Automatic Image Annotation and Image Retrieval in Social Networks Using Hadoop

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ABSTRACT
With the advanced technologies of smart phones and internet, images can be easily uploaded, tagged and shared to online social networks such as twitter and Facebook. This led to a rapid increase of images in social networks and becomes a problem to the user to store and retrieve images manually. Automatic Image Annotation (AIA) and Image Retrieval is one of the most challenging tasks in online social networks. In order to achieve AIA, the proposed system helps to organize the images automatically with the help of Hadoop Image Processing Interface (HIPI) technique. HIPI is used to store a large collection of images in matrix format which is a highly available cluster in a distributed environment. Finally, a YARN based retrieval algorithm will use to extract the images for achieving high performance in the big data environment. The experimental results will conclude that automatically organize images and efficient retrieval of images from social media.


INTRODUCTION
In this current era, social media usage is rapidly increasing day by day to update once thought, creativity, interest, etc... Most of the social media users are interested to update their important activities/occasions as pictures. Nowadays taking a picture is not complex one, where a personal need to look for a Digital Camera, almost every individual has their smart phones with high quality camera. There is a trend that people are taking more and more photo each day and uploaded in their social networks. As a result, the number of photos taken or obtained from friend’s sharing can soon create a great problem on how to organize and retrieve them from various sources.

One widely adopted solution for accessing and retrieving images is to annotate the content with meaningful labels. Two types of annotation approaches are available: manual annotation and automatic annotation[1]. Manual image annotation is time-consuming, tedious and expensive task. The goal of automatic image annotation assigns a collection of keywords (annotation) to a target image. (i.e.) input is the target (untagged) image and the output is a collection of keywords that describe the target image in the most possible way. In other words, the system semantically describes the content of an image.

An image retrieval framework is a computer system framework for surfing, seeking and retrieving images from a large database of digital images. Most conventional and common strategies for image retrieval use some technique for including metadata such as captioning, keywords, or descriptions with the goal that can be performed over the annotation words.
Annotation based image retrieval (image tagging) permits users to add meta information to images. Although the semantic data cannot be represented in an image itself, using metadata information object can obtain a relevant image that is already annotated. In the image tagging approach, description for an image is done collaboratively by various users. Anyone can assign several tags to an image. In order to increase the relevance between image tags and an image, state of the art techniques in the area of image retrieval have focused on tag recommendation/extension, tag positioning (reordering), and disambiguation. To date, the goal of automatic image annotation based approaches is to improve the quality of image retrieval using additional data such as tag relationships (e.g., term recurrence and term similarity) and context-information (e.g., what, where, when, and sort data).

Therefore, in this project develop a photo organization application that facilitates the management of photo in social network platform. Tagging information can be collected from location, place, date etc. Based on the similarity of these properties, system will provide useful functions to tackle common problems encountered. This system also provides searching and grouping capabilities to the user, so that users can reorganize the photos in different ways based on needs to finding the desired photos whenever necessary. This greatly helps users to find desired photos easily without the need to organize the photos manually.

Automatic image annotation and image retrieval application can bring the convenience to the users, and also provide a simple and easy way for users to view and manage their photos.

Related Works:

Abbas Bahlrololoum and Hossein Nezamabadi-pour [1] proposed an automatic image annotation framework including two stream lines for combining different feature spaces. Concept prototypes and feature prototypes are extracted in various spaces by gravity clustering in training phase. To select the optimal space subset and related participation weights for combining the feature spaces in each stream line a metaheuristic search algorithm is applied to the problem. Finally, the result of two stream lines is combined to annotate an unlabeled query image in the performance phase. This framework is tested on two standard databases containing 20k images and a set of experiments are performed to explore the different aspects and abilities of the system.

Hofmann [4] proposed the Probabilistic Latent Semantic Indexing (PLSI) display, as a contrasting option to LSI. The underlying foundations of PLSI backpedal to the LSI. Like LSI, PLSI manages synonymous and in addition polysemous words. PLSI is a computerized report ordering strategy, in which every archive is spoken to by its statement recurrence. PLSI is otherwise called the viewpoint demonstrate which is the Latent variable model in which idle factors are connected with watched factors. Thus, it has a stronger factual establishment, and can give legitimate generative information demonstrate. PLSI depends on the Expectation Maximization (EM) calculation. While PLSI is one of the great content examination method it has a few disadvantages, for example, it is deficient since give no probabilistic model at the level of archives, prompts over fitting issues if there are excessively numerous parameters in the model and it's not clear how to allocate, how to dole out likelihood to a report outside of the preparation information. To address the impediments here proposed an unsupervised, generative model called Latent Dirichlet Allocation (LDA).

J. Hu and K.M. Lam [5] introduced a two-arrange strategy for multi-class image marking. They first present a basic name filtering calculation, which can expel the vast majority of the superfluous marks for a question image while the potential names are kept up. With a little populace of potential names left, then the relationship between the elements to be utilized and every single class is investigated. Consequently, they asserted that the particular and viable elements are chosen for every class to frame a name particular classifier.

M. Ivasić-kos et al [6] proposed a fluffy learning based astute framework for image annotation, which can manage unverifiable and questionable information and can explain images with ideas on various levels of reflection that is more human-like. They utilized a fluffy learning representation conspire in view of fluffy petri net. They asserted that the procurement of learning is encouraged in a way that other than the general information gave by the master, the calculable realities and standards about the ideas and in addition their unwavering quality are professional duced naturally from information.

E.kuric and M.Bielikova [7] recommended a technique for automatic image annotation utilizing moderately substantial scale picture preparing dataset. They joined nearby and worldwide elements to guarantee power and speculation required by complex questions, so they concentrated on execution and versatility. To get explanation for a given target image, they asserted that their approach depends in transit how human explain images physically. Latest strategies for AIA based image retrieval for the most part isolated into two sorts of methodologies, the probabilistic displaying techniques and the classification techniques. The probabilistic demonstrating strategies intend to build up a pertinence model to speak to the relationship or joint likelihood dispersion amongst images and catchphrases.

Lavrenko et al. [8] demonstrate Cross Media Relevance Model (CMRM) bring about the loss of helpful data in image area and also recommended that every piece of partitioned image can be best portrayed by consistent esteemed component vector. Here nonstop elements are specifically connected with words and does not require a transitional bunching stage. This model additionally permits rank recovery because of a content
question. Continuous Relevance model (CRM) makes no suspicion about topological structure. It is a sort of doubly non-parametric approach where desire is processed on each individual point in preparing set. genuine esteemed component vector determines the protest area, shading, shape in the first image.

G. Nasierting et al [9] introduced a multi-name order outline work for automatic image annotation. This structure includes an underlying bunching stage that breaks the first preparing set into a few disjoint groups of information. It then prepares a multiname classifier from the information of every bunch. Given another test occurrence, the system first finds the closest bunch and afterward applies the relating model.

S. Zhang et al [11] proposed a strategy of automatic image annotation utilizing bunch sparsity. It regularizes the issue highlights related choice and takes care of comment as a recovery issue. It utilizes idea of regressor for speaking to closeness of image match if regressor esteem is sure means combine is comparative if negative match are dissimilar. To joining the watchword data similitude function are utilize . The natures of combine comparability very impact the general execution. Image has numerous components so discovering likeness essential elements are utilized and other can be pruned by doing out weighted separation zero. Desire augmentation calculation is utilized to input comparative and unique combine and iteratively enhance the execution by discovering better match.

Zhu and Liu [12] proposed to regard image explanation as a procedure of machine interpretation. They presented a Translation Model (TM) in light of measurements. They utilized the technique to make an interpretation of a visual vocabulary into watchwords. The other run of the mill technique is the Latent Dirichlet Allocation. As of late developing pattern for recovering the images factual arrangement is utilized to aggregate the images into harsh semantic classes, for example, chart photo, finished non-finished. In this manner image is sorted and by allowing versatile semantic seeking and by narrowing down the hunt space in database image recovery get improved.

**Overview And Implementation:**

Multi Expert Architecture for Image Organization is built on the Hadoop environment with mobile application as client side and web application as server which stored photo and auxiliary information.

![Diagram](image_url)

Figure 1 shows an illustration of the components in photo organizing system. The client side provides a user interface for searching and organizing similar photos in their collection.

**Fig. 1: Multi Expert Architecture for Image Organization**

In user interface configure developer application id to collect user credential information. If user login with system, it provides option to sign in with social media. When user sign in with the application, the respective social media handle the user authentication and ask permission for automatic image annotation. If user provides permission, the social media handler returns user authentication token and user id. Store that credential information in the HBase.
If any entry is available in HBase the resource manager allocates YARN jobs which is automatically processed by a server. After getting user token it calls developer API for getting images in Social Networks and it can be stored in HBase. The images can be converted into matrix format through HIPI technique and store into Hadoop Distributed File System. Image can be recognized using OpenCV and extract image as an object attribute and meta attribute. Based on tagging and object, images are organized with the help of Haar classifier and finally store into HBase.

In the following, introduce some of the important components individually in more detail.

A. User Interface:
In User interface, developer register account in social media and get application id. After getting application id, configure into user interface. When user opens the app, list of social networks options can be provided. When users select any one option, the respective social media handler returns the user authentication token and asks permission for automatic image annotation. If user provides permission, the social media handler returns user id to the developer to collect images in social networks. Store user credential information in the HBase.

B. Image Retrieval:
Images can be retrieved through user token. After getting user token multi expert system ask permission from the users to organize the images. If user provides permission, it calls developer API (Application Programming Interface) for getting images in social networks such as facebook and twitter. Finally retrieve images in social networks can be stored in HBase.

C. Image Preprocessing:
Source image can be preprocessed to extract image details. Preprocessed image can be extracted based on object and tag detail and store into HBase. The stored image can be send to Hadoop Image Processing Interface (HIPI) to convert image into matrix format. HIPI provides solution to store large collection of images which is highly available cluster and store into HBase.

D. Object Detection & Recognition:
After getting image from HIPI storage it detect the object using openCV. Open source computer vision helps the user to easily detect object in an image. Detected image can be extracted based on object attribute such as human, animal, tree etc., and meta attribute such as place, location ,date, etc., as shown in Figure 2 and store into HBase.

Get untagged image from HBase and compare the object with existing tagged object. The existing tagged object contains the attributes as face, animal, place, etc. If an object match with existing tagged object give same tag name to the object else based on the object images are organized.

Fig. 2: Framework for Object detection and Recognition
RESULT AND DISCUSSION

Multi expert architecture for Image Organization system have tested with various modules individually. Figure 3 and 4 are the screen capture demonstrating the results of different operations. Figure 2 shows that user to login with social media to organize the images automatically. After login to the account, user provide permission to access the token. Through authorized token web service call API to getting images as shown in Figure 4.

Fig. 3: Results for getting Authorized token from user

Fig. 4: Results for collecting images through token
The sort by object and location can present reasonable ordering and grouping as expected. Similar objects or locations are rearranged closer together, so that one can easily pick their desired type of image without scrolling and seeking from beginning of the collection till the end. However, problem may appear when sorting by object if there are multiple objects in an image. This current implementation will try to use the objects such as face, location and date to group the image. Thus these images will appear only once in the collection. For photos without objects and location, they will be placed at the end of the collection.

**Conclusion:**

This paper proposed a solution for automatic image annotation and image retrieval by using the hadoop platform. For efficient image processing and image storage, HIPI is doing vital role to store a large collection of images in matrix format. Haar cascade classifier is used for face detection to organize processed images. The whole process mitigates the tedious and painful manual image collection. The system is flexible for sorting and searching capabilities so users can reorganize or seek their images based on their needs. Finally, yarn algorithm provides best way to organize and retrieve images which is processed automatically by server. The experimental results confirmed the effectiveness of the proposed system and showed that it can be effectively used as automatic image annotation and image retrieval in social networks such as Facebook. In future, it can be enhanced to organize/annotate with most of the real world entity images which has shared and tagged by a social user.

**REFERENCES**