Web image re-ranking and their techniques for better search experience: An Overview

Miss. Namrata P. Kawtikwar, Prof. M.R. Joshi

***Abstract*— In today's era search engines are used every where, as it is source to retrieve efficient result related to query. Web-scale image search engines often uses keywords as queries and also depends on neighboring text to search images. These search engines entails difficulty due to the ambiguity of query keywords, since it is hard for users to correctly depict th visual content of target images by only using keywords. F example, if query keyword is mouse, then result may conta mouse animal, Mickey Mouse, wireless mouse, or optical mou etc. To overcome this problem search engines uses re-rankin Image re-ranking is an efficient way to advance the results web-based image search, has been implemented by commerci search engines such as Google and Bing. A main challenge the research of image re-ranking is that the similarities visual features do not well associate with semantic meanings images which infer users' search goal. Asking the user to sele a query image from the set the minus images are re-rank based on their visual similarities with the query image.**

Keywords: image search engine, keyword, image re-rankin semantic signatures

I. INTRODUCTION

In the past few years, internet has been spread widely all over the world and because of it image database on the internet has become huge. Searching the right image from such a huge database is a very difficult task. Mainly there are two approaches used by internet scale search engines. First is text-based image search. Many commercial internet scale image search engines use this approach. They use only keywords as queries. Users type query keywords in the hope of finding a certain type of images. The text-based search result is ambiguous. Because keywords provided by the users tend to be short and they cannot describe the actual visual content of target images just by using keywords. The text-based search results are noisy and consist of images with quite different semantic meanings. For example, if "apple" is entered by the user to a search engine as a query keyword, the search results may belong to different categories such as "green apple," "red apple," "apple logo," "apple laptop" and "apple iphone" because of the ambiguity of the word "apple".

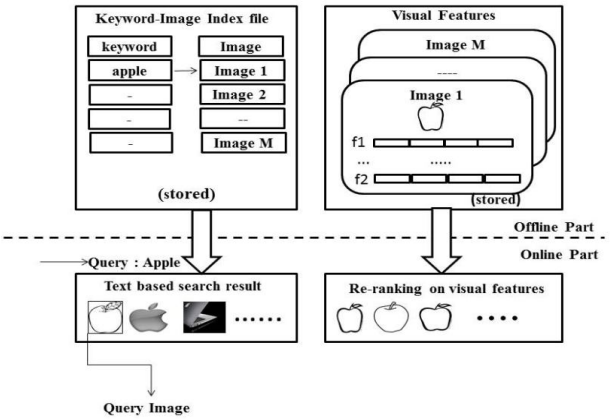

Fig 1: Traditional image re-ranking framework

To overcome this problem of ambiguity of keywords, text-based image search alone is not enough. Additional information has to be used to capture users search intention. As a solution to this problem, the second approach, content based image search with relevance feedback is then introduced. For this multiple relevant and irrelevant image examples are to be selected by the users. Through the online training, the visual similarity metrics are learned from them, from which re-ranking of images is performed. But a lots of user interventions is needed in this approach and hence it is very time consuming and not appropriate for commercial web-scale search engines. A combination of both above approaches is useful. But to effectively improve the search results, online image re-ranking should limit users' effort to just one-click feedback. In this a major challenge is that sometimes the visual feature vectors are large in size and thus it slows down their matching speed. Also, to acquire the users' search intentions, the resemblance of low-level visual features and images' high-level semantic meanings should correlate, but it does not happen always. However, there have been many studies to decrease this semantic gap.

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Miss. Namrata P. Kawtikwar
M.E. CSIT (First Year)
P.G. Department of Computer Science & Information Technology, HVPM, COET Amravati, Maharashtra, India.

Prof. M. R. Joshi
Asst.Professor PG Department of Computer Science & Information Technology, HVPM COET Amravati,Maharashtra

Why image Re-Ranking:

There are two main reasons for using the image re-ranking:

- To maximize relevancy of image result
- To achieve diversity of image result

II. TECHNIQUES FOR IMAGE RE-RANKING

Computing the visual similarities that reflect the semantic relevance of images is the key component of image re-ranking. Many visual features have been developed in recent years. However, the effective low-level visual features are different for different query images. Query-specific semantic signature was first proposed in order to reduce the semantic gap.There is a lot of work on using visual features to re-rank images retrieved by initial text-only search, however, without requiring users to select query images. Following are some techniques which are used for the re-ranking:

A. Using Textual information [1]

As like a traditional method the image search is performed using text keywords in the query. If the keywords in the query appear in the surrounding text of the image then that image is retrieved as a resulting image. There is some work related with textual information is going on which uses text including filename of the image, URL of the image and description or the caption of the image as a surrounding text parameter. If the text is found in these surrounding parameters of the image then that image is displayed as a result image. The textual search is used as a input for visual similarity based search by grouping the images which is having same textual tag. But some difficulty with textual search is that if the external text is ambiguous or not related with the image then this becomes a limitation for textual search. e.g. if user wants to search for the image "sky" and if there is one image of sky but having caption as a "blue" then this image will not be retrieved in the result even it contains the visual scene which user wants. If the surrounding text is ambiguous then also results generated may be poor.

B. Visual and Textual Context-based Re-ranking

This technique requires only one-click user feedback. Intention specific weight schema is used to unite visual features and to calculate visual adaptive similarity to query images.[2] Despite of human feedback, visual and textual expansions of keywords are incorporated to attain user intention. Expanded keywords are utilized to broaden positive instance images and also widen the image pool to hold additional relevant images. This structure makes it promising for commercial range image search by both visual and text term. The presented image re ranking structure comprises of several steps, which can be enhanced independently or replaced by other methods which is considered consistently effective.

C. Visual Rank

Visual Rank algorithm, a straightforward method to include the advances made in using network and link investigation for Web document search into image search[3] .Visual Rank appears to diverge from a critical source of information which makes Page Rank more successful: the huge amount of manually produced links on a diverse set of pages. On the other hand, a major quantity of the human-coded information reconvened by two systems. Firstly Visual Rank query dependent is made in which the initial set of images are selected from retrieved answers and human knowledge by means of connecting relevant images to Web pages which is openly initiated into the system. Secondly the image similarity graph is developed based on the general features among images. Those images that detain the common subjects from other images are generally results in higher relevancy.

D. Supervised Re-Ranking

In supervised learning hypothesis into the visual search re-ranking idea to produce a more robust re-ranking system[4]. The idea controls the merits of both supervised concept-related search and unsupervised visual related search re-ranking, whereas it does not undergoes from scalability issues which represents the concept-based image search. To deal with this the presented approach in this method defines a learning-to re rank structure, which incorporated the adapted Ranking SVM algorithm and 11 lightweight re-ranking features that determines the relevance between the visual and textual queries of images.

E. Prototype based visual Re-ranking

The prototype-based re-ranking method inheres of an online and an offline step. In the online part, when a textual query is given in to the image search engine, initial search is performed using any in fashion text-based search technique. Then, visual prototypes are created and for each and every prototype a Meta re-ranker is build. The offline component is affectionate to learning the re-ranking model from human-labeled data like tags, comments. Since the learned model will be used the text-based search results for re-ranking, the training set is build from these results through the following way. After the training data is collected, we can calculate the score vector Meta re-rankers, as per in the online part, for each and every image and the corresponding query. prototype-based re-ranking model, which builds meta re-rankers corresponding to visual feature representing the textual query and learns the weights of a linear re-ranking model to combine the results of meta re-rankers and create the re-ranking score of a given image taken from the earlier text-based search result.

III. DISADVANTAGES OF EXISTING SYSTEM

- Some popular visual features are in high dimensions and efficiency is not satisfactory if they are directly matched.
- Another major challenge is that, without online training, the similarities of low-level visual features may not well correlate with images' high-level semantic meanings which interpret users' search intention.

IV. RE-RANKING USING QUERY SPECIFIC SEMANTIC SIGNATURES [6]

Instead of manually defining a universal concept dictionary, it learns different semantic spaces for different query keywords individually and automatically. The semantic space related to the images to be re-ranked can be significantly narrowed down by the query keyword provided by the user. A user once find candidate image of target image the re-ranking function is used by choosing that candidate image as a query image. One of the approach described which has offline and online parts as follows.

The offline stage has following steps:

i. Set of related keywords with query keyword using keyword expansions are generated automatically. e.g. if query keyword is "apple" then expansion is "red apple", "apple i-watch".
ii. These expansions are used as a reference classes for query keyword. The training tuples are automatically obtained using keyword expansion. Obtained training examples of a reference class and to retrieve images by search engine based on textual information again.
iii. Images retrieved by keyword expansion are more correct than those retrieved by original keyword "apple".
iv. The lier images are removed automatically and top images are used as training examples of the reference class.
v. By calculating similarities between images and reference classes the semantic signature of an image is fetched using trained multiclass classifier.
vi. To extract one semantic signature for an image the features like shape, texture, color are grouped to train single classifier.

The online stage has following steps:

vii. With reference to query keyword the images are retrieved.
viii. The images retrieved are associated with query keyword reference to the word image index file. The word-image index file contains image associated with many query keywords.
ix. When user chooses a query, image semantic signatures are used for finding image similarities for re-ranking.

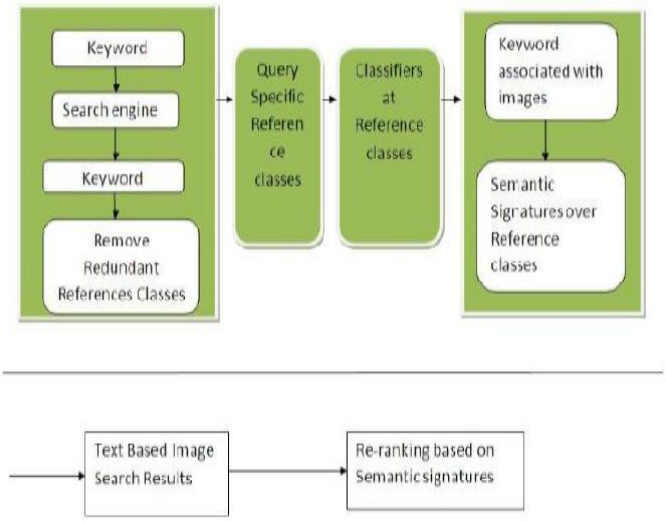

Fig 2: Semantic Approach of Re-ranking of Images

The query-specific semantic spaces can more accurately model the images to be re-ranked, since they have excluded other potentially unlimited number of irrelevant concepts, which serve only as noise and deteriorate the re-ranking performance on both accuracy and computational cost. The visual and textual features of images are then projected into their related semantic spaces to get semantic signatures. At the online stage, images are re-ranked by comparing their semantic signatures obtained from the semantic space of the query keyword. The semantic correlation between concepts is explored and incorporated when computing the similarity of semantic signatures. In figure3 we can see the expected search result using Query Specific Semantic Signature

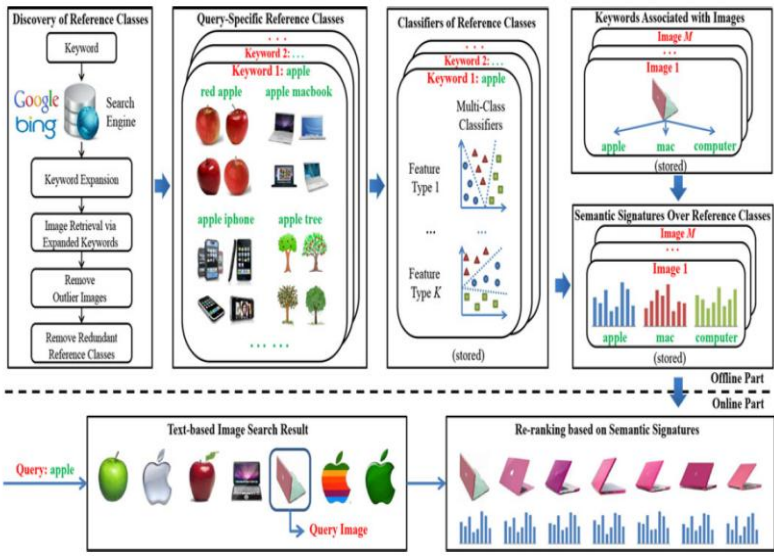

Fig3: Diagram of Query specific semantic Signature

Re-ranking Framework

V. ADVANTAGES OF USING QUERY SPECIFIC SEMANTIC SIGNATURES RE-RANKING

- The visual features of images are projected into their related semantic spaces automatically learned through keyword expansions offline.

- Because of the large number of keywords and the dynamic variations of the web, the semantic spaces of query keywords are automatically learned through keyword expansion and online image re-ranking becomes extremely efficient.

VI. CONFIDENTIALITY PRESERVING IMAGE SEARCH

While performing image search the confidentiality of image is also taken into consideration. Also there are some methods used to preserve confidentiality during image search. For secure transmission the data is transmitted in encrypted format and it is decrypted at server side to operate on plain text. This makes user's private information vulnerable. So the user's personal albums can be viewed by system administrator. By storing data in encrypted format at server side makes task difficult to server for handling client request and process encrypted data. There are technologies developed to work on encrypted databases that protect user's private data without any difficulties on server. There are two types described i.e. homomorphic encryption and cryptography protocols and the second type is the randomization techniques for visual features and search indexes for preserving image search confidentiality. These are the different methods used and developed with respect to web image search.

VII. CONCLUSION

With the increasing demands of multimedia applications over the Internet, the importance of image re-ranking and image retrieval has also increased. Currently, many new schemes are proposed in the field of Image Re-ranking. In this paper we provide an overview of the fundamental theories and emerging techniques for Image Re-ranking, as well as several extended work in these areas. We propose a novel image re-ranking framework, which learns query-specific semantic spaces to significantly improve the effectiveness and efficiency of online image reranking. The visual features of images are projected into their related visual semantic spaces automatically learned through keyword expansions at the offline stage.All these techniques have their own advantages as well as certain limitations. In other words, there is not a single technique that fits best in all sorts of user's requirements; therefore, the doors are still open to keep inventing new methodologies.

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Authors Details:-

Miss. Namrata P. Kawtikwar
M.E. CSIT (First Year)
P.G. Department of Computer Science & Information Technology,
HVPM, COET Amravati, Maharashtra, India.

Prof. M.R.Joshi
Asst.Professor PG Department of Computer Science & Information Technology, HVPM COET Amravati,Maharashtra

