Guided Projects: Feature Engineering

Hashing: Querying in Face Datasets

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Course	**AI and ML (Batch 5)**
Problem Statement	Query the image dataset using Hashing Technique

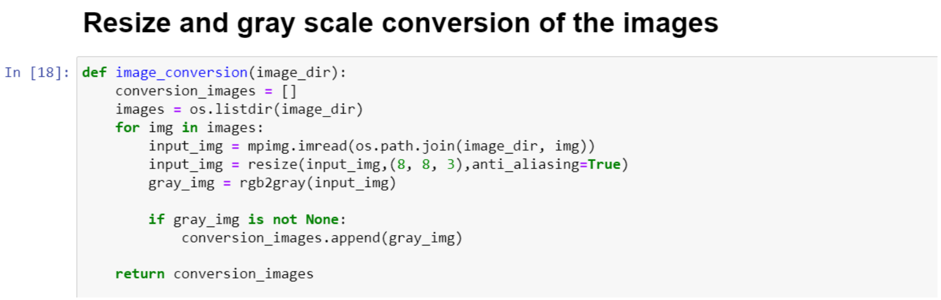
Software requirements perquisites

1. Anaconda
2. Python 3.8
3. Python Packages
    - NumPy
    - Pandas
    - Matplotlib

Steps

1. Down load the image dataset and store in the **CatHead** folder in the scripts directory.

2. Resize the image into 8*8 dimensions and then convert into gray scale images.



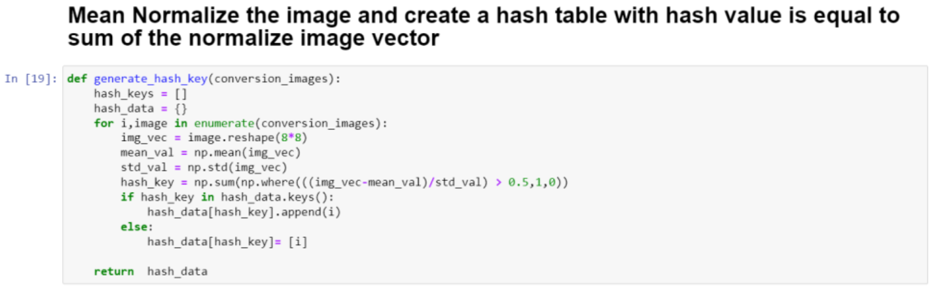
Resize and gray scale conversion of the images

```
In [18]: def image_conversion(image_dir):
             conversion_images = []
             images = os.listdir(image_dir)
             for img in images:
                 input_img = mpimg.imread(os.path.join(image_dir, img))
                 input_img = resize(input_img,(8, 8, 3),anti_aliasing=True)
                 gray_img = rgb2gray(input_img)

                 if gray_img is not None:
                     conversion_images.append(gray_img)

             return conversion_images
```

3. Flatten the images into one dimensional array, then normalize those images using standard scalar , then convert those images into a binary image and followed by Hash key generation.

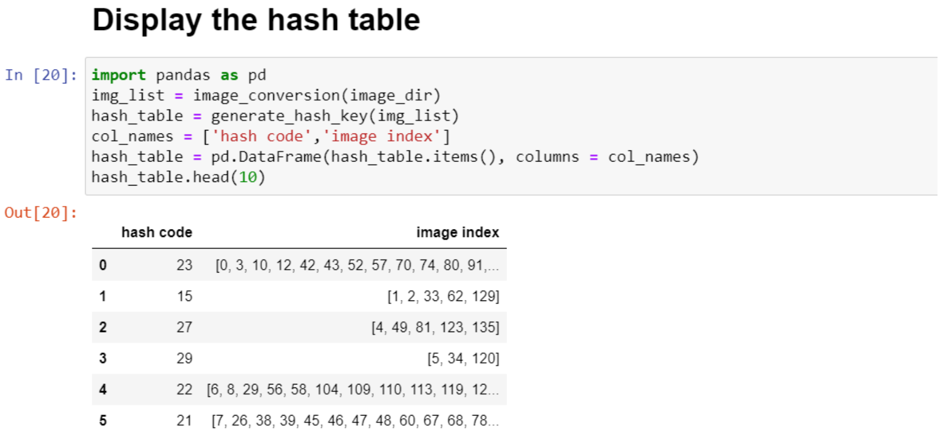


Mean Normalize the image and create a hash table with hash value is equal to sum of the normalize image vector

```
In [19]: def generate_hash_key(conversion_images):
             hash_keys = []
             hash_data = {}
             for i,image in enumerate(conversion_images):
                 img_vec = image.reshape(8*8)
                 mean_val = np.mean(img_vec)
                 std_val = np.std(img_vec)
                 hash_key = np.sum(np.where(((img_vec-mean_val)/std_val) > 0.5,1,0))
                 if hash_key in hash_data.keys():
                     hash_data[hash_key].append(i)
                 else:
                     hash_data[hash_key]= [i]

             return  hash_data
```

4. Display the hash map table



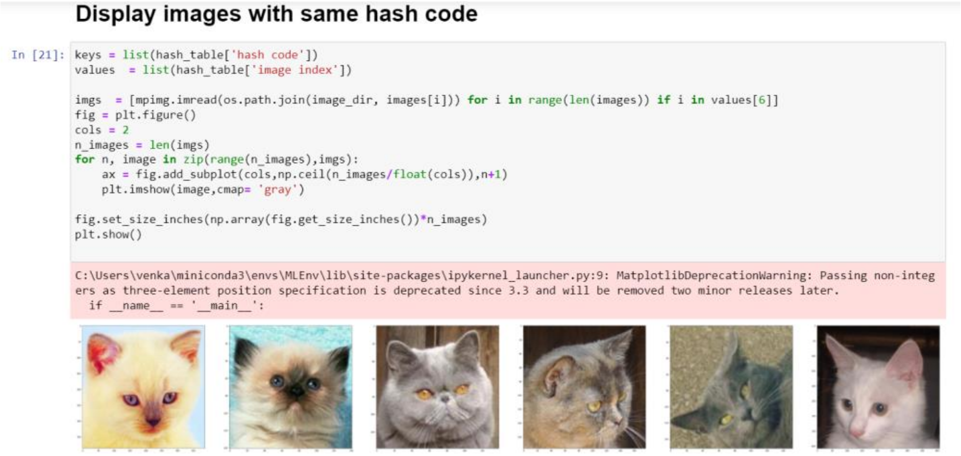
Display the hash table

```
In [20]: import pandas as pd
         img_list = image_conversion(image_dir)
         hash_table = generate_hash_key(img_list)
         col_names = ['hash code','image index']
         hash_table = pd.DataFrame(hash_table.items(), columns = col_names)
         hash_table.head(10)
```

Out[20]:

	hash code	image index
0	23	[0, 3, 10, 12, 42, 43, 52, 57, 70, 74, 80, 91,...
1	15	[1, 2, 33, 62, 129]
2	27	[4, 49, 81, 123, 135]
3	29	[5, 34, 120]
4	22	[6, 8, 29, 56, 58, 104, 109, 110, 113, 119, 12...
5	21	[7, 26, 38, 39, 45, 46, 47, 48, 60, 67, 68, 78...

5. Display the images associated with the hash code 21 (Index : 5)



Display images with same hash code

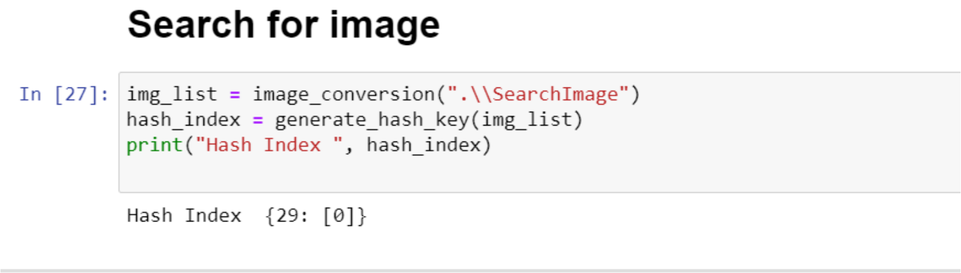
```
In [21]: keys = list(hash_table['hash code'])
         values  = list(hash_table['image index'])

         imgs  = [mpimg.imread(os.path.join(image_dir, images[i])) for i in range(len(images)) if i in values[6]]
         fig = plt.figure()
         cols = 2
         n_images = len(imgs)
         for n, image in zip(range(n_images),imgs):
             ax = fig.add_subplot(cols,np.ceil(n_images/float(cols)),n+1)
             plt.imshow(image,cmap= 'gray')

         fig.set_size_inches(np.array(fig.get_size_inches())*n_images)
         plt.show()
```

```
C:\Users\venka\miniconda3\envs\MLEnv\lib\site-packages\ipykernel_launcher.py:9: MatplotlibDeprecationWarning: Passing non-integ
ers as three-element position specification is deprecated since 3.3 and will be removed two minor releases later.
  if __name__ == '__main__':
```

6. Search the image present in the SearchImage folder.



Search for image

```
In [27]: img_list = image_conversion(".\\SearchImage")
         hash_index = generate_hash_key(img_list)
         print("Hash Index ", hash_index)
```

```
Hash Index  {29: [0]}
```