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Course Project
On
Image Reverse Search Engine on IDH Data

Computer Vision(17ECSC308)

Submitted by

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Abstract

With the extensive growth of internet people can exposed to the access to massive amount of information. Images, data, flow charts, maps, news, etc all these come under information. The major issue lies in locating and finding the relevant information. A lot of textual-based search engines are exists, but there are very rare image search engines through which desired images can be searched from the pool of images available.

India is a country of vast cultural heritage resources. A large amount of cultural resources is available in India. Digital preservation is a process of preserving contents to a distant future in reusable condition for access by its users.

If a person has an image of a particular heritage site and if he wishes to retrieve or obtain related images to the given query image, it becomes a necessary task to have a system which satisfies this need.

Hence there is need of such an image search engine using which the related and exact images of monuments and cultural heritage sites in India can be searched.

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Contents

1 Introduction

1.1 Overview of the project

The data abundance is increasing with time due to advancements in technology and the concepts driving these changes. Users demand for better and accurate systems which satisfy their needs. Retrieving images has always been a need. Using text to search for an object will not always yield better search results. The solution is to provide users with such a search engine in which they can use any image as input query and get related images as result which is the desired output. Indian Heritage consists of many temples and building an image search engine for such dataset one of the concerns to be addressed. As deep learning models work well with abundant data, implementing reverse search engine with a deep neural architecture makes it a better system. The deep neural architecture is trained as a part of transfer learning with the IDH Dataset. Later this trained model is used for the prediction of the class of the query image. Based on the the class the query image gets classified, the resulting related images for that class are displayed to the user.

1.2 Literature survey

1.2.1 Inception-v4, Inception-ResNet and the Impact of Residual Connections on Learning

This paper describes states about the importance of combining the Inception architecture with residual connections. It says that training with residual connections accelerates the training the training of the Inception network significantly.

It also provides a streamlined architectures for both residual and non-residual Inception networks. These variations tend to improve single-frame recognition performance for classification task.

It talks about the objectives of the model providing a better objection recognition and object recognition related tasks as they form a major tasks for computer vision.

1.2.2 Building a Reverse Image Search Engine: Understanding Embeddings: Article

This article provides an insights on the importance of deep neural networks in providing a better solution and acting as a rescue for designing a system which aims to search among millions of images.

1.2.3 Image Query Based Search Engine Using Image Content Retrieval

The paper put forwards a model for a search engine where an image can be uploaded from the local database of the user to retrieve information about it from the internet.

It states that this is similar to the traditional keyword search used by most of the search engines with the only difference being that the image is uploaded as a query rather than textual keywords.

1.3 Problem definition

To build a reverse image search engine for Indian Digital Heritage dataset, which takes an image from the IDH dataset as a query image and gives related images as the output.

2 Approach

2.1 About the Project

The reverse image search engine is developed using deep neural architecture, which initially classifies the given query input image as one of the trained classes from the IDH dataset and later based on the classified class the other best images from the same class are displayed to the user from the local database.

Firstly, Inception Resnet deep learning architecture implemented model is studied for its compatibility with the required dataset. The architecture provides promising results compared to other architecture due to significantly improved recognition performance. Due to the advantages of Inception Resnet over the other architectures, it is used as the model, which furthers undergoes transfer learning.

This approach considers five different classes of monuments for the implementation of reverse image search engine. We apply transfer learning on the selected architecture with these five different classes of monuments. Once the trained model is ready, we fix the weights and use this model to classify the given query image. Once the images gets classified into any of the five classes, the related images of the particular class are displayed to the user. If the input image does not belong to any of the five classes, it gets classified as others class.

2.2 Datasets

2.2.1 Indian Digital Heritage Dataset

A data set of various temples and other monuments from all over India. The data set for the implementation of the reverse search engine consists of 5 classes. These classes are

- Lotus Temple
- Mahadeva Temple
- Amrutheshwar Temple
- Kadasiddeshwar Temple
- Tarakeshwar Temple

3 A Deep Walk Through The Pipeline

Reverse Image Search Engine for the IDH data set is implemented using Inception Resnet Architecture.
Inception networks tend to be very deep, it is natural to replace the filter concatenation stage the Inception architecture with the residual connections. This would allow Inception to reap all the benefits of the residual approach while retaining its computational efficiency.

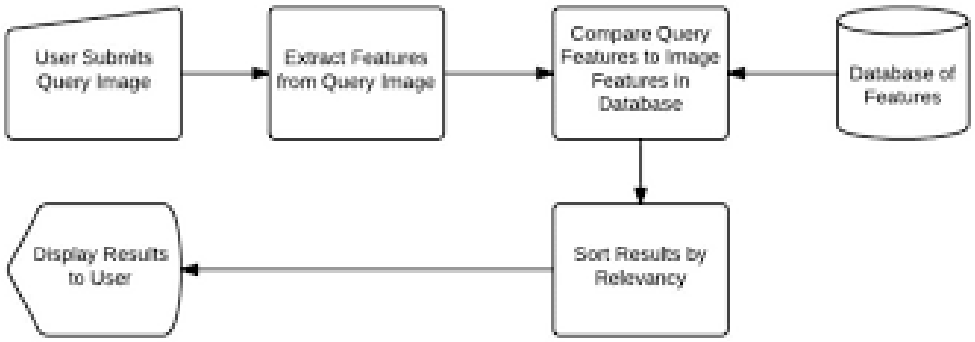

Figure 1: Reverse Image Search Engine Architecture

The Inception architecture is highly tunable, meaning that there are a lot of possible changes to the number of filters in the various layers that do not affect the quality of the fully trained network.

The basic functioning lies as follows, for the residual versions of the Inception networks, cheaper Inception blocks are used than origianl Inception. Each Inception block is followed by filter-expansion layer which is used for scaling up the dimensionality of the filter bank before the addition to match the depth of the input.
This is needed to compensate for the dimensionality reduction induced by the Inception block.

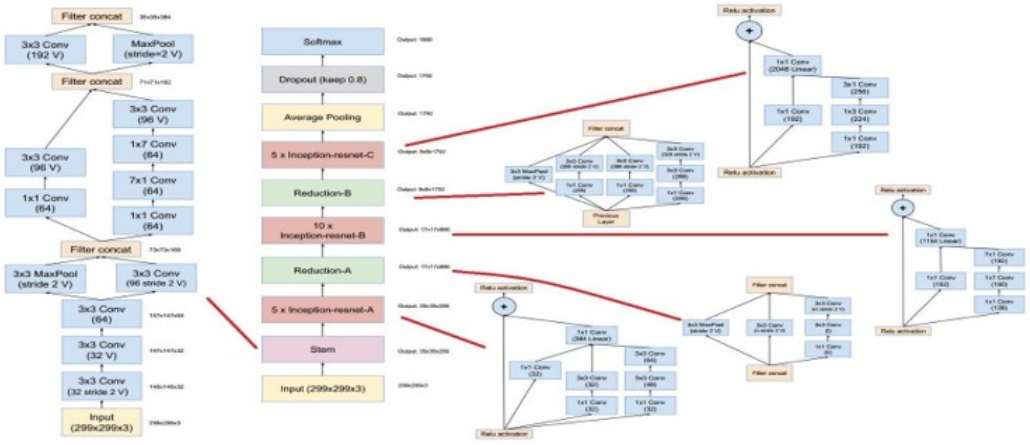

Figure 2: Inception-Resnet

These advantages and properties of this architecture yields the best accuracy. To exploit this, we further apply transfer learning.

In this section we change the number of output layers and retrain the pretrained model with the Indian Heritage Data set. We train until we get negotiable train and validation set errors.

Once we have the model ready, we take the query image. This query image gets classified into any of the five classes if it belongs to any of them or if it does not belong to any of the five classes then it gets classified as other class.

After it gets classified, based on the class to which it gets classified, the images of that class present from the users database are displayed to the user.
Hence addressing the required problem statement.

4 Results

4.1 Input Query Image

The below is the image of Mahadeva Temple which is acting as query image:

Figure 3: Mahadeva Temple

4.2 Result of reverse search engine for the given input query:

The below is the result of Mahadeva temple and its related images

Figure 4: Related images for Mahadeva input query image

5 Conclusion

With respect to the context of proposing a Reverse Image Search Engine for Indian digital heritage data set the system achieves:

- to process the input query image.
- to classifies the processed query image into respective class.
- to also classifies random image which does not belong the trained temple data set into others class.
- to display the related images of the query image from the users local database.

6 Future Scope

- The model can be extended for many classes of temples and monuments, i.e not just for five classes.
- The system can further be improved in retrieving the images by using the web crawlers instead of the local database.

7 References

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