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Building powerful image classification models using very ...

05-Jun-2016 — In this tutorial, we will present a few simple yet effective methods that you can use to **build** a **powerful image classifier**, using only very ...

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The Keras Blog

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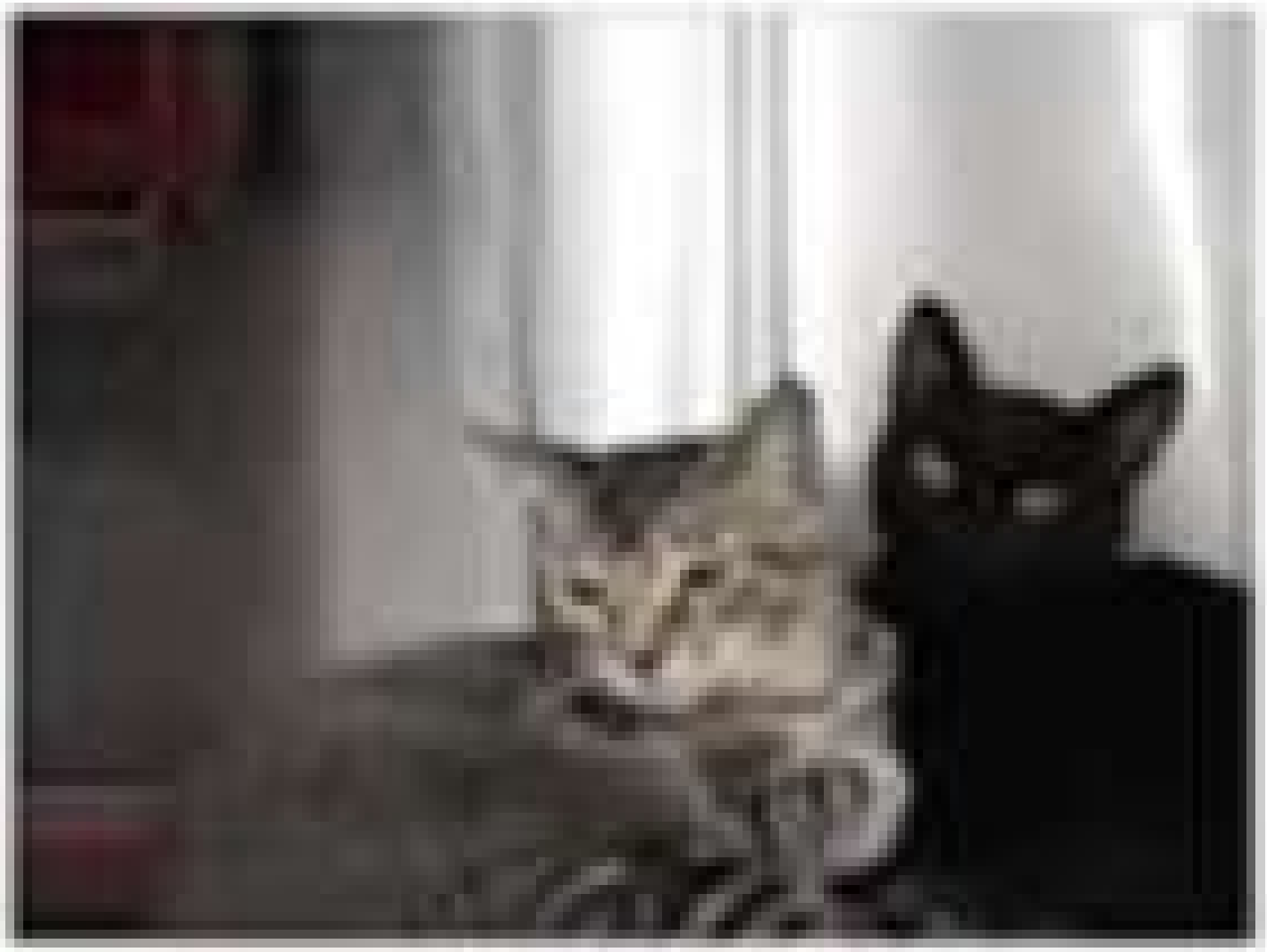

jupyter single-image-data-augumentation Last Checkpoint: 4 hours ago (autosaved)

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Trusted Python 3

Run Code

In [2]:
```
from keras.preprocessing import image
from keras.preprocessing.image import ImageDataGenerator
```

```
Using TensorFlow backend.
```

In [3]:
```
img = image.load_img('train/cat.18.jpg',target_size=(200,200))
```

In [5]:
```
type(img)
```

Out[5]:
```
PIL.Image.Image
```

In [36]:
```
datagen = ImageDataGenerator(
    rotation_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    vertical_flip=True,
    width_shift_range=0.2,
    height_shift_range=0.2,
)
```

In [7]:
```
img = image.img_to_array(img)
```

In [8]:
```
type(img)
```

Out[8]:
```
numpy.ndarray
```

In [38]:
```
img.shape
```

Out[38]:
```
(200, 200, 3)
```

In [39]:
```
input_batch = img.reshape(1,200,200,3)
```

In [40]:
```
i=0

for output in datagen.flow(input_batch,batch_size=1,save_to_dir='aug'):

    i = i + 1

    if i == 10:
        break
```

jupyter cat-dog-normal Last Checkpoint: 2 hours ago (autosaved)

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Trusted Python 3

Run Code

In [1]:
```
import cv2
import os
import random
import numpy as np
```

In [2]:
```
mydir = r'C:\Users\91842\batch 6\cnn-lecture-1\data\train'
```

In [3]:
```
categories = ['cats','dogs']
```

In [4]:
```
data = []

for i in categories:

    folder_path = os.path.join(mydir,i)

    if i == 'cats':
        label = 0
    else:
        label = 1
```

In [3]:
```
categories = ['cats','dogs']
```

In [4]:
```
data = []

for i in categories:

    folder_path = os.path.join(mydir,i)

    if i == 'cats':
        label = 0
    else:
        label = 1

    for j in os.listdir(folder_path):

        img_path = os.path.join(folder_path,j)
        img = cv2.imread(img_path)
        img = cv2.resize(img,(150,150))
        data.append([img,label])
```

```
        data.append([img,label])
```

In [5]:
```
random.shuffle(data)
```

In [6]:
```
X = []
y = []
for i in data:

    X.append(i[0])
    y.append(i[1])
```

In [7]:
```
y = np.array(y)
```

In [8]:
```
X = np.array(X)
```

In [9]:
```
X.shape
```

Out[9]:
```
(2000, 150, 150, 3)
```

In [7]:
```
y = np.array(y)
```

In [8]:
```
X = np.array(X)
```

In [9]:
```
X.shape
```

Out[9]:
```
(2000, 150, 150, 3)
```

In [10]:
```
X = X/255
```

```
from keras import Sequential
from keras.layers import Conv2D,MaxPooling2D,Dense,Flatten,Activation,Dropout
```

```
Using TensorFlow backend.
```

In [12]:

```
model = Sequential()
model.add(Conv2D(32, (3, 3), input_shape=(150, 150,3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(32, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(64, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
```

In [13]:
```
model.add(Flatten())  # this converts our 3D feature maps to 1D feature vectors
model.add(Dense(64))
model.add(Activation('relu'))
model.add(Dropout(0.5))
model.add(Dense(1))
model.add(Activation('sigmoid'))

model.compile(loss='binary_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])
```

In [14]:
```
model.fit(X,y,epochs=5,validation_split=0.1)
```

```
Train on 1800 samples, validate on 200 samples
Epoch 1/5
1800/1800 [==============================] - 12s 6ms/step - loss: 0.7444 - accuracy: 0.5244 - val_loss: 0.6911 - val_accuracy:
0.5050
Epoch 2/5
1800/1800 [==============================] - 5s 3ms/step - loss: 0.6903 - accuracy: 0.5561 - val_loss: 0.6895 - val_accuracy:
```

In [14]:
```
model.fit(X,y,epochs=5,validation_split=0.1)
```

```
Train on 1800 samples, validate on 200 samples
Epoch 1/5
1800/1800 [==============================] - 12s 6ms/step - loss: 0.7444 - accuracy: 0.5244 - val_loss: 0.6911 - val_accuracy:
0.5050
Epoch 2/5
1800/1800 [==============================] - 5s 3ms/step - loss: 0.6903 - accuracy: 0.5561 - val_loss: 0.6895 - val_accuracy:
0.5350
Epoch 3/5
1800/1800 [==============================] - 5s 3ms/step - loss: 0.6558 - accuracy: 0.6217 - val_loss: 0.6386 - val_accuracy:
0.6600
Epoch 4/5
1800/1800 [==============================] - 5s 3ms/step - loss: 0.6338 - accuracy: 0.6817 - val_loss: 0.6079 - val_accuracy:
0.7150
Epoch 5/5
1800/1800 [==============================] - 5s 3ms/step - loss: 0.5640 - accuracy: 0.7261 - val_loss: 0.7446 - val_accuracy:
0.5750
```

Out[14]:
```
<keras.callbacks.callbacks.History at 0x27bd62d2088>
```

In [ ]:

jupyter cat-dogs-with-data-augmentation Last Checkpoint: 10 hours ago (autosaved)

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Trusted Python 3

Run Code

In [15]:
```
from keras.preprocessing.image import ImageDataGenerator
```

In [16]:
```
batch_size = 16

# this is the augmentation configuration we will use for training
train_datagen = ImageDataGenerator(
        rescale=1./255,
        shear_range=0.2,
        zoom_range=0.2,
        horizontal_flip=True)

# this is the augmentation configuration we will use for testing:
# only rescaling
test_datagen = ImageDataGenerator(rescale=1./255)

# this is a generator that will read pictures found in
# subfolers of 'data/train', and indefinitely generate
# batches of augmented image data
```

```
# this is a generator that will read pictures found in
# subfolers of 'data/train', and indefinitely generate
# batches of augmented image data
train_generator = train_datagen.flow_from_directory(
        'data/train',  # this is the target directory
        target_size=(150, 150),  # all images will be resized to 150x150
        batch_size=batch_size,
        class_mode='binary')  # since we use binary_crossentropy loss, we need binary labels

# this is a similar generator, for validation data
validation_generator = test_datagen.flow_from_directory(
        'data/valid',
        target_size=(150, 150),
        batch_size=batch_size,
        class_mode='binary')
```

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

In [17]:

```
from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D
from keras.layers import Activation, Dropout, Flatten, Dense

model = Sequential()
model.add(Conv2D(32, (3, 3), input_shape=(150, 150,3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(32, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(64, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
```

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

In [17]:
```
from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D
from keras.layers import Activation, Dropout, Flatten, Dense

model = Sequential()
model.add(Conv2D(32, (3, 3), input_shape=(150, 150,3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(32, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Conv2D(64, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
```

In [18]:
```
model.add(Flatten())  # this converts our 3D feature maps to 1D feature vectors
model.add(Dense(64))
model.add(Activation('relu'))
```

```
model.add(Activation('relu'))
model.add(Dropout(0.5))
model.add(Dense(1))
model.add(Activation('sigmoid'))

model.compile(loss='binary_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])
```

In [19]:

```
model.fit_generator(
        train_generator,
        steps_per_epoch=2000 // batch_size,
        epochs=25,
        validation_data=validation_generator,
        validation_steps=800 // batch_size)
```

```
Epoch 1/25
125/125 [==============================] - 37s 293ms/step - loss: 0.7147 - accuracy: 0.5465 - val_loss: 0.6834 - val_accuracy:
0.5088
Epoch 2/25
125/125 [==============================] - 34s 271ms/step - loss: 0.6867 - accuracy: 0.5770 - val_loss: 0.6183 - val_accuracy:
0.6338
Epoch 3/25
125/125 [==============================] - 34s 272ms/step - loss: 0.6357 - accuracy: 0.6365 - val_loss: 0.8259 - val_accuracy:
0.5770
```

```
Epoch 1/25
125/125 [==============================] - 37s 293ms/step - loss: 0.7147 - accuracy: 0.5465 - val_loss: 0.6834 - val_accuracy:
0.5088
Epoch 2/25
125/125 [==============================] - 34s 271ms/step - loss: 0.6867 - accuracy: 0.5770 - val_loss: 0.6183 - val_accuracy:
0.6338
Epoch 3/25
125/125 [==============================] - 34s 272ms/step - loss: 0.6357 - accuracy: 0.6365 - val_loss: 0.8259 - val_accuracy:
0.5770
Epoch 4/25
125/125 [==============================] - 31s 250ms/step - loss: 0.6191 - accuracy: 0.6745 - val_loss: 0.3901 - val_accuracy:
0.7172
Epoch 5/25
125/125 [==============================] - 34s 275ms/step - loss: 0.6031 - accuracy: 0.6955 - val_loss: 0.6000 - val_accuracy:
0.6925
```

```
Epoch 20/25
125/125 [==============================] - 54s 436ms/step - loss: 0.4234 - accuracy: 0.8125 - val_loss: 0.6448 - val_accuracy:
0.7400
Epoch 21/25
125/125 [==============================] - 58s 462ms/step - loss: 0.4118 - accuracy: 0.8220 - val_loss: 1.1208 - val_accuracy:
0.7449
Epoch 22/25
125/125 [==============================] - 56s 445ms/step - loss: 0.4186 - accuracy: 0.8040 - val_loss: 0.4275 - val_accuracy:
0.7576
Epoch 23/25
125/125 [==============================] - 54s 435ms/step - loss: 0.4092 - accuracy: 0.8220 - val_loss: 0.6022 - val_accuracy:
0.7348
Epoch 24/25
125/125 [==============================] - 53s 423ms/step - loss: 0.4064 - accuracy: 0.8275 - val_loss: 0.5712 - val_accuracy:
0.7399
Epoch 25/25
125/125 [==============================] - 40s 322ms/step - loss: 0.4065 - accuracy: 0.8230 - val_loss: 0.3671 - val_accuracy:
0.7487
```

Out[19]: <keras.callbacks.callbacks.History at 0x29276314ec8>

In [ ]: