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A Review on Multi-Attribute Assisted Reranking using SVM Classification for Web Image Search

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Abstract: ***This review paper formulates an image reranking problem to improve Text Based Information Retrieval (TBIR) by using Multi-attribute learning methods. Existing methods train separate classifier for each word and heuristically combine outputs for retrieving multiword query. The proposed work partition relevant images into clusters, known as container, by using visual and textual attributes. Based on multi-attributes learning we cluster multiple relevant images in positive container whereas few relevant images are clustered with irrelevant images in negative container. Further we enhance multi-attribute learning algorithm to effectively rerank relevant images.***

Keywords: image retrieval, attribute-assisted, search, SVM, Multiple-instance learning, CBIR

1. Introduction

Search engine can provide many search services to users including text, image and video search. Today, searches for textual content generally include the majority of searches performed by users. However, searches for image content are increasingly becoming popular with users as image search services are becoming more readily available.

Currently, image search technology is based on keyword search. An image is, for example, indexed by its URL and with associated text from the web page in which it appears. Search queries that match the indexed text can return the associated image as an answer, with little or no information from the image media itself being used in querying process.

There is no sufficient method for determining the relevance of each indexed image for a corresponding search query. Conventional methods may not take into consideration the relevancy of the text indexed with corresponding images as well as the quality of indexed images.

The computer readable media can be configured to perform a method that includes receiving a search query in text and identifying images related to the search query. Further the method rank the images using one or more ranking factors.

The proposed system of this paper is described below:

- We propose a new multi-attribute assisted reranking method by using SVM classification for web image search. Firstly, we partition relevant images into two clusters with the help of visual and textual attributes. Each cluster of images will be treated as "container" and images inside the cluster as "instances".
- Positive container contain very relevant multiple images whereas negative container clustered with few relevant images alongwith irrelevant images.
- We enhance multi-attribute learning algorithm using SVM for effective reranking of relevant images.

2. Literature Survey

Image search reranking is the procedure to arrange the matched images according to the relevancy of an image. Recently, visual reranking is proposed to refine text-based search results by exploiting the visual information contained in image [2]-[4]. The existing visual reranking method can be categorized into three categories as clustering based, classification based and graph based[1].The reranking method proposed in [1]is such that each image is represented by an attribute feature consisting of the responses from the classifiers for all the predefined attributes. A hypergraph is used to model the relationship between images by integrating low–level visual features and attribute features and then hypergraph reranking is used to rank the images. The "learning-to-rerank" paradigm ,which derives the reranking function in a supervised fashion from the human-labeled training data is proposed in [2].In paper[3] proposed a model in which textual and visual information from the probabilistic perspective and formulate visual reranking as an optimization problem, termed as Bayesian visual reranking. The method proposed for multi-attribute retrieval in [5] is to explicitly model the correlations present between the attributes and also utilizes other attributes in the vocabulary which are not present in the query, for ranking and retrieval. An effectiveness of semantic attributes was used in number of applications, including face verification [7], object recognition [6]-[12], fine grained visual categorization [17] and image search [5].

In Information Bottle based scheme [10], the images in the initial results are primarily grouped automatically into several clusters. Then the re-ranked result list is created first by ordering the clusters according to the cluster conditional probability and next by ordering the samples within a cluster based on their cluster membership value. In [19], a fast and accurate scheme is proposed for grouping Web image search results into semantic clusters.

In the classification based methods, visual reranking is

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formulated as binary classification problem which aims to identify whether each search result is relevant or not. For instance, a classifier or a ranking model is learned with the pseudo relevance feedback (PRF) [13]. To address the issue of noisy training examples, paper [4] learned a query independent text based re-ranker. The top ranked results from the text based reranking are then selected as positive training examples. Negative training examples are picked randomly from the other queries. A binary SVM classifier is then used to re-rank the results on the basis of visual features.

3. Basic System Architecture

To improve the searching performance, in this work, we present a novel framework that enables us to formulate the image re-ranking problem to improve TBIR performance by using Multi-Attributes (MA) learning methods.

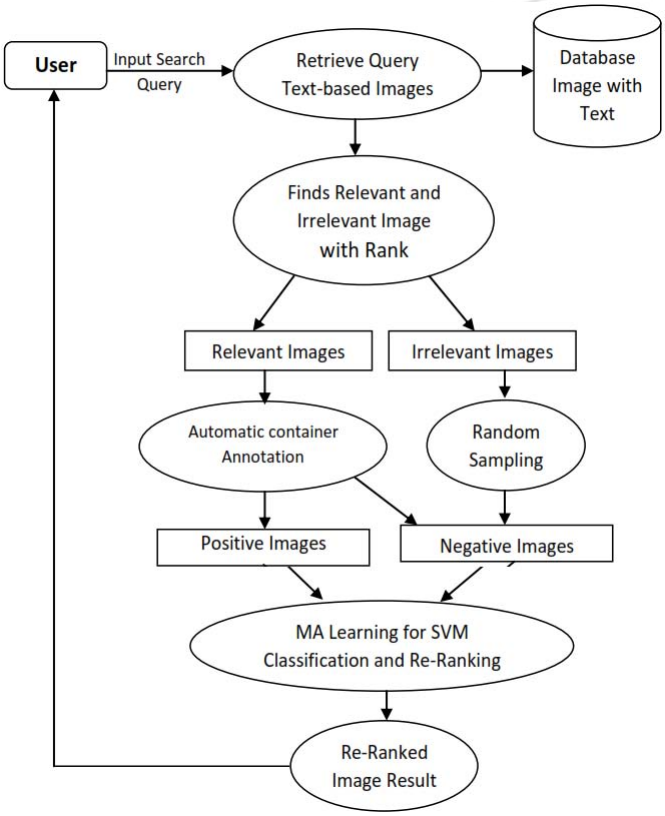

Figure 1: Basic System Architecture

It implements a multi-attribute based image re-ranking approach. The proposed work initially partitions the relevant images into clusters by using visual and textual attributes. Based on the multi-attributes learning we treat each cluster of images as a "container" and the images inside the cluster as "instances". We cluster the very likely images that can have multiple relevant images in a positive container while a few relevant images may be clustered with irrelevant images in a negative container. But this case may not be effective to address the ambiguities on the image instance labels in both positive and negative container. Therefore, we further enhance the multi-attribute learning algorithm using SVM, referred to MAL-SVM, which uses the "Multi-attributes Generation" strategy and maximum margin criterion to effectively re-rank the relevant images.

This proposed framework will implement the functions to handle the user search query and to provide an easy access for relevant and irrelevant images.

It automatic annotates an image based on the visual and textual features such as color, shape and textures which are considered and compared with user selected image. To construct "containers," we partition the relevant images into clusters using the k-means clustering method based on visual and textual features. After that, each cluster is considered as a "container." The images in the image container will be annotated as positive and negative containers to train classifiers for image classification and re-ranking using SVM.

4. Conclusion

Image search reranking has been studied for number of years and various approaches have been developed recently to boost the performance of text-based image search engine for general queries. But in text based queries, the associated text is unable to appropriately describe the image content. To address this issue visual reranking is used which gives visual information contained in the image. An attribute-based image representation describes image regions that are common within an object category but rare outside of it.

Motivated from the observations during survey, in this paper, we proposed a framework to improve searching performance. In which we used clustering based reranking and clustering the images in positive and negative containers by using k-means clustering method based on visual and textual feature. Further, reranking is performed using multi-attribute learning algorithm using SVM, known as MAL-SVM.

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