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To create program to perform a retrieving Images and Searching
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Aim: To create program to perform a retrieving Images and Searching

Objective:The fundamental need of any image retrieval model is to search and arrange the images that arc in a visual semantic relationship with the query given by the user.

Most of the search engines on the Intemet retrieve the images based on text-based approaches that require captions as input.

Theory:

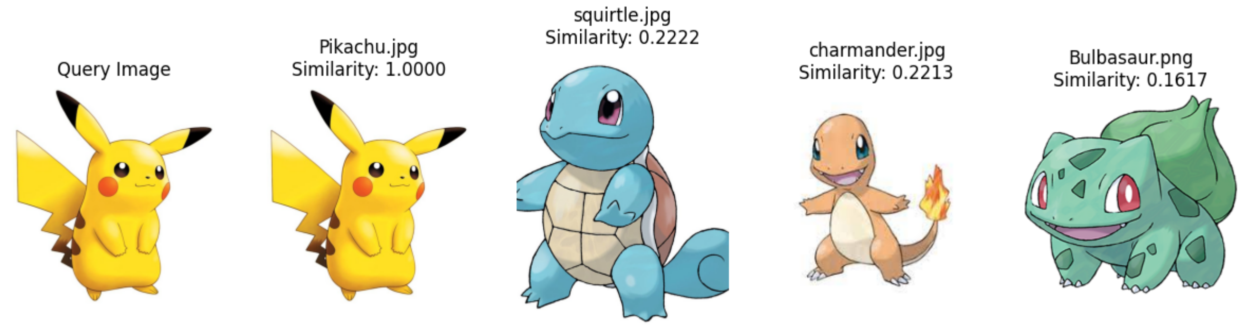
Image Retrieval is a fundamental and long-standing computer vision task that involves finding images similar to a provided query from a large database. It's often considered as a form of fine-grained, instance-level classification. Not just integral to image recognition alongside classification and detection, it also holds substantial business value by helping users discover images aligning with their interests or requirements, guided by visual similarity or other parameters.

Code:-

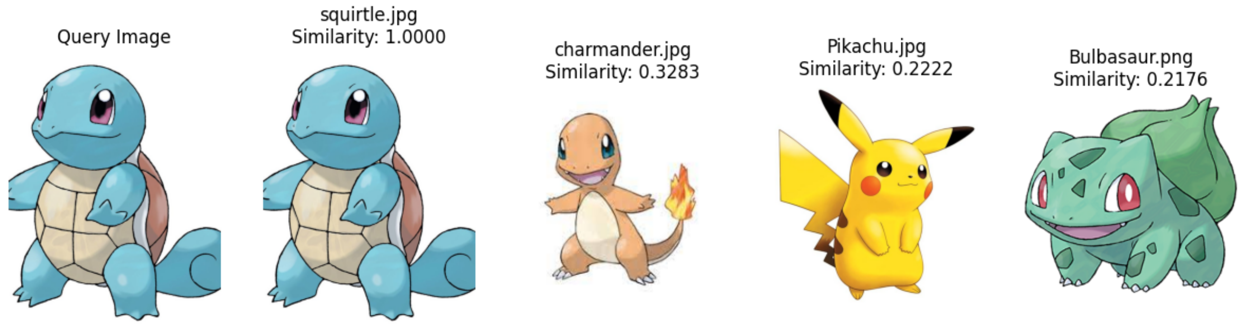
```
import os
import numpy as np
from keras.applications.vgg16 import VGG16, preprocess_input
from keras.preprocessing import image
from sklearn.metrics.pairwise import cosine_similarity
import matplotlib.pyplot as plt
from PIL import Image, ImageDraw, ImageFont


def extract_features(image_path):
    model = VGG16(weights='imagenet', include_top=False)

    img = image.load_img(image_path, target_size=(224, 224))

    img_array = image.img_to_array(img)

    img_array = np.expand_dims(img_array, axis=0)

    img_array = preprocess_input(img_array)


    features = model.predict(img_array)

    features = features.flatten()


    return features


def find_similar_images(query_features, dataset_features):

    similarities = {}

    for filename, features in dataset_features.items():

                    similarity   =   cosine_similarity([query_features],
[features])[0][0]

        similarities[filename] = similarity


    return similarities


Def        plot_images_with_similarity(images,        similarity_ratios,
query_image_path):

    # Load the query image

    query_img = Image.open(query_image_path)
    # Plotting setup
    fig, axs = plt.subplots(1, len(images) + 1, figsize=(15, 5))
    axs[0].imshow(query_img)
    axs[0].axis('off')
    axs[0].set_title('Query Image')

    # Load and annotate similar images
    for i, (filename, ratio) in enumerate(zip(images, similarity_ratios), 1):
        img_path = os.path.join(dataset_path, filename)
        img = Image.open(img_path)
        axs[i].imshow(img)
        axs[i].axis('off')
        axs[i].set_title(f'{filename}\nSimilarity: {ratio:.4f}')

    plt.show()

# Path to your dataset
dataset_path = "/content/input"

# Extract features for all images in the dataset
feature_vectors = {}
for filename in os.listdir(dataset_path):
    if filename.endswith(".jpg") or filename.endswith(".png") or filename.endswith(".jpeg"):
        image_path = os.path.join(dataset_path, filename)
        features = extract_features(image_path)
        feature_vectors[filename] = features

# Path to your query image
query_image_path = "/content/squirtle.jpg"
query_features = extract_features(query_image_path)

# Find similar images
similarities = find_similar_images(query_features, feature_vectors)

# Sort the results by similarity
sorted_similarities = sorted(similarities.items(), key=lambda x: x[1], reverse=True)

# Extract filenames and similarity ratios for plotting
filenames, similarity_ratios = zip(*sorted_similarities)

# Plot images with similarity ratios
plot_images_with_similarity(filenames, similarity_ratios, query_image_path)
```

Output:-

For Pikachu Image Search:-



For Squirtle Image Search:-



Conclusion: In conclusion, the aim of studying the image retrieval using SIFT (Scale-Invariant Feature Transform) descriptors. It extracts distinctive features from a query image and a dataset of images, matches these features, and ranks images in the dataset based on the number of matching features. The program can be useful for applications like content-based image search and recommendation. While the code here uses SIFT, more advanced methods and deep learning can enhance retrieval accuracy.