In [4]:

```
import numpy as np
import matplotlib.pyplot as plt
from keras.models import Sequential
from keras.layers import Dense
from keras.optimizers import Adam
from keras.utils.np_utils import to_categorical
from keras.layers import Dropout, Flatten
from keras.layers.convolutional import Conv2D, MaxPooling2D
import cv2
from sklearn.model_selection import train_test_split
#import pickle
import os
import pandas as pd
import random
from keras.preprocessing.image import ImageDataGenerator
```

In [3]:

```
path = "D:\Logos1" # folder with all the class folders
labelFile = "D:\Labels1.csv" # file with all names of classes
batch_size_val=5  # how many to process together
steps_per_epoch_val=5
epochs_val=10
imageDimesions = (400,400,3)
testRatio = 0.2    # if 1000 images split will 200 for testing
validationRatio = 0.2 # if 1000 images 20% of remaining 800 will be 160 for validation
```

In [4]:

```
count = 0
images = []
classNo = []
myList = os.listdir(path)
print("Total Classes Detected:",len(myList))
noOfClasses=len(myList)
print("Importing Classes.....")
for x in range (0,len(myList)):
    myPicList = os.listdir(path+"/"+str(count))
    for y in myPicList:
        curImg = cv2.imread(path+"/"+str(count)+"/"+y)
        images.append(curImg)
        classNo.append(count)
    print(count, end =" ")
    count +=1
print(" ")
images = np.array(images)
classNo = np.array(classNo)
```

```
Total Classes Detected: 11
Importing Classes.....
0 1 2 3 4 5 6 7 8 9 10
```

In [5]:

```
X_train, X_test, y_train, y_test = train_test_split(images, classNo, test_size=testRatio)
X_train, X_validation, y_train, y_validation = train_test_split(X_train, y_train, test_size=validationRatio)
```

In [6]:

```
print("Data Shapes")
print("Train",end = "");print(X_train.shape,y_train.shape)
print("Validation",end = "");print(X_validation.shape,y_validation.shape)
print("Test",end = "");print(X_test.shape,y_test.shape)
assert(X_train.shape[0]==y_train.shape[0]), "The number of images is not equal to the number of lables in tra
assert(X_validation.shape[0]==y_validation.shape[0]), "The number of images is not equal to the number of lab
assert(X_test.shape[0]==y_test.shape[0]), "The number of images is not equal to the number of lables in test
assert(X_train.shape[1:]==(imageDimesions))," The dimesions of the Training images are wrong "
assert(X_validation.shape[1:]==(imageDimesions))," The dimesions of the Validation images are wrong "
assert(X_test.shape[1:]==(imageDimesions))," The dimesions of the Test images are wrong"
```

```
Data Shapes
Train(29, 400, 400, 3) (29,)
Validation(8, 400, 400, 3) (8,)
Test(10, 400, 400, 3) (10,)
```

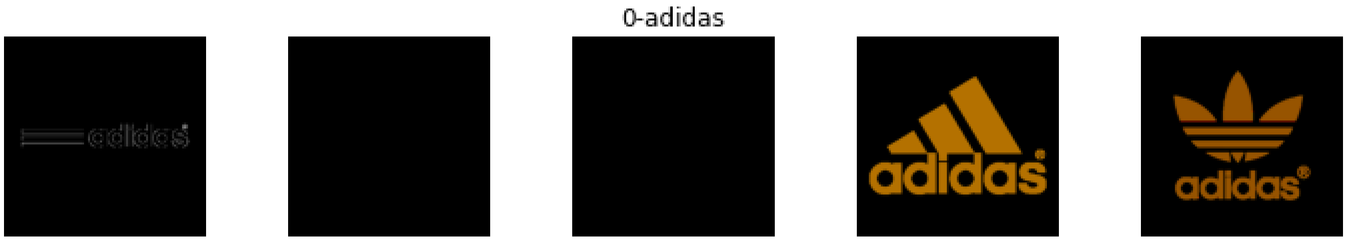
In [7]:

```
data=pd.read_csv("D:\Labels1.csv")
print("data shape ",data.shape,type(data))
```

```
data shape  (11, 2) <class 'pandas.core.frame.DataFrame'>
```

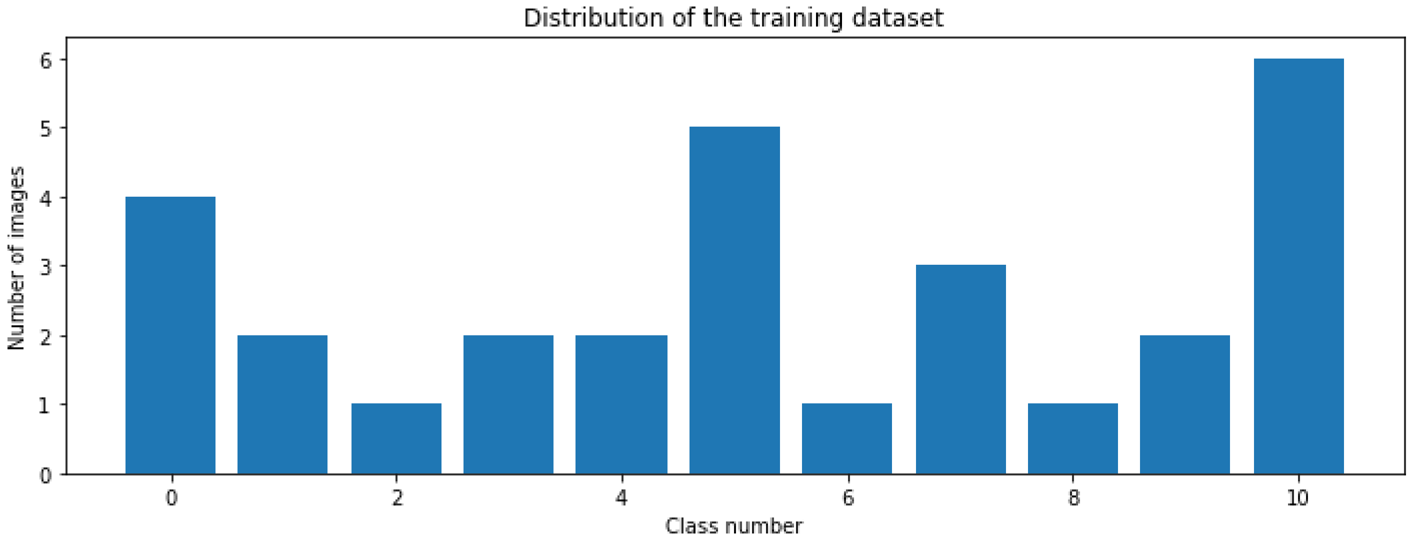
In [8]:

```
num_of_samples = []
cols = 5
num_classes = noOfClasses
fig, axs = plt.subplots(nrows=num_classes, ncols=cols, figsize=(10, 300))
fig.tight_layout()
for i in range(cols):
    for j,row in data.iterrows():
        x_selected = X_train[y_train == j]
        axs[j][i].imshow(x_selected[random.randint(0, len(x_selected)- 1), :, :], cmap=plt.get_cmap("gray"))
        axs[j][i].axis("off")
        if i == 2:
            axs[j][i].set_title(str(j)+ "-"+row["Name"])
            num_of_samples.append(len(x_selected))
```



In [9]:
```
print(num_of_samples)
plt.figure(figsize=(12, 4))
plt.bar(range(0, num_classes), num_of_samples)
plt.title("Distribution of the training dataset")
plt.xlabel("Class number")
plt.ylabel("Number of images")
plt.show()
```

```
[4, 2, 1, 2, 2, 5, 1, 3, 1, 2, 6]
```



In [10]:
```
def grayscale(img):
    img = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    return img
def equalize(img):
    img =cv2.equalizeHist(img)
    return img
def preprocessing(img):
    img = grayscale(img)     # CONVERT TO GRAYSCALE
    img = equalize(img)      # STANDARDIZE THE LIGHTING IN AN IMAGE
    img = img/255            # TO NORMALIZE VALUES BETWEEN 0 AND 1 INSTEAD OF 0 TO 255
    return img

X_train=np.array(list(map(preprocessing,X_train)))  # TO IRETATE AND PREPROCESS ALL IMAGES
X_validation=np.array(list(map(preprocessing,X_validation)))
X_test=np.array(list(map(preprocessing,X_test)))
cv2.imshow("GrayScale Images",X_train[random.randint(0,len(X_train)-1)]) # TO CHECK IF THE TRAINING IS DONE F
```

In [11]:
```
X_train=X_train.reshape(X_train.shape[0],X_train.shape[1],X_train.shape[2],1)
X_validation=X_validation.reshape(X_validation.shape[0],X_validation.shape[1],X_validation.shape[2],1)
X_test=X_test.reshape(X_test.shape[0],X_test.shape[1],X_test.shape[2],1)
```

In [12]:
```
dataGen= ImageDataGenerator(width_shift_range=0.1,   # 0.1 = 10%     IF MORE THAN 1 E.G 10 THEN IT REFFERS TO
                            height_shift_range=0.1,
                            zoom_range=0.2,  # 0.2 MEANS CAN GO FROM 0.8 TO 1.2
                            shear_range=0.1,  # MAGNITUDE OF SHEAR ANGLE
                            rotation_range=10)  # DEGREES
dataGen.fit(X_train)
batches= dataGen.flow(X_train,y_train,batch_size=20)  # REQUESTING DATA GENRATOR TO GENERATE IMAGES  BATCH SI
X_batch,y_batch = next(batches)
```

In [13]:

```
fig,axs=plt.subplots(1,15,figsize=(20,5))
fig.tight_layout()

for i in range(15):
    axs[i].imshow(X_batch[i].reshape(imageDimesions[0],imageDimesions[1]))
    axs[i].axis('off')
plt.show()


y_train = to_categorical(y_train,noOfClasses)
y_validation = to_categorical(y_validation,noOfClasses)
y_test = to_categorical(y_test,noOfClasses)
```

In [2]:

```
def myModel():
    no_Of_Filters=60
    size_of_Filter=(5,5) # THIS IS THE KERNEL THAT MOVE AROUND THE IMAGE TO GET THE FEATURES.
                         # THIS WOULD REMOVE 2 PIXELS FROM EACH BORDER WHEN USING 32 32 IMAGE
    size_of_Filter2=(3,3)
    size_of_pool=(2,2)  # SCALE DOWN ALL FEATURE MAP TO GERNALIZE MORE, TO REDUCE OVERFITTING
    no_Of_Nodes = 50  # NO. OF NODES IN HIDDEN LAYERS
    model= Sequential()
    model.add((Conv2D(no_Of_Filters,size_of_Filter,input_shape=(imageDimesions[0],imageDimesions[1],1),activa
    model.add((Conv2D(no_Of_Filters, size_of_Filter, activation='relu')))
    model.add(MaxPooling2D(pool_size=size_of_pool)) # DOES NOT EFFECT THE DEPTH/NO OF FILTERS

    model.add((Conv2D(no_Of_Filters//2, size_of_Filter2,activation='relu')))
    model.add((Conv2D(no_Of_Filters // 2, size_of_Filter2, activation='relu')))
    model.add(MaxPooling2D(pool_size=size_of_pool))
    model.add(Dropout(0.5))

    model.add(Flatten())
    model.add(Dense(no_Of_Nodes,activation='relu'))
    model.add(Dropout(0.5)) # INPUTS NODES TO DROP WITH EACH UPDATE 1 ALL 0 NONE
    model.add(Dense(noOfClasses,activation='softmax')) # OUTPUT LAYER
    # COMPILE MODEL
    model.compile(Adam(lr=0.001),loss='categorical_crossentropy',metrics=['accuracy'])
    return model
```

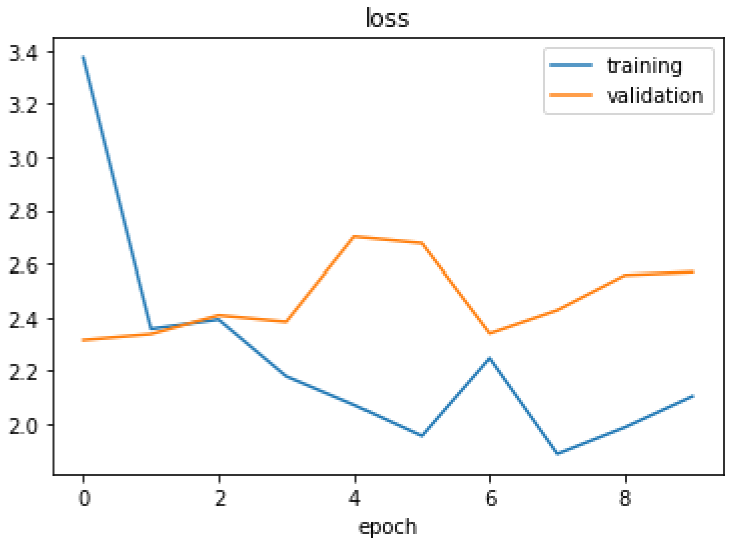
In [3]:

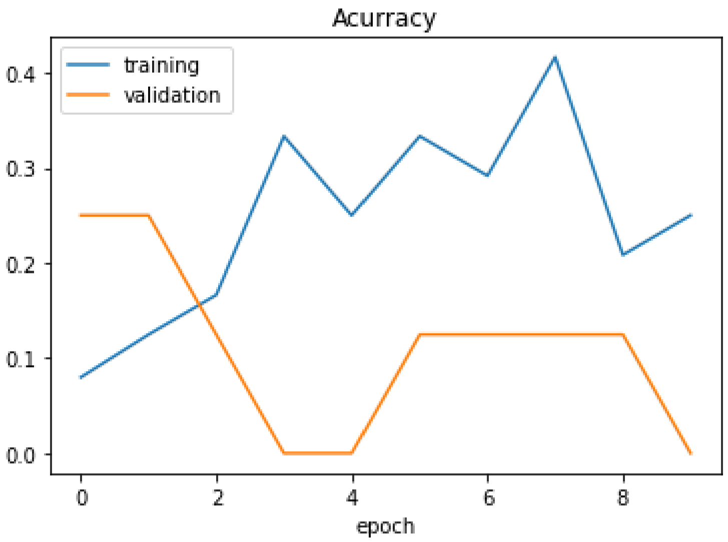
```
model = myModel()
print(model.summary())
history=model.fit(dataGen.flow(X_train,y_train,batch_size=batch_size_val),steps_per_epoch=steps_per_epoch_val
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-3-94282f6bfacd> in <module>
----> 1 model = myModel()
      2 print(model.summary())
      3 history=model.fit(dataGen.flow(X_train,y_train,batch_size=batch_size_val),steps_per_epoch=steps_per
_epoch_val,epochs=epochs_val,validation_data=(X_validation,y_validation),shuffle=1)
      4

<ipython-input-2-84118ca74cd0> in myModel()
      6     size_of_pool=(2,2)  # SCALE DOWN ALL FEATURE MAP TO GERNALIZE MORE, TO REDUCE OVERFITTING
      7     no_Of_Nodes = 50  # NO. OF NODES IN HIDDEN LAYERS
----> 8     model= Sequential()
      9     model.add((Conv2D(no_Of_Filters,size_of_Filter,input_shape=(imageDimesions[0],imageDimesions
[1],1),activation='relu')))  # ADDING MORE CONVOLUTION LAYERS = LESS FEATURES BUT CAN CAUSE ACCURACY TO INC
REASE
     10     model.add((Conv2D(no_Of_Filters, size_of_Filter, activation='relu')))

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

In [16]:

```
plt.figure(1)
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.legend(['training','validation'])
plt.title('loss')
plt.xlabel('epoch')
plt.figure(2)
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.legend(['training','validation'])
plt.title('Acurracy')
plt.xlabel('epoch')
plt.show()
score =model.evaluate(X_test,y_test,verbose=0)
print('Test Score:',score[0])
print('Test Accuracy:',score[1])
```





```
Test Score: 2.452125072479248
Test Accuracy: 0.0
```

In [1]:

```
# STORE THE MODEL AS A PICKLE OBJECT
#pickle_out= open("model_trained.p","wb")  # wb = WRITE BYTE
#pickle.dump(model,pickle_out)
#pickle_out.close()
#cv2.waitKey(0)
```

In [ ]: