Assignment 3b

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Outline

1. Kaggle Dogs and Cats Dataset
    - Create Numpy Files from Images
    - Model Fitting with Keras

Steps for Assignment 3b-1

1. Open assignment_3b.ipynb
2. Create `dogs_cats.pkl` from train_list.txt and test_list.txt
    1. train_list.txt contains 5000 image names for training
    2. test_list.txt contains 500 images names for testing
    3. The class label is 0 if the image name has Cat
       The class label is 1 if the image name has Dog
    4. Create X_train, Y_train, X_test, Y_test
       X_train.shape is of shape (num_X, 48, 48, 3)
       Y_train.shape is of shape (num_X,)
       X_test.shape is of shape (num_Y, 48, 48, 3)
       Y_test.shape is of shape (num_Y,)
       num_X is less than 5000 because some files are corrupted
       num_Y is less than 500 because some files are corrupted
    5. Save X_train, Y_train, X_test, Y_test to `dogs_cats.pkl`

Folder structure

```
+-- current_dir/
|   +-- PetImages/
|       +-- Cat/
|       +-- Dog/
```

Contents of train_list.txt:

```
Cat/10849.jpg
Dog/9305.jpg
Cat/10211.jpg
Dog/12063.jpg
…
```

Steps for Assignment 3b-1

See below hints if you are not sure how to complete Step 2.

Implement the following pseudo code (綠色字體是要實作的部分)

```
def get_data_from_file(train_file):
  train_data = []
  with open(train_file) as fp:
    for line in fp:
      obtain img_path from line
      try:
        img = cv2.imread(img_path)
        img_resized = cv2.resize(img, (48, 48))
        if line contains Cat
          label = 0
        if line contains Dog
          label = 1
        train_data.append([img_resized, label])
      except:
        print error message
  return train_data
```

Steps for Assignment 3b-1

- `train_data = get_data_from_file(train_file)`
- `X_train, Y_train = get_image_and_label(train_data)`
- Implement `get_image_and_label()` such that

  `X_train.shape` is of shape (num_X, 48, 48, 3)
  `Y_train.shape` is of shape (num_X,)
  num_X is the length of `train_data`

- Place below inside `assignment3b_1()`

```
train_data = get_data_from_file(train_file)
X_train, Y_train = get_image_and_label(train_data)
test_data = get_data_from_file(test_file)
X_test, Y_test = get_image_and_label(test_data)
save_path = 'dogs_cats.pkl'
print('Saving to', save_path)
data = {}
data['X_train'] = X_train
data['Y_train'] = Y_train
data['X_test'] = X_test
data['Y_test'] = Y_test
pickle.dump(data, open(save_path, 'wb'))
```

Steps for Assignment 3b-2

1. Define a Keras Model (need to determine `input_shape` and `output_shape`)

```
def build_model():
  model = keras.Sequential([
      keras.layers.Flatten(input_shape=input_shape),
      keras.layers.Dense(256, activation=tf.nn.relu),
      keras.layers.Dense(128, activation=tf.nn.relu),
      keras.layers.Dense(output_shape, activation=tf.nn.softmax)
  ])
  return model
```

2. Fit the Keras model to `(X_train, Y_train)` and report the test accuracy.

3. The test accuracy is much lower than the training accuracy. Why?

   How can we improve the test accuracy?

Steps for Assignment 3b-3

1. Define a Keras Model (need to determine `input_shape` and `output_shape`)

```
def build_model():
  model = keras.Sequential([
      keras.layers.Flatten(input_shape=input_shape),
      keras.layers.Dense(256, activation=tf.nn.relu),
      keras.layers.Dense(128, activation=tf.nn.relu),
      keras.layers.Dense(output_shape, activation="linear")
  ])
  return model
```

2. Use below to compile your model

```
model.compile(optimizer='adam', loss='mean_squared_error')
```

3. Fit the Keras model to `(X_train, Y_train)`

Steps for Assignment 3b-3

4. Compute and report test accuracy.

   Use `reg = model.predict(X_test).squeeze()` to get regression outputs

   `reg[i]` is the regression output of `X_test[i]`

   - Obtain `predictions` from `reg`
     - Note that `predictions` and `reg` should have the same shape
     - `predictions[i] = 0` if `reg[i]` is close to 0
     - `predictions[i] = 1` if `reg[i]` is close to 1
   - Compute the test accuracy by comparing `predictions` with `Y_test`
     - Use the == operator.
     - This task does not require the for loop. You cannot get full marks if you use the for loop.

5. Compare the test accuracy of `mean_squared_error` to that of `sparse_categorical_crossentropy.` Which one is better? Why?