Review of Web Image Re-ranking

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Abstract: Web mining is application of data mining technique to extract knowledge from web data. Web mining is important part for users to get the highly accurate and closely related to user query. Web image re-ranking is used to produce a desired way to improve the result of web based image search. Given a query keyword, images are firstly retrieved on the basis of textual information. Then user select the query image from the pool, and re-ranked the remaining images on the basis of visual similarities with the query image. A major challenge in web image re-ranking is that the similarity of visual features do not well correlate with image. By providing the effective solution to keyword and visual query the results retrieved are promising.

Keywords— Image re-ranking, visual similarity, image search, keyword expansion.

I. INTRODUCTION

Web mining is the use of data mining technique to automatically discover and extract information from web document and services. Mining the data over the World Wide Web using various data mining techniques and tools are known as web mining. This area is most popular among research today. Web mining is most important application of data mining and other information processing technique for finding useful patterns of data. Web mining describes the application of traditional data mining techniques onto the web resources and has facilitated the further development of this technique to consider the specific structure of web data.

Web mining can be divided or classified into four categories: I. Web Content Mining (WCM), II. Web Structure Mining (WSM), III. Web Usage Mining (WUM), and 4. User Profiles. Web content mining is the process of discovery and extraction of useful information. Web structure mining is related to analysing hyperlink and link structure on web for information retrieval and knowledge discovery of any type of data or items. Web usage mining is the process of extracting information from user data history from web, either textual, or multimedia. User profiling web log mining provides demographic information about users of web site.

Web usage mining then refers to the derivation of useful knowledge from these data input. The content of the raw data for web usage mining on the one hand, and the expected knowledge to be derived from it. Web mining automatically extracts information from web documents or services and can be applied to semi-structured or unstructured data like free-from texts.

The primary objective of this paper is to study about the web image re-ranking. It is used to provide accurate search results based on various methods and techniques. Also use to provide re-ranked images for the users. Sometimes it is difficult to find just the right bit of images that user need from the Internet. It is a big challenge of image retrieval in web mining. Even though there are a lot of well-known search engines like Google, Bing and Yahoo, still it is not easy to find the relevant images as per the user requirement. Many users search queries over the internet with keywords and because of the huge amount of data on the internet, almost all of these keywords will be ambiguous to a certain degree.

Web-scale image search engines mostly use keywords as queries and rely on surrounding text to search images. They suffer from ambiguity of query keyword, because it is hard for the user to perfectly describe the visual content of the target image only using keywords. For example, using “Banana” as a query keyword, the retrieved images belong to different categories such as “yellow banana,” “banana tree,” and “banana sweet.” In order to solve the ambiguity, content-based image retrieval with relevance feedback is widely used. It requires users to select multiple relevant and irrelevant image examples, from which visual similarity metrics are learned through online training. Images are re-ranked based on the learned visual similarities. However, for web-scale commercial systems, users’ feedback has to be limited to the minimum without online training.

The application will feature a search box for typing keyword queries and image queries. It also have an option to browse and open the image which the user requires to search for in the web[13]. There are two stages: offline stage and online stage. Semantic signatures of any image queried by the user is calculated and stored in database at the offline stage. Most of the work is done at the offline stage. At the online stage, the user receives re-ranked images those are calculated using semantic signatures at the offline stage. A novel framework is proposed for web image re-ranking. Instead of developing a universal concept dictionary. It learns different visual semantic spaces for different query keywords individual and automatically.

This paper is organized as follows: the next section II gives literature survey in which motivation,
background and literature review is explained in well manner. In section III conclusion is presented.

II. LITERATURE SURVEY

A. Motivation

To facilitate access to the rapidly growing collections of images on the Web and maximise their benefit for the users, image search has become an increasingly important research topic. Independent of which search scheme is deployed, an image search engine generally operates in two main steps: the online index generation and the online index serving step. Meaningful Image retrieval is a challenge for effective web search. Due to lack of domain knowledge, relevant image remains hidden in the database itself. Web search made out of irrelevant and meaningless images sometimes leads to irreparable damage and reputation. Due to this reason Text based image re-ranking play an important role in Web mining.

B. Background

Several techniques have been put forward for better performance of web image re-ranking in the recent days.

![Fig. 1 Illustration of web image Re-ranking](image.png)

Web image re-ranking[2], is a mixed process of both text based image result and visual features to obtained good performance in image search. The process can be explained by Fig.1 in which text query is given by the user and the search is done. It returns few mismatched images which are not related to query and not useful to user. After that query image is selected by user and again the search will be done. Then we get the most relevant image based result, after that re-ranking is done.

The methods for image search re-ranking can be classified into supervised and unsupervised [3]. The unsupervised re-ranking methods do not rely on human labeling of relevant images but require prior assumptions on how to employ the information contained in underlying text based result for re-ranking. The challenge of supervised re-ranking models is to design query-independent re-ranking models based on query dependent re-ranking features.

Most existing methods rely on the same framework: I. The text query is used to retrieve a noisy set of images using a text-based search engine, II. In some approaches, this initial set of images is filtered by removing drawings and other non-photographic images, then III. A classifier, specific to the given query, is learned from this image set. For example, using “Sachin” as a query keyword, the retrieved images belong to different three main categories, such as “Sachin Tendulkar” (Cricket), “Sachin Pilgaonkar” (Actor), and “Sachin Patil” (Name of person). Within each main class, there can be several images that are visually similar. Also, there are images that can be irrelevant images or hard to judge relevancy.

Major web image search engines have adopted the strategy. A query keyword as a input given by a user, a pool of images relevant to the query keyword are retrieved by the search engine according to a stored image database. Then user select a query image which observes the user’s search objective, from the set, the remaining images in the set are re-ranked based on their visual similarities with the query image. The text-image index file and visual features of images are pre-calculated offline and stored visual features must be saved then the web image collection is dynamically upgraded. If the visual features are not selected and only the similarity scores of images are stored whenever a new image is added into the collection and we have to compute its similarities with existing images, then the visual features need be computed again.

C. Related Work

Recently so many methods have been proposed for image search re-ranking, which can be divided into three categories: classification- based, clustering-based, graph based[2]. The various methods and techniques are use to do the image re-ranking process and select the most accurate image from the internet.

The Main aim of image re-ranking is to find out visual similarities of images and re-ranking the remaining images based on their visual similarities.
Which are reflecting semantic relevance of images for different query images. The effective low-level visual features are different for the different images. Krapac et al.[1], introduced generic classifiers based on query-relative features which could be used for new query keywords without additional training. Therefore, Unsuitable for real world web search applications. They use new database for the evaluation of web image search algorithm.

There is a lot of work on[5], using visual features to re-rank images retrieved by initial text-only search, however, without requiring users to select query images. Tian et al.[2], formulated image re-ranking with a Bayesian framework. Here, the textual information is modelled as a likelihood, to reflect the disagreement between re-ranked result and text-based search results is called ranking distance. To indicate the ranking score consistency among visually similar samples is called visual consistency. Bayesian visual re-ranking derives the best re-ranking results by maximizing visual consistency while minimizing ranking distance.

The methods for image search re-ranking can be classified into supervised and unsupervised. Some of the methods for image search re-ranking suffer from the unreliability of the assumptions under which the initial text-based image search result is employed in the re-ranking process. Then Yang et al. [3] introduced prototype-based re-ranking method to address this problem in a supervised, but scalable fashion. One of the approaches in this direction is to utilize the online learning algorithms.

Cui et al.[6], [7], classified query images into eight predefined intention categories and gave different feature weighting schemes to different types of query images. But it was difficult for the eight weighting schemes to cover the large diversity of all the web images. It was also likely for a query image to be classified to a wrong category. In order to reduce the semantic gap, query-specific semantic signature was first proposed in [8]. Kuo et al. [9] recently augmented each image with relevant semantic features through propagation over a visual graph and a textual graph which were correlated.

Hsu et al.[4], used the Information Bottleneck (IB) principle to maximize the mutual information between search relevance and visual features. Recently, for general image recognition and matching, there have been a number of works on using projections over predefined concepts, attributes or reference classes as image signatures. Many concepts irrelevant to the query not only increase the computational cost but also deteriorate the accuracy of re-ranking. However, how to automatically find such relevant concepts and use them for online web image re-ranking was not well explored in previous studies.

To avoid the ambiguities in the re-ranked process and to achieve an effective and efficient re-ranking process S.Keerthana et al.[12] introduce a Bag Based Re-ranking approach. In which, given a query keyword a pool of images are re-ranked by the search engines based on the query. By asking the user to select a particular image from the pool, the remaining images are re-ranked based on the user selected image. This method performs: I. Automatic annotation process by K-means algorithm which split the positive and negative bag that contains relevant and irrelevant images respectively. II. GMI-SVM process which perform bag based re-ranking effectively. III. Perform user log operation for individual user log in.

D. Literature Review

Several works have done in web image re-ranking. Some works have addressed the visual re-ranking process in visual search process. The below table gives an overview of all methods used in the visual search process with their merits and demerits.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Feature</th>
<th>Merits</th>
<th>Demerits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Pseudo Relevance Feedback (PRF), SVM Classifier, Boosting, Ranking</td>
<td>Very effective in data retrieval</td>
<td>Sufficient training needed, lot of parameter needed, complexity in designing</td>
</tr>
<tr>
<td>Method</td>
<td>SVM classifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clustering</td>
<td>Information Bottleneck Principle[4].Agglomerative Information Bottleneck</td>
<td>Good performance on name-person queries</td>
<td>Limited to those queries which have significant duplicate characteristics</td>
</tr>
<tr>
<td>Based Method</td>
<td>Bayesian Visual Re-ranking [2], Pointwise ranking distance</td>
<td>Very effective, increase visual consistency and reduce ranking distance</td>
<td>Fails to capture disagreement between score list</td>
</tr>
<tr>
<td>Graph Based</td>
<td>Bayesian Visual Re-ranking [2], Pointwise ranking distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methods</td>
<td>Bayesian Visual Re-ranking [2], Pointwise ranking distance</td>
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</table>

As the Table I shows existing technique can be categories into Classification based, Clustering based and Graph based methods. These methods use different technique for image re-ranking.

In the first row, classification based methods uses the pseudo relevance feedback (PRF) is often utilized. Pseudo relevance feedback is a method that began from text retrieval. It takes few of the top-ranked documents from the search results done initially as pseudo positive. Then in this method the different
classifiers such as SVM, boosting and ranking SVM can be adopted. These techniques are very effective in data retrieval but it needs sufficient training. A lot of parameters need to be estimated.

The second method is clustering based method in which each sample is given a soft pseudo label according to the initial text search result, and then the Information Bottleneck Principle, Agglomerative Information Bottleneck is used for re-ranking. These methods achieve good performance on the named-person queries. But it is limited to those queries which have significant duplicate characteristics.

The third method graph based method in which graph is constructed with the samples as the nodes and the edges between them being weighted by visual similarity. In this method Bayesian Visual Re-ranking, Point wise ranking distance technique are used to re-ranked the images which are very effective also increase visual consistency and reduce ranking distance. But it fails to capture disagreement between score list.

Web mining is important aspect for users to get the data to be highly accurate and most relevant to user query and to at most satisfaction of user. Web Image Re-ranking is an effective way to improve the results of web-based image search. A major challenge in web image Re-ranking is that the similarities of visual features do not well correlate with images and semantic meanings which cannot interpret users search intention. By providing keyword expansion to textual query and visual query expansion to image query the results retrieved are promising than previous implemented systems.

III. CONCLUSION

As the Table1 shows the various methods and techniques to perform image re-ranking and also use to search the most relevant image which is similar to query image. Web image re-ranking is a method which introduced to improve the result of web based image search. It is adopted by current commercial search engines such as Bing, Google, and Yahoo. There is need of image re-ranked using above various methods and techniques to provide better efficiency and effectiveness. In future by defining and modelling new technique and using proper ranking methods efficient and most relevant results can be achieved.

IV. REFERENCES