Cat vs Dod Audio Claaification using Mfccs

1: Extracting data into Dataframe (Train/Test)

2: Feature Extraction using MFccs and librosa module

3: Train test data creation

4: Modle building and training

5: Visualisations

In [1]:

```
#Importing the required libraries

import pandas as pd
import numpy as np
import os
import librosa
import tensorflow as tf
import librosa.display
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder,OneHotEncoder
import tensorflow.keras.layers as layers
from sklearn.metrics import confusion_matrix,classification_report,accuracy_s
```

In [6]:

```
pwd
```

Out[6]:

```
'/home/honey/Desktop/Vidyashilp-Assignment/Task1'
```

1: Extracting data into Dataframe (Train/Test)

In [17]:

```
#Function to generate the train data
def generate_Train_data(directory):
    names = []
    label_names = []
    for folder in os.listdir(directory):
        #for each folder in cat and dog get the respective files
        for filename in os.listdir(directory + '/' + str(folder)):
            #for each file
            f = os.path.join(directory + '/' + str(folder), filename)
            names.append(f.split('/')[-1])
            label_names.append(f.split('/')[-2])
    return names, label_names

def generate_Test_data(directory):
    #test data creator
    names=[]
    label_names=[]
    for folder in os.listdir(directory):
        #print("folder = ", folder)
        for filename in os.listdir(directory + '/' + str(folder)):
            f = os.path.join(directory + '/' + str(folder), filename)
            names.append(f.split('/')[-1])
            label_names.append(f.split('/')[-2])
```

```
    for i in range(len(label)):
        if(label[i]=='test'):
            label[i]='dogs'

    return names, label_names
```

In [18]:

```
#calling the above function to generate train and test data
name, label = generate_Train_data('input/cats_dogs/train')
Tname, Tlabel = generate_Test_data('input/cats_dogs/test')
train_data = pd.DataFrame({'name': name, 'label': label})
test_data = pd.DataFrame({'name': Tname, 'label': Tlabel})
```

2: Feature Extraction using MFccs and librosa module

In [24]:

```
def get_features(directory):
    features=[]
    names=[]
    #loop through the folder
    for folder in os.listdir(directory):
        #print("folder = ", folder)
        for filename in os.listdir(directory+ '/' + str(folder)):
            f = os.path.join(directory + '/' + str(folder), filename)
            #useing librosa we get the required audio format
            x,sr = librosa.load(f,sr=None)
            #extracted x is used to get mfccs as using librosa's feature.mfcc
            mfccs= np.mean(librosa.feature.mfcc(x,sr=sr,n_mfcc=100).T,axis=0)
            features.append(mfccs)
            names.append(f.split('/')[-1])
    return [names, features]
```

In [47]:

```
names, train_features = get_features('input/cats_dogs/train')
T_names, test_features = get_features('input/cats_dogs/test')
```

In [31]:

```
print("train_features = ", len(train_features))
```

```
train_features =  210
```

3: Train test data creation

In [32]:

```
#creating trainig and testing dataset using the feature extracted
X_train =np.array(train_features)
X_test =np.array(test_features)
Y_train=train_data.label
Y_test=test_data.label
```

In [33]:

```
Y_train=LabelEncoder().fit_transform(Y_train).reshape(-1,1)
Y_test =LabelEncoder().fit_transform(Y_test).reshape(-1,1)


print("Y_train shape = ", Y_train.shape)
print("Y_test shape = ", Y_test.shape)
print("X_train shape = ", X_train.shape)
print("Y_test shape = ", X_test.shape)
```

```
Y_train shape =  (210, 1)
Y_test shape =  (67, 1)
X_train shape =  (210, 100)
Y_test shape =  (67, 100)
```

4: Modle building and training

In [51]:

```
def build_model():
    model=tf.keras.Sequential()
    model.add(layers.Dense(input_shape=(100,), units= 200,activation='relu'))
    model.add(layers.Dense(150,activation='relu'))
    model.add(layers.Dense(200,activation='relu'))
    model.add(layers.Dense(1,activation='sigmoid'))

    return model

def build_model2():
    model=tf.keras.Sequential()
    model.add(layers.Dense(input_shape=(100,), units= 200,activation='relu'))
    model.add(layers.Dense(25,activation='relu'))
    model.add(layers.Dense(25,activation='relu'))
    model.add(layers.Dense(1,activation='sigmoid'))

    return model
```

In [53]:

```
model = build_model()
model2 = build_model2()
model.summary()
model.compile(optimizer='sgd',loss='binary_crossentropy',metrics=['accuracy']
hist=model.fit(X_train,Y_train,epochs=100,validation_data = (X_test,Y_test))
```

```
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense_16 (Dense)             (None, 200)               20200
_________________________________________________________________
dense_17 (Dense)             (None, 150)               30150
_________________________________________________________________
dense_18 (Dense)             (None, 200)               30200
_________________________________________________________________
dense_19 (Dense)             (None, 1)                 201
=================================================================
Total params: 80,751
Trainable params: 80,751
Non-trainable params: 0
_________________________________________________________________
Epoch 1/100
7/7 [==============================] - 1s 143ms/step - loss: 29.3328 - accura
cy: 0.6143 - val_loss: 2.3882 - val_accuracy: 0.4179
Epoch 2/100
7/7 [==============================] - 0s 4ms/step - loss: 1.0463 - accuracy:
0.6286 - val_loss: 0.5220 - val_accuracy: 0.7612
Epoch 3/100
7/7 [==============================] - 0s 4ms/step - loss: 0.4602 - accuracy:
0.8000 - val_loss: 0.4511 - val_accuracy: 0.8209
Epoch 4/100
7/7 [==============================] - 0s 4ms/step - loss: 0.5648 - accuracy:
0.7571 - val_loss: 0.5065 - val_accuracy: 0.7164
Epoch 5/100
```

```
7/7 [==============================] - 0s 4ms/step - loss: 0.4478 - accuracy: 
0.8190 - val_loss: 0.5619 - val_accuracy: 0.6119
Epoch 6/100
7/7 [==============================] - 0s 5ms/step - loss: 0.4601 - accuracy: 
0.7524 - val_loss: 0.3780 - val_accuracy: 0.8358
Epoch 7/100
7/7 [==============================] - 0s 5ms/step - loss: 0.3570 - accuracy: 
0.8714 - val_loss: 0.3920 - val_accuracy: 0.8358
Epoch 8/100
7/7 [==============================] - 0s 8ms/step - loss: 0.4336 - accuracy: 
0.8048 - val_loss: 0.3714 - val_accuracy: 0.8657
Epoch 9/100
7/7 [==============================] - 0s 5ms/step - loss: 0.3313 - accuracy: 
0.8714 - val_loss: 0.3236 - val_accuracy: 0.8657
Epoch 10/100
7/7 [==============================] - 0s 5ms/step - loss: 0.3680 - accuracy: 
0.8619 - val_loss: 0.3233 - val_accuracy: 0.8806
Epoch 11/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3097 - accuracy: 
0.8857 - val_loss: 0.4864 - val_accuracy: 0.7313
Epoch 12/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3636 - accuracy: 
0.8476 - val_loss: 0.2897 - val_accuracy: 0.9104
Epoch 13/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3064 - accuracy: 
0.8762 - val_loss: 0.6202 - val_accuracy: 0.7612
Epoch 14/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3699 - accuracy: 
0.8524 - val_loss: 0.3341 - val_accuracy: 0.8657
Epoch 15/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2627 - accuracy: 
0.8810 - val_loss: 0.4378 - val_accuracy: 0.8209
Epoch 16/100
7/7 [==============================] - 0s 4ms/step - loss: 0.4052 - accuracy: 
0.8333 - val_loss: 0.3134 - val_accuracy: 0.8806
Epoch 17/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2512 - accuracy: 
0.9000 - val_loss: 0.3266 - val_accuracy: 0.8657
Epoch 18/100
7/7 [==============================] - 0s 5ms/step - loss: 0.3482 - accuracy: 
0.8333 - val_loss: 0.3177 - val_accuracy: 0.8955
Epoch 19/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3055 - accuracy: 
0.8857 - val_loss: 0.4002 - val_accuracy: 0.8358
Epoch 20/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2372 - accuracy: 
0.9048 - val_loss: 0.2937 - val_accuracy: 0.8955
Epoch 21/100
7/7 [==============================] - 0s 4ms/step - loss: 0.5491 - accuracy: 
0.7952 - val_loss: 0.3258 - val_accuracy: 0.8955
Epoch 22/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2914 - accuracy: 
0.8952 - val_loss: 0.3015 - val_accuracy: 0.8806
Epoch 23/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2476 - accuracy: 
0.9095 - val_loss: 0.2973 - val_accuracy: 0.9254
Epoch 24/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2325 - accuracy: 
0.9190 - val_loss: 0.4888 - val_accuracy: 0.7015
Epoch 25/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2183 - accuracy: 
0.9190 - val_loss: 0.2789 - val_accuracy: 0.8955
Epoch 26/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3203 - accuracy: 
0.8667 - val_loss: 0.3113 - val_accuracy: 0.8657
```

```
Epoch 27/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3271 - accuracy:
0.8667 - val_loss: 0.4107 - val_accuracy: 0.8209
Epoch 28/100
7/7 [==============================] - 0s 5ms/step - loss: 0.2190 - accuracy:
0.9095 - val_loss: 0.5170 - val_accuracy: 0.6866
Epoch 29/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2744 - accuracy:
0.8810 - val_loss: 0.2804 - val_accuracy: 0.9104
Epoch 30/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1853 - accuracy:
0.9429 - val_loss: 0.3024 - val_accuracy: 0.8657
Epoch 31/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1765 - accuracy:
0.9429 - val_loss: 0.3331 - val_accuracy: 0.8507
Epoch 32/100
7/7 [==============================] - 0s 5ms/step - loss: 0.2892 - accuracy:
0.8810 - val_loss: 0.2928 - val_accuracy: 0.8955
Epoch 33/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2000 - accuracy:
0.9381 - val_loss: 0.4645 - val_accuracy: 0.8060
Epoch 34/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2407 - accuracy:
0.9000 - val_loss: 0.2895 - val_accuracy: 0.8955
Epoch 35/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1897 - accuracy:
0.9286 - val_loss: 0.2785 - val_accuracy: 0.8657
Epoch 36/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1607 - accuracy:
0.9524 - val_loss: 0.2231 - val_accuracy: 0.9254
Epoch 37/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1926 - accuracy:
0.9190 - val_loss: 1.1845 - val_accuracy: 0.6567
Epoch 38/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3419 - accuracy:
0.9048 - val_loss: 0.3504 - val_accuracy: 0.8507
Epoch 39/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2820 - accuracy:
0.8905 - val_loss: 0.3556 - val_accuracy: 0.8358
Epoch 40/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1423 - accuracy:
0.9571 - val_loss: 0.2720 - val_accuracy: 0.9104
Epoch 41/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1487 - accuracy:
0.9619 - val_loss: 0.2577 - val_accuracy: 0.9254
Epoch 42/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2432 - accuracy:
0.8857 - val_loss: 0.2926 - val_accuracy: 0.8806
Epoch 43/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2345 - accuracy:
0.8905 - val_loss: 0.3883 - val_accuracy: 0.8358
Epoch 44/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1946 - accuracy:
0.9333 - val_loss: 0.3409 - val_accuracy: 0.8507
Epoch 45/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1624 - accuracy:
0.9476 - val_loss: 0.3084 - val_accuracy: 0.8657
Epoch 46/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1276 - accuracy:
0.9667 - val_loss: 0.2818 - val_accuracy: 0.9104
Epoch 47/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1309 - accuracy:
0.9667 - val_loss: 0.2647 - val_accuracy: 0.9104
Epoch 48/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1235 - accuracy:
```

```
0.9571 - val_loss: 0.3107 - val_accuracy: 0.8657
Epoch 49/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2289 - accuracy:
0.8952 - val_loss: 0.3925 - val_accuracy: 0.8060
Epoch 50/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1647 - accuracy:
0.9476 - val_loss: 0.2462 - val_accuracy: 0.9104
Epoch 51/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1331 - accuracy:
0.9667 - val_loss: 0.2274 - val_accuracy: 0.8955
Epoch 52/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1263 - accuracy:
0.9667 - val_loss: 0.2860 - val_accuracy: 0.8806
Epoch 53/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1600 - accuracy:
0.9429 - val_loss: 0.2409 - val_accuracy: 0.9104
Epoch 54/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1572 - accuracy:
0.9095 - val_loss: 0.2901 - val_accuracy: 0.9104
Epoch 55/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1948 - accuracy:
0.9333 - val_loss: 0.2793 - val_accuracy: 0.8657
Epoch 56/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1191 - accuracy:
0.9762 - val_loss: 0.2360 - val_accuracy: 0.8955
Epoch 57/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2427 - accuracy:
0.9095 - val_loss: 0.4769 - val_accuracy: 0.7612
Epoch 58/100
7/7 [==============================] - 0s 4ms/step - loss: 0.3175 - accuracy:
0.8571 - val_loss: 0.2978 - val_accuracy: 0.9104
Epoch 59/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1747 - accuracy:
0.9476 - val_loss: 0.2534 - val_accuracy: 0.9104
Epoch 60/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1677 - accuracy:
0.9333 - val_loss: 0.2307 - val_accuracy: 0.9104
Epoch 61/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1789 - accuracy:
0.9429 - val_loss: 0.4208 - val_accuracy: 0.8209
Epoch 62/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1548 - accuracy:
0.9333 - val_loss: 0.2262 - val_accuracy: 0.9104
Epoch 63/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1345 - accuracy:
0.9667 - val_loss: 0.2264 - val_accuracy: 0.9254
Epoch 64/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0972 - accuracy:
0.9762 - val_loss: 0.5093 - val_accuracy: 0.7612
Epoch 65/100
7/7 [==============================] - 0s 5ms/step - loss: 0.3017 - accuracy:
0.8810 - val_loss: 0.3179 - val_accuracy: 0.8955
Epoch 66/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1649 - accuracy:
0.9476 - val_loss: 0.3413 - val_accuracy: 0.8507
Epoch 67/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1156 - accuracy:
0.9714 - val_loss: 0.2732 - val_accuracy: 0.8955
Epoch 68/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1141 - accuracy:
0.9667 - val_loss: 0.2276 - val_accuracy: 0.9254
Epoch 69/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1062 - accuracy:
0.9571 - val_loss: 0.2312 - val_accuracy: 0.9104
Epoch 70/100
```

```
7/7 [==============================] - 0s 4ms/step - loss: 0.1043 - accuracy:
0.9714 - val_loss: 0.2465 - val_accuracy: 0.9104
Epoch 71/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0898 - accuracy:
0.9857 - val_loss: 0.2221 - val_accuracy: 0.9254
Epoch 72/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0911 - accuracy:
0.9857 - val_loss: 0.3288 - val_accuracy: 0.8806
Epoch 73/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1028 - accuracy:
0.9619 - val_loss: 0.2801 - val_accuracy: 0.9104
Epoch 74/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1756 - accuracy:
0.9190 - val_loss: 0.3365 - val_accuracy: 0.8657
Epoch 75/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1798 - accuracy:
0.9238 - val_loss: 0.2433 - val_accuracy: 0.9104
Epoch 76/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0928 - accuracy:
0.9810 - val_loss: 0.3222 - val_accuracy: 0.8358
Epoch 77/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0968 - accuracy:
0.9762 - val_loss: 0.2314 - val_accuracy: 0.9254
Epoch 78/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1600 - accuracy:
0.9429 - val_loss: 0.2790 - val_accuracy: 0.8955
Epoch 79/100
7/7 [==============================] - 0s 5ms/step - loss: 0.1031 - accuracy:
0.9714 - val_loss: 0.2248 - val_accuracy: 0.9254
Epoch 80/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0817 - accuracy:
0.9762 - val_loss: 0.7340 - val_accuracy: 0.8060
Epoch 81/100
7/7 [==============================] - 0s 5ms/step - loss: 0.2576 - accuracy:
0.9095 - val_loss: 0.4483 - val_accuracy: 0.8060
Epoch 82/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0896 - accuracy:
0.9762 - val_loss: 0.2551 - val_accuracy: 0.9254
Epoch 83/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0933 - accuracy:
0.9619 - val_loss: 0.2805 - val_accuracy: 0.8955
Epoch 84/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0691 - accuracy:
0.9857 - val_loss: 0.2901 - val_accuracy: 0.9104
Epoch 85/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0637 - accuracy:
0.9905 - val_loss: 0.3039 - val_accuracy: 0.8806
Epoch 86/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1023 - accuracy:
0.9619 - val_loss: 0.2969 - val_accuracy: 0.9104
Epoch 87/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0616 - accuracy:
0.9952 - val_loss: 0.2868 - val_accuracy: 0.9104
Epoch 88/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1135 - accuracy:
0.9524 - val_loss: 0.2760 - val_accuracy: 0.9104
Epoch 89/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0767 - accuracy:
0.9810 - val_loss: 0.3516 - val_accuracy: 0.8209
Epoch 90/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1558 - accuracy:
0.9429 - val_loss: 0.2806 - val_accuracy: 0.9104
Epoch 91/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0984 - accuracy:
0.9667 - val_loss: 0.2635 - val_accuracy: 0.9254
```

```
Epoch 92/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0636 - accuracy:
0.9857 - val_loss: 0.2550 - val_accuracy: 0.9104
Epoch 93/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0624 - accuracy:
0.9857 - val_loss: 0.2568 - val_accuracy: 0.9403
Epoch 94/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0604 - accuracy:
0.9857 - val_loss: 0.3107 - val_accuracy: 0.8358
Epoch 95/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2411 - accuracy:
0.9286 - val_loss: 0.2956 - val_accuracy: 0.9254
Epoch 96/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0879 - accuracy:
0.9810 - val_loss: 0.2915 - val_accuracy: 0.9104
Epoch 97/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1022 - accuracy:
0.9667 - val_loss: 0.2221 - val_accuracy: 0.9403
Epoch 98/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0767 - accuracy:
0.9857 - val_loss: 0.2791 - val_accuracy: 0.9104
Epoch 99/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0616 - accuracy:
0.9905 - val_loss: 0.2343 - val_accuracy: 0.9254
Epoch 100/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0458 - accuracy:
0.9905 - val_loss: 0.2955 - val_accuracy: 0.8507
```

In [54]:

```
model2.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy
hist2=model.fit(X_train,Y_train,epochs=100,validation_data = (X_test,Y_test))
```

```
Epoch 1/100
7/7 [==============================] - 0s 7ms/step - loss: 0.0694 - accuracy:
0.9714 - val_loss: 0.4927 - val_accuracy: 0.7761
Epoch 2/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0479 - accuracy:
0.9952 - val_loss: 0.2975 - val_accuracy: 0.8955
Epoch 3/100
7/7 [==============================] - 0s 6ms/step - loss: 0.1216 - accuracy:
0.9667 - val_loss: 0.3203 - val_accuracy: 0.8806
Epoch 4/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0619 - accuracy:
0.9857 - val_loss: 0.2508 - val_accuracy: 0.9254
Epoch 5/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0528 - accuracy:
0.9905 - val_loss: 0.3387 - val_accuracy: 0.8507
Epoch 6/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0576 - accuracy:
0.9905 - val_loss: 0.2850 - val_accuracy: 0.9254
Epoch 7/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0432 - accuracy:
0.9952 - val_loss: 0.3027 - val_accuracy: 0.8507
Epoch 8/100
7/7 [==============================] - 0s 3ms/step - loss: 0.1565 - accuracy:
0.9333 - val_loss: 0.3764 - val_accuracy: 0.8358
Epoch 9/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0918 - accuracy:
0.9571 - val_loss: 0.3132 - val_accuracy: 0.8806
Epoch 10/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0972 - accuracy:
0.9714 - val_loss: 0.2487 - val_accuracy: 0.9254
Epoch 11/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0451 - accuracy:
0.9952 - val_loss: 0.2623 - val_accuracy: 0.9104
```

```
Epoch 12/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0595 - accuracy:
0.9810 - val_loss: 0.2826 - val_accuracy: 0.9254
Epoch 13/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0919 - accuracy:
0.9714 - val_loss: 0.3058 - val_accuracy: 0.9254
Epoch 14/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0471 - accuracy:
0.9905 - val_loss: 1.1377 - val_accuracy: 0.6119
Epoch 15/100
7/7 [==============================] - 0s 4ms/step - loss: 0.2823 - accuracy:
0.9000 - val_loss: 0.3372 - val_accuracy: 0.8657
Epoch 16/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0832 - accuracy:
0.9810 - val_loss: 0.3736 - val_accuracy: 0.8806
Epoch 17/100
7/7 [==============================] - 0s 3ms/step - loss: 0.2552 - accuracy:
0.8905 - val_loss: 0.3380 - val_accuracy: 0.8657
Epoch 18/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0878 - accuracy:
0.9810 - val_loss: 0.2620 - val_accuracy: 0.9104
Epoch 19/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1099 - accuracy:
0.9667 - val_loss: 0.3538 - val_accuracy: 0.8657
Epoch 20/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0620 - accuracy:
0.9857 - val_loss: 0.2788 - val_accuracy: 0.9104
Epoch 21/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0661 - accuracy:
0.9762 - val_loss: 0.2839 - val_accuracy: 0.9104
Epoch 22/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0379 - accuracy:
0.9952 - val_loss: 0.2996 - val_accuracy: 0.9104
Epoch 23/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0553 - accuracy:
0.9810 - val_loss: 0.2809 - val_accuracy: 0.8955
Epoch 24/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0601 - accuracy:
0.9857 - val_loss: 0.3154 - val_accuracy: 0.8806
Epoch 25/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0672 - accuracy:
0.9857 - val_loss: 0.3112 - val_accuracy: 0.8806
Epoch 26/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0512 - accuracy:
0.9905 - val_loss: 0.3117 - val_accuracy: 0.8955
Epoch 27/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0589 - accuracy:
0.9810 - val_loss: 0.2966 - val_accuracy: 0.9104
Epoch 28/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0441 - accuracy:
0.9905 - val_loss: 0.3096 - val_accuracy: 0.9104
Epoch 29/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0429 - accuracy:
0.9905 - val_loss: 0.3307 - val_accuracy: 0.9104
Epoch 30/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0328 - accuracy:
0.9952 - val_loss: 0.3016 - val_accuracy: 0.8955
Epoch 31/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0370 - accuracy:
0.9952 - val_loss: 0.2812 - val_accuracy: 0.9104
Epoch 32/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1054 - accuracy:
0.9619 - val_loss: 0.3555 - val_accuracy: 0.8955
Epoch 33/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1398 - accuracy:
```

```
0.9524 - val_loss: 0.2482 - val_accuracy: 0.9254
Epoch 34/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0734 - accuracy:
0.9714 - val_loss: 0.2781 - val_accuracy: 0.9254
Epoch 35/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0349 - accuracy:
0.9905 - val_loss: 0.2884 - val_accuracy: 0.8955
Epoch 36/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0308 - accuracy:
0.9952 - val_loss: 0.3285 - val_accuracy: 0.8806
Epoch 37/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0329 - accuracy:
0.9952 - val_loss: 0.2942 - val_accuracy: 0.9254
Epoch 38/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0522 - accuracy:
0.9857 - val_loss: 0.7950 - val_accuracy: 0.7164
Epoch 39/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1445 - accuracy:
0.9429 - val_loss: 0.3103 - val_accuracy: 0.9104
Epoch 40/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0376 - accuracy:
0.9905 - val_loss: 0.4597 - val_accuracy: 0.8358
Epoch 41/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0973 - accuracy:
0.9619 - val_loss: 0.3254 - val_accuracy: 0.8955
Epoch 42/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0346 - accuracy:
0.9905 - val_loss: 0.3007 - val_accuracy: 0.9104
Epoch 43/100
7/7 [==============================] - 0s 3ms/step - loss: 0.0239 - accuracy:
1.0000 - val_loss: 0.3226 - val_accuracy: 0.9104
Epoch 44/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0327 - accuracy:
0.9952 - val_loss: 0.3243 - val_accuracy: 0.9104
Epoch 45/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0370 - accuracy:
0.9952 - val_loss: 0.2911 - val_accuracy: 0.8955
Epoch 46/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0269 - accuracy:
0.9952 - val_loss: 0.3272 - val_accuracy: 0.9104
Epoch 47/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0254 - accuracy:
0.9952 - val_loss: 0.3151 - val_accuracy: 0.9254
Epoch 48/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0407 - accuracy:
0.9810 - val_loss: 0.3993 - val_accuracy: 0.8955
Epoch 49/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0458 - accuracy:
0.9905 - val_loss: 0.3300 - val_accuracy: 0.9104
Epoch 50/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0323 - accuracy:
0.9905 - val_loss: 0.3662 - val_accuracy: 0.8806
Epoch 51/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0770 - accuracy:
0.9762 - val_loss: 0.9515 - val_accuracy: 0.7015
Epoch 52/100
7/7 [==============================] - 0s 5ms/step - loss: 0.2603 - accuracy:
0.8952 - val_loss: 0.2424 - val_accuracy: 0.9552
Epoch 53/100
7/7 [==============================] - 0s 4ms/step - loss: 0.1211 - accuracy:
0.9619 - val_loss: 0.2826 - val_accuracy: 0.9104
Epoch 54/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0600 - accuracy:
0.9810 - val_loss: 0.2760 - val_accuracy: 0.9104
Epoch 55/100
```

```
7/7 [==============================] - 0s 5ms/step - loss: 0.0317 - accuracy:
0.9952 - val_loss: 0.2913 - val_accuracy: 0.9104
Epoch 56/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0300 - accuracy:
0.9952 - val_loss: 0.3319 - val_accuracy: 0.8657
Epoch 57/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0621 - accuracy:
0.9905 - val_loss: 0.4461 - val_accuracy: 0.7910
Epoch 58/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0614 - accuracy:
0.9762 - val_loss: 0.2887 - val_accuracy: 0.8955
Epoch 59/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0285 - accuracy:
0.9905 - val_loss: 0.3894 - val_accuracy: 0.8657
Epoch 60/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0239 - accuracy:
1.0000 - val_loss: 0.3274 - val_accuracy: 0.9104
Epoch 61/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0396 - accuracy:
0.9810 - val_loss: 0.3839 - val_accuracy: 0.8507
Epoch 62/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0668 - accuracy:
0.9762 - val_loss: 0.2876 - val_accuracy: 0.9104
Epoch 63/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0208 - accuracy:
0.9952 - val_loss: 0.3314 - val_accuracy: 0.8358
Epoch 64/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0502 - accuracy:
0.9905 - val_loss: 0.3580 - val_accuracy: 0.9254
Epoch 65/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0310 - accuracy:
0.9857 - val_loss: 0.3287 - val_accuracy: 0.9104
Epoch 66/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0247 - accuracy:
0.9952 - val_loss: 0.3264 - val_accuracy: 0.9104
Epoch 67/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0239 - accuracy:
0.9905 - val_loss: 0.3387 - val_accuracy: 0.8955
Epoch 68/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0300 - accuracy:
0.9905 - val_loss: 0.4784 - val_accuracy: 0.8358
Epoch 69/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0570 - accuracy:
0.9714 - val_loss: 0.3411 - val_accuracy: 0.9104
Epoch 70/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0316 - accuracy:
0.9952 - val_loss: 0.3523 - val_accuracy: 0.9104
Epoch 71/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0196 - accuracy:
1.0000 - val_loss: 0.3521 - val_accuracy: 0.8955
Epoch 72/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0332 - accuracy:
0.9857 - val_loss: 0.3918 - val_accuracy: 0.8806
Epoch 73/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0306 - accuracy:
0.9905 - val_loss: 0.3447 - val_accuracy: 0.8955
Epoch 74/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0315 - accuracy:
0.9857 - val_loss: 0.3899 - val_accuracy: 0.8358
Epoch 75/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0270 - accuracy:
1.0000 - val_loss: 0.3333 - val_accuracy: 0.9104
Epoch 76/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0430 - accuracy:
0.9857 - val_loss: 0.3347 - val_accuracy: 0.9104
```

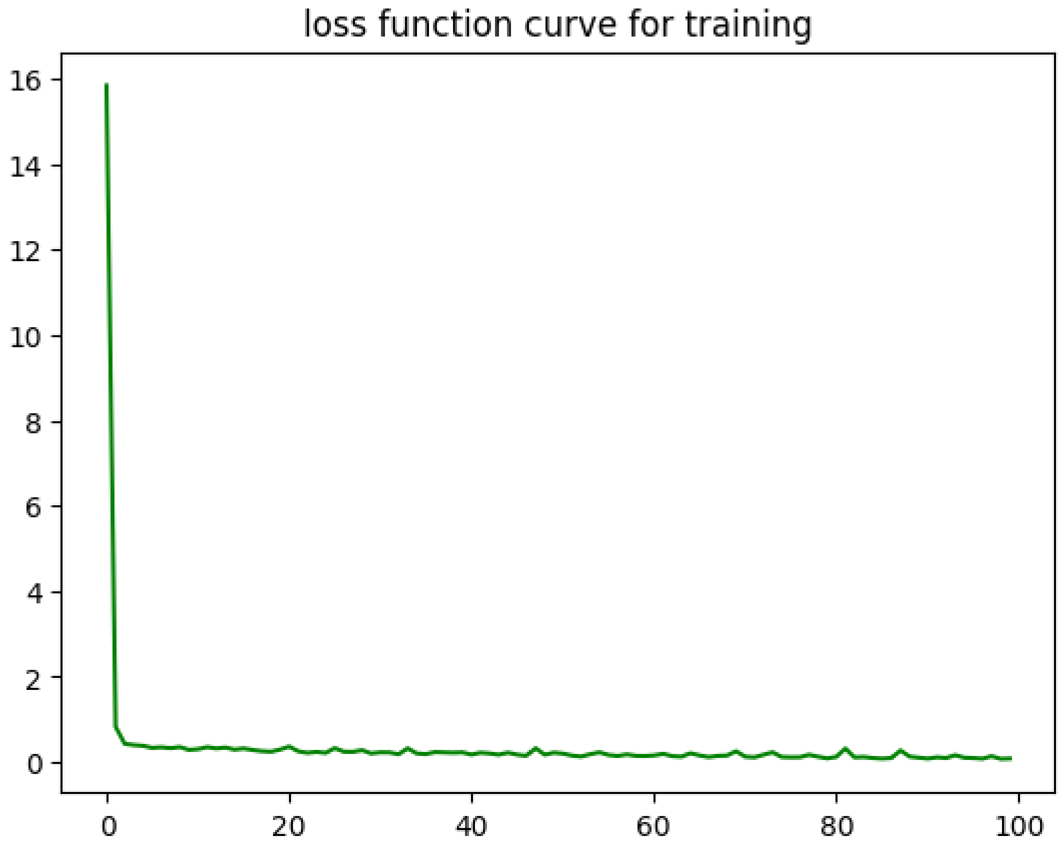
```
Epoch 77/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0207 - accuracy:
0.9952 - val_loss: 0.3223 - val_accuracy: 0.9104
Epoch 78/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0129 - accuracy:
1.0000 - val_loss: 0.3413 - val_accuracy: 0.9104
Epoch 79/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0192 - accuracy:
0.9952 - val_loss: 0.2920 - val_accuracy: 0.9104
Epoch 80/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0197 - accuracy:
0.9952 - val_loss: 0.3533 - val_accuracy: 0.9104
Epoch 81/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0115 - accuracy:
1.0000 - val_loss: 0.3403 - val_accuracy: 0.9104
Epoch 82/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0119 - accuracy:
1.0000 - val_loss: 0.3586 - val_accuracy: 0.9104
Epoch 83/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0198 - accuracy:
0.9952 - val_loss: 0.3538 - val_accuracy: 0.9104
Epoch 84/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0106 - accuracy:
1.0000 - val_loss: 0.3530 - val_accuracy: 0.9104
Epoch 85/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0133 - accuracy:
1.0000 - val_loss: 0.3652 - val_accuracy: 0.8955
Epoch 86/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0122 - accuracy:
1.0000 - val_loss: 0.3664 - val_accuracy: 0.9104
Epoch 87/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0095 - accuracy:
1.0000 - val_loss: 0.3556 - val_accuracy: 0.8955
Epoch 88/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0148 - accuracy:
1.0000 - val_loss: 0.3583 - val_accuracy: 0.9104
Epoch 89/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0096 - accuracy:
1.0000 - val_loss: 0.3635 - val_accuracy: 0.9104
Epoch 90/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0099 - accuracy:
1.0000 - val_loss: 0.3388 - val_accuracy: 0.9104
Epoch 91/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0105 - accuracy:
1.0000 - val_loss: 0.3618 - val_accuracy: 0.9104
Epoch 92/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0113 - accuracy:
1.0000 - val_loss: 0.3415 - val_accuracy: 0.9104
Epoch 93/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0104 - accuracy:
1.0000 - val_loss: 0.3650 - val_accuracy: 0.9104
Epoch 94/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0143 - accuracy:
1.0000 - val_loss: 0.3654 - val_accuracy: 0.9104
Epoch 95/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0098 - accuracy:
1.0000 - val_loss: 0.3655 - val_accuracy: 0.9104
Epoch 96/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0091 - accuracy:
1.0000 - val_loss: 0.3618 - val_accuracy: 0.9104
Epoch 97/100
7/7 [==============================] - 0s 7ms/step - loss: 0.0162 - accuracy:
1.0000 - val_loss: 0.3925 - val_accuracy: 0.8955
Epoch 98/100
7/7 [==============================] - 0s 5ms/step - loss: 0.0130 - accuracy:
```

```
1.0000 - val_loss: 0.3724 - val_accuracy: 0.9104
Epoch 99/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0295 - accuracy:
0.9905 - val_loss: 0.3561 - val_accuracy: 0.9104
Epoch 100/100
7/7 [==============================] - 0s 4ms/step - loss: 0.0131 - accuracy:
1.0000 - val_loss: 0.3536 - val_accuracy: 0.9104
```

5: Visualisations

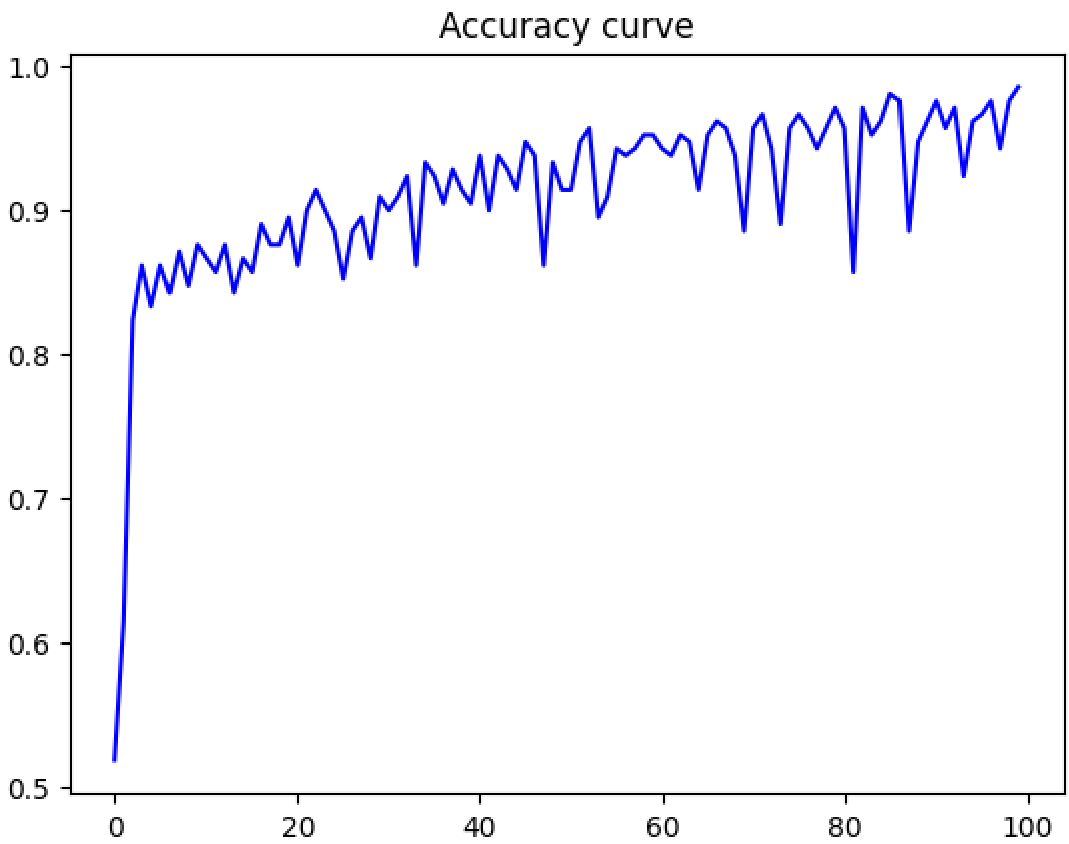
In [39]:

```
plt.title('loss function curve for training')
plt.plot(hist.history['loss'],color='green')
plt.show()
```

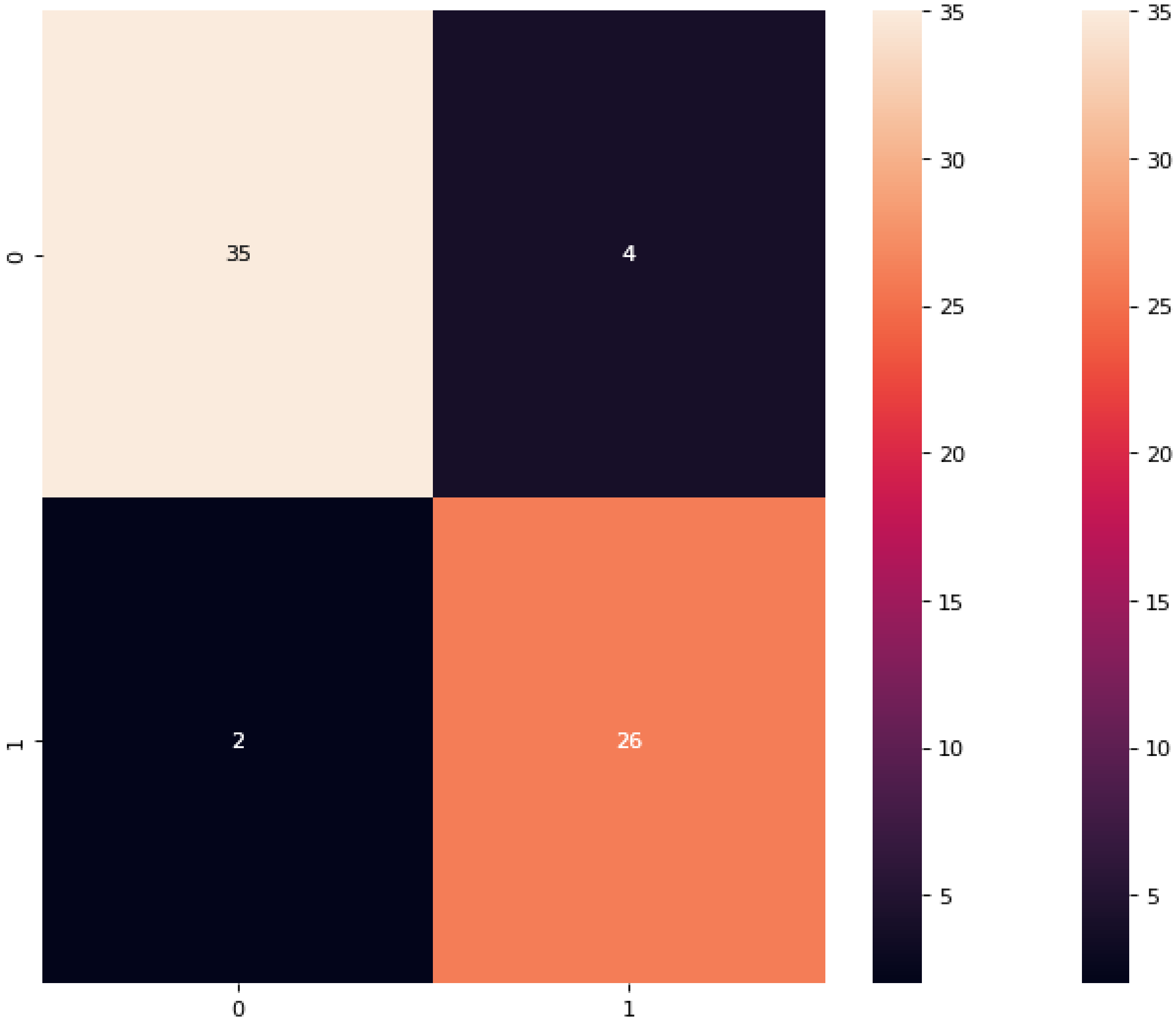


In [40]:

```
plt.title('Accuracy curve')
plt.plot(hist.history['accuracy'],color='blue')
plt.show()
```



In [46]:
```
Y_predicted =model.predict(X_test)
#masking if greater than 0.5
Y_predicted =(Y_predicted>0.5)*1
sns.heatmap(confusion_matrix(Y_test,Y_predicted),annot=True,)
plt.show()
```



In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [42]:

```
plt.figure(figsize=(10,8),dpi=80)
sns.heatmap(confusion_matrix(Y_test,Y_pred),annot=True,cmap='Blues')
plt.title('1 signifies dog sounds and 0 signifies cat sounds \n'+'Accuracy:'+
plt.show()
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-42-38fb401baffb> in <module>
      1 plt.figure(figsize=(10,8),dpi=80)
----> 2 sns.heatmap(confusion_matrix(Y_test,Y_pred),annot=True,cmap='Blues')
      3 plt.title('1 signifies dog sounds and 0 signifies cat sounds \n'+'Acc
uracy:'+str(accuracy_score(Y_test,Y_pred)))
      4 plt.show()

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

In [ ]: