



Research Article



## Design and Implementation of a Framework for Image Search Reranking

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### ABSTRACT

Images play a vital role in the real world applications.

Government and civil application need to process images in terms of searching, identification and so on. In this context, it is imperative to have an application that can provide web search results so as to automate process of searching for web images. Ranking techniques have been around for improving quality of search results. Reranking is another technique that provides more quality of results. This is the motivation behind this research work which is aimed at proposing a new way of performing reranking. Many techniques came into existence in the real-world. However, their efficiency can be improved further. In this paper, we proposed a framework for image reranking. Our framework performs reranking for web search results. We proposed an algorithm for the same. The algorithm is capable of performing reranking based attributes. The algorithm is implemented using image API and other business logic. We built a prototype application to demonstrate the proof of concept. The empirical results reveal that the proposed framework is useful for image search reranking.

**Keywords** – Image search, reranking, image processing.

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### ABSTRACT

Images play a vital role in the real world applications. Government and civil application need to process images in terms of searching, identification and so on. In this context, it is imperative to have an application that can provide web search results so as to automate process of searching for web images. Ranking techniques have been around for improving quality of search results. Reranking is another technique that provides more quality of results. This is the motivation behind this research work which is aimed at proposing a new way of performing reranking. Many techniques came into existence in the real world. However, their efficiency can be improved further. In this paper, we proposed a framework for image reranking. Our framework performs reranking for web search results. We proposed an algorithm for the same. The algorithm is capable of performing reranking based attributes. The algorithm is implemented using image API and other business logic. We built a prototype application to demonstrate the proof of concept. The empirical results reveal that the proposed framework is useful for image search reranking.

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### 1. INTRODUCTION

Images are growing exponentially in World Wide Web (WWW). The web images are subjected to many applications. Users across the globe use search engines as shown in Figure 1 for performing image search. General search engines provide results of search. However, specialized applications for searching for web images can provide ranked results with tailor made algorithms.



Figure 1: Search engines for web image search

Semantic attributes associated with web images can improve quality of search. In this paper we make use of semantic attributes for leveraging reranking mechanism. Ranking of images can provide high quality results. The process of reranking further refine search results. The results will be satisfactory to end users. This is the mutations behind our work in this paper.

Our contributions in this paper are described here. We proposed a framework for image reranking. Our framework performs reranking for web search results. We proposed an algorithm for the same. The algorithm is capable of performing reranking based attributes. The algorithm is implemented using image API and other business logic. We built a prototype application to demonstrate the proof of concept. The empirical results reveal that the proposed framework is useful for image search reranking. The remainder of the paper is structured as follows. Section II provides review of literature. Section III presents the proposed system in detail. Section IV presents experimental results while section V concludes the paper.

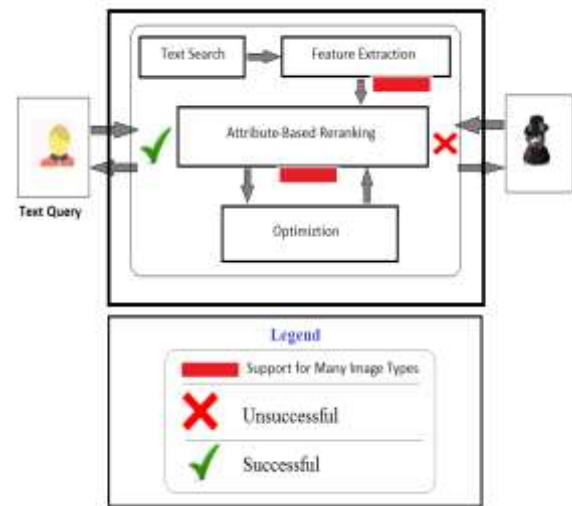
## 2. RELATED WORKS

There has been dramatic increase in the image available over Internet sources. Therefore there is increased research on the image retrieval and image search in the academia as explored in [1]-[2]. Most of the search engines depend on text based search. The results are sometimes not relevant. This is due to dependence on text based search. The queries made by users across the globe are answered in general way. Text based image search suffers from many difficulties. To overcome this problem and refine text-based search results visual ranking came into existence. The visual ranking takes care of images and the features in order to have best ranking. The ranked results naturally produce quality results. Visual ranking is explored in [3]-[4]. The existing visual ranking methods make use of data mining techniques such as K-Means, K-Medoid and so on.

Relevance feedback and its related researches came into existence. Later on attribute based approaches came into existence. They make use of semantic features of attributes for better quality results as explored in [5]. There are techniques like semantic web search [6], classifications [7], fine-grained visual categorization [8] and object recognition [9]-[10]. In this paper we exploited attribute based text features in order to have more refined search results. We built a framework for reranking for better quality search results. Our system is able to differentiate relevant images, highly relevant images and irrelevant images.

## 3. PROPOSED FRAMEWORK

In this paper we proposed framework as shown in Figure 2. Our framework makes use of our proposed algorithm to perform attribute based reranking. We also use semantic concept in order to improve accuracy in results. The framework takes text query as input and performs text search using semantic concept. The features of results are extracted for attribute-based reranking. The reranking results in quality images. They are subjected to further optimization before returning results to end users. Sometime it may result in unsuccessful search based on the availability of images.



**Figure 2:** Proposed Framework

The framework is flexible in nature and supports multiple kinds of images. Images are of different types and with different extensions. Such images are handled by our framework. The text based query is achieved with semantic attributes that can help in improving quality of search results. We proposed an algorithm for performing re-ranking of images.

### Proposed Algorithm

**Algorithm:** Attribute-Based Reranking Algorithm

**Inputs:** Text Based Query  $q$ , Image Database  $IDB$

**Outputs:** Reranking image results  $I'$

```

01 Initialize query  $q$  with user input
02 Initialize Image Vector  $IV$ 
03 Initialize Feature Vector  $FV$ 
04 Initialize Graph Vector  $GV$ 
05 For each image in  $IDB$ 
06   IF image matches with  $q$  THEN
07     Add image to  $IV$ 
08   END IF
09 End For
10 For each image in  $IV$ 
11   Extract features into  $FV$ 
12   Update  $GV$ 
13 End For
14 For each entity in  $GV$ 
15   Extract weight of entity
16   Update rank
17   Add re ranked image to  $I'$ 
18 End For
19 Return  $I'$ 

```

**Algorithm 1:** Attribute-Based Reranking Algorithm

As shown in the algorithm it has a series of steps for reranking. It has many phases known as initialization, performing text based search, feature extraction, generation of graph for easy processing and reranking of images besides optimization.

#### 4. EXPERIMENTAL RESULTS

We built a prototype application to demonstrate the proof of concept. Our framework performs reranking for web search results. We proposed an algorithm for the same. The algorithm is capable of performing reranking based attributes. The algorithm is implemented using image API and other business logic. We built a prototype application to demonstrate the proof of concept. The empirical results reveal that the proposed framework is useful for image search reranking.



Figure 3: Results with demarcation

As shown in Figure 3, it is evident that the proposed system is able to differentiate irrelevant images from relevant and very relevant images. This kind of discrimination can help the application to produce quality results.



Figure 4: Attribute Based Reranking Results

As shown in Figure 4, it is evident that five semantic words are used to provide quality results. The search results are reranking based on the semantic attributes that help in filtering out irrelevant images.

Position	Fitted curve
1	1.63
2	1.51
3	1.42
4	1.35
5	1.31
6	1.28
7	1.25
8	1.24
9	1.23
10	1.22
11	1.21

Table 1: Average Relevance Score

As shown in Table 1, the average relevance score is computed and the results are observed. These results are used to make well-informed decisions in the process of making final results and reranking.

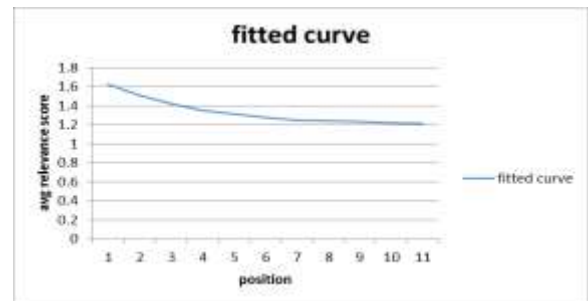


Figure 5: Relevance Score Dynamics

As shown in Figure 5, the average relevance score is computed and the results are observed. These results are used to make well-informed decisions in the process of making final results and reranking.

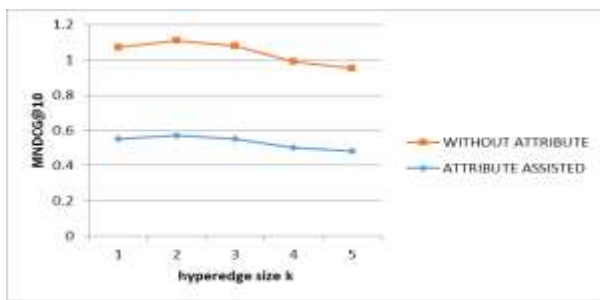
Hyper edge size of k	Attribute assisted	Without attribute
1	0.55	0.52
2	0.57	0.54
3	0.55	0.53
4	0.5	0.49
5	0.482	0.47

Table 2: Performance of Algorithm with Attribute Assisted and Without

As shown in Table 2, the hyper edge size, attribute assisted results and without attributed assisted results are presented. The performance is more when attribute assisted approach is followed.

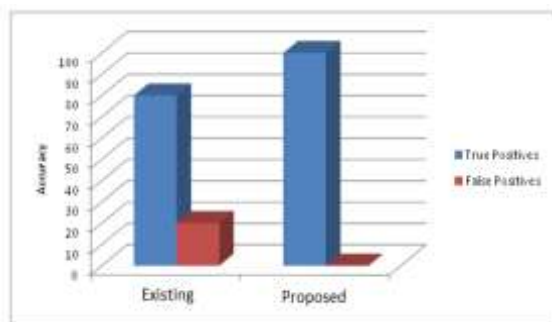


The performance of the algorithm is computed and the results are presented in Table 2.



**Figure 6:** Performance comparison with and without attribute assistance

As shown in Figure 6, the horizontal axis represents hyper edge size while the vertical axis shows resultant values. The hyper edge size, attribute assisted results and without attributed assisted results are presented. The performance is more when attribute assisted approach is followed.



**Figure 7:** Performance comparison

As shown in Figure 7, it is evident that the proposed system is more robust and produces quality results in the form of images.

## 5. CONCLUSIONS AND FUTURE WORK

In this paper we studied the problem of reranking for web search images. Web is rich with images. Images are grown exponentially. They are either associated with WWW or an image database associated with an enterprise. There are many applications that need to process images. Image search is an important activity. When images are searched, they appear in the results. Ranking for the images can improve search results. The quality of search results is enhanced with reranking. In this paper, we focused on reranking technique for improved quality of search results. In literature any approaches came into existence. We proposed a framework for image reranking. Our framework

performs reranking for web search results. We proposed an algorithm for the same. The algorithm is capable of performing reranking based attributes. The algorithm is implemented using image API and other business logic. We built a prototype application to demonstrate the proof of concept. The empirical results reveal that the proposed framework is useful for image search reranking. This research can be extended further by incorporating this into a domain specific application as part of decision support systems.

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