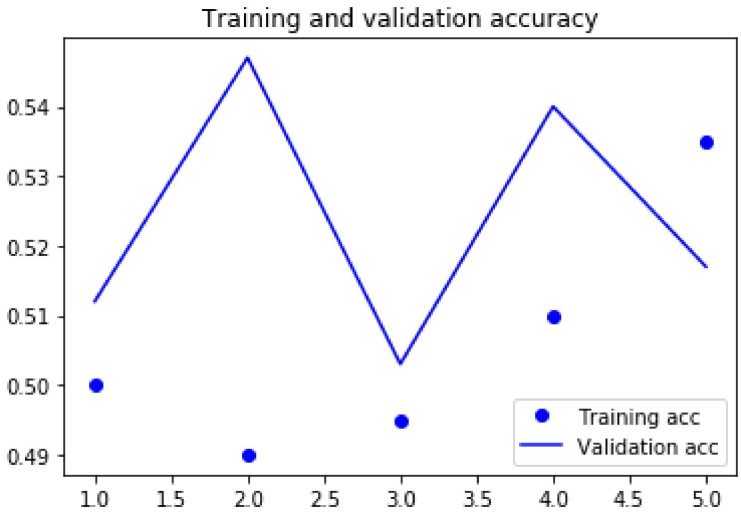
```
WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:1033: The name tf.assign_add is deprecated. Please
use tf.compat.v1.assign_add instead.

Epoch 1/5
10/10 [==============================] - 39s 4s/step - loss: 0.7069 - acc: 0.
5000 - val_loss: 0.6911 - val_acc: 0.5120
Epoch 2/5
10/10 [==============================] - 23s 2s/step - loss: 0.6941 - acc: 0.
4900 - val_loss: 0.6897 - val_acc: 0.5470
Epoch 3/5
10/10 [==============================] - 26s 3s/step - loss: 0.6947 - acc: 0.
4950 - val_loss: 0.6926 - val_acc: 0.5030
Epoch 4/5
10/10 [==============================] - 25s 3s/step - loss: 0.6922 - acc: 0.
5100 - val_loss: 0.6861 - val_acc: 0.5400
Epoch 5/5
10/10 [==============================] - 26s 3s/step - loss: 0.6917 - acc: 0.
5350 - val_loss: 0.6894 - val_acc: 0.5170
```

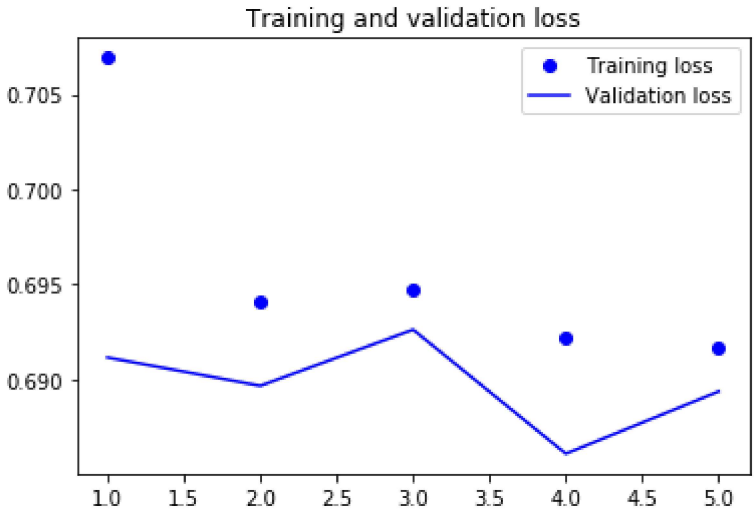
In [17]:
```
model.save('cats_and_dogs_small_1.h5')
```

In [18]:
```
os.getcwd()
```

Out[18]:
```
'C:\\WINDOWS\\system32\\python'
```

In [20]:
```
import matplotlib.pyplot as plt
acc=history.history['acc']
val_acc=history.history['val_acc']
loss=history.history['loss']
val_loss=history.history['val_loss']
epochs=range(1,len(acc)+1)
plt.plot(epochs,acc,'bo',label='Training acc')
plt.plot(epochs,val_acc,'b',label='Validation acc')
plt.title('Training and validation accuracy')
plt.legend()
plt.figure()
plt.plot(epochs,loss,'bo',label='Training loss')
plt.plot(epochs,val_loss,'b',label='Validation loss')
plt.title('Training and validation loss')
plt.legend()
plt.show()
```

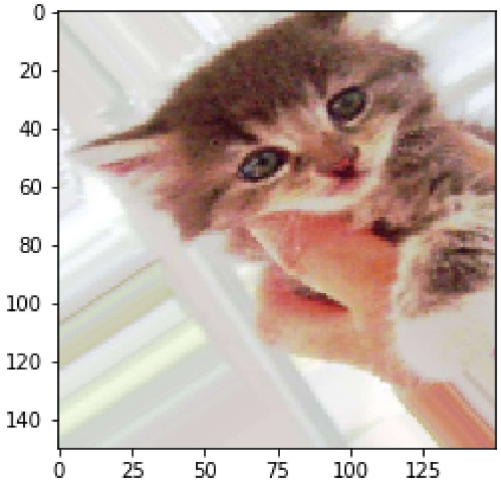


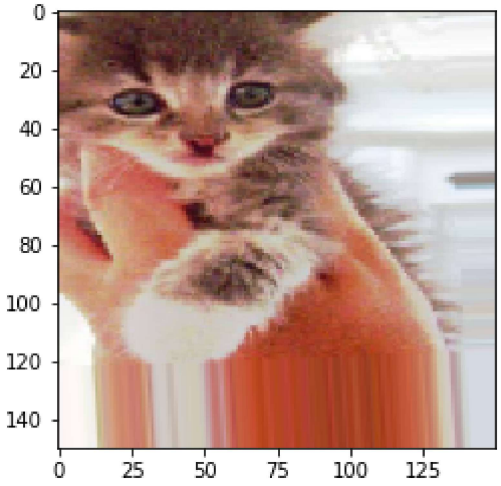


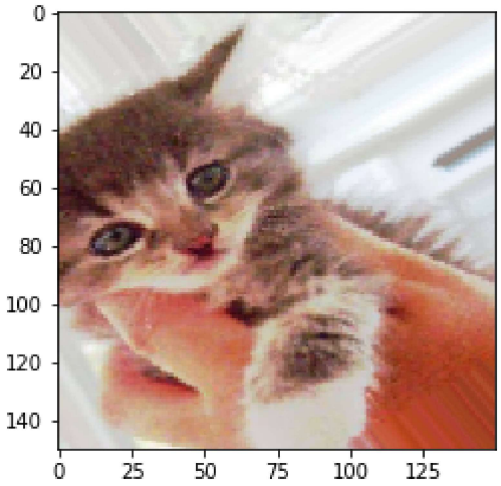
In [21]:
```
import os
from keras.preprocessing import image
fnames=[os.path.join(train_cats_dir,fname)
for fname in os.listdir(train_cats_dir)]
img_path=fnames[3]
img=image.load_img(img_path,target_size=(150,150))
```

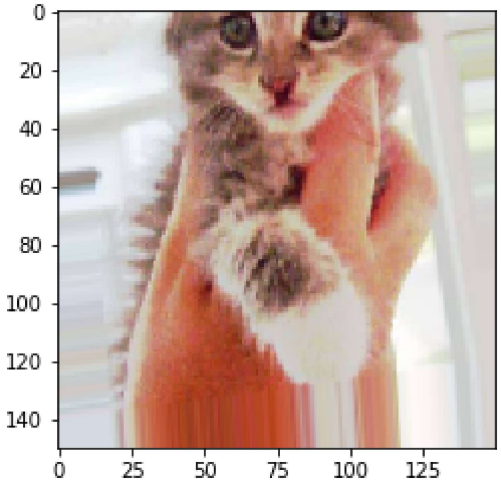
In [22]:
```
datagen=ImageDataGenerator(
    rotation_range=40,
    width_shift_range=0.2,
    height_shift_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    fill_mode='nearest')
```

In [23]:
```
x=image.img_to_array(img)
x=x.reshape((1,)+x.shape)
i=0
for batch in datagen.flow(x,batch_size=1):
    plt.figure(i)
    imgplot=plt.imshow(image.array_to_img(batch[0]))
    i+=1
    if i%4==0:
        break
plt.show()
```


0
20
40
60
80
100
120
140
0
25
50
75
100
125


0
20
40
60
80
100
120
140
0
25
50
75
100
125


0
20
40
60
80
100
120
140
0
25
50
75
100
125



In [24]:
```
model=models.Sequential()
model.add(layers.Conv2D(32,(3,3),activation='relu',
input_shape=(150,150,3)))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(64,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(128,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(128,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Flatten())
model.add(layers.Dropout(0.5))
model.add(layers.Dense(512,activation='relu'))
model.add(layers.Dense(1,activation='sigmoid'))
model.compile(loss='binary_crossentropy',
optimizer=optimizers.RMSprop(lr=1e-4),
metrics=['acc'])
```

```
WARNING:tensorflow:From C:\ProgramData\Anaconda3\lib\site-packages\keras\back
end\tensorflow_backend.py:3733: calling dropout (from tensorflow.python.ops.n
n_ops) with keep_prob is deprecated and will be removed in a future version.
Instructions for updating:
Please use `rate` instead of `keep_prob`. Rate should be set to `rate = 1 - k
eep_prob`.
```

In [25]:
```
train_datagen=ImageDataGenerator(
    rescale=1./255,
    rotation_range=40,
    width_shift_range=0.2,
    height_shift_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,)
test_datagen=ImageDataGenerator(rescale=1./255)
train_generator=train_datagen.flow_from_directory(
train_dir,
target_size=(150,150),
batch_size=32,
class_mode='binary')
validation_generator=test_datagen.flow_from_directory(
validation_dir,
target_size=(150,150),
batch_size=32,
class_mode='binary')
history=model.fit_generator(
train_generator,
steps_per_epoch=50,
epochs=4,
validation_data=validation_generator,
validation_steps=20)
```

```
Found 2000 images belonging to 2 classes.
Found 1000 images belonging to 2 classes.
Epoch 1/4
50/50 [==============================] - 96s 2s/step - loss: 0.6963 - acc: 0.
5194 - val_loss: 0.6908 - val_acc: 0.5453
Epoch 2/4
50/50 [==============================] - 109s 2s/step - loss: 0.6922 - acc:
0.5269 - val_loss: 0.6887 - val_acc: 0.5406
Epoch 3/4
50/50 [==============================] - 103s 2s/step - loss: 0.6870 - acc:
0.5282 - val_loss: 0.6743 - val_acc: 0.5734
Epoch 4/4
50/50 [==============================] - 98s 2s/step - loss: 0.6820 - acc: 0.
5700 - val_loss: 0.6527 - val_acc: 0.6364
```

In [26]:
```
from keras.applications  import VGG16
conv_base=VGG16(weights='imagenet',
include_top=False,
input_shape=(150,150,3))
```

```
Downloading data from https://github.com/fchollet/deep-learning-models/releas
es/download/v0.1/vgg16_weights_tf_dim_ordering_tf_kernels_notop.h5
58892288/58889256 [==============================] - 633s 11us/step
```

In [27]:
```
conv_base.summary()
```

```
Model: "vgg16"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
input_1 (InputLayer)         (None, 150, 150, 3)       0
_________________________________________________________________
block1_conv1 (Conv2D)        (None, 150, 150, 64)      1792
_________________________________________________________________
block1_conv2 (Conv2D)        (None, 150, 150, 64)      36928
_________________________________________________________________
block1_pool (MaxPooling2D)   (None, 75, 75, 64)        0
_________________________________________________________________
block2_conv1 (Conv2D)        (None, 75, 75, 128)       73856
_________________________________________________________________
block2_conv2 (Conv2D)        (None, 75, 75, 128)       147584
_________________________________________________________________
block2_pool (MaxPooling2D)   (None, 37, 37, 128)       0
_________________________________________________________________
block3_conv1 (Conv2D)        (None, 37, 37, 256)       295168
_________________________________________________________________
block3_conv2 (Conv2D)        (None, 37, 37, 256)       590080
_________________________________________________________________
block3_conv3 (Conv2D)        (None, 37, 37, 256)       590080
_________________________________________________________________
block3_pool (MaxPooling2D)   (None, 18, 18, 256)       0
_________________________________________________________________
block4_conv1 (Conv2D)        (None, 18, 18, 512)       1180160
_________________________________________________________________
block4_conv2 (Conv2D)        (None, 18, 18, 512)       2359808
_________________________________________________________________
block4_conv3 (Conv2D)        (None, 18, 18, 512)       2359808
_________________________________________________________________
block4_pool (MaxPooling2D)   (None, 9, 9, 512)         0
_________________________________________________________________
block5_conv1 (Conv2D)        (None, 9, 9, 512)         2359808
_________________________________________________________________
block5_conv2 (Conv2D)        (None, 9, 9, 512)         2359808
_________________________________________________________________
block5_conv3 (Conv2D)        (None, 9, 9, 512)         2359808
_________________________________________________________________
block5_pool (MaxPooling2D)   (None, 4, 4, 512)         0
=================================================================
Total params: 14,714,688
Trainable params: 14,714,688
Non-trainable params: 0
_________________________________________________________________
```

In [28]:
```
os.getcwd()
```

Out[28]:
```
'C:\\WINDOWS\\system32\\python'
```

In [ ]:
```

```