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A Novel Dictionary Learning Method for Image Annotation and Retrieval

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Abstract- Now-a- days increase in usage of social media like Facebook, Twitter, Instagram; Image Annotation is necessary process. Image annotation which is also known as Image Tagging is the process by which a computer system automatically assigns meta-data in the form of captioning or keywords to a digital image. In the previous approach Multi-label Dictionary Learning has been implemented for image annotation. But now for effective and accurate labeling we will be implementing SURF Algorithm. In this novel approach we are taking image of as input and then applying SURF algorithm for image tagging. Thus output will contain labels of objects in the images.

Keywords— Image annotation, Feature extraction, Multi-label dictionary, KNN algorithm, Naïve Bayes classifier.

I. INTRODUCTION

Now-a-days increase in usage of social media like Facebook, Twitter, Instagram; Image Annotation is necessary process. People using social media may incorrectly label the image which leads to ambiguity. The incorrect labels to images may decrease the efficiency of search engines. Thus automatic image annotation will significantly improve the performance of the search engines and will also be helpful for proper tagging of images on social media.
Image annotation which is also known as Image Tagging is the process by which a computer system automatically assigns meta-data in the form of captioning or keywords to a digital image. In this novel approach we are taking image of constant resolution as input and then applying SURF algorithm for image tagging. SURF (Speeded Up Robust Features) algorithm is used for local feature detection such as object recognition, image registration, classification and 3-D reconstructions. The feature vector matrix of the input image will be calculated using RGB features, further using this feature vector will compute the similarity values with images in training dataset. The training dataset includes images labelled images from every domain. Using the similarity values, the input image will be annotated with related labels. Thus output will contain labels of objects in the images.

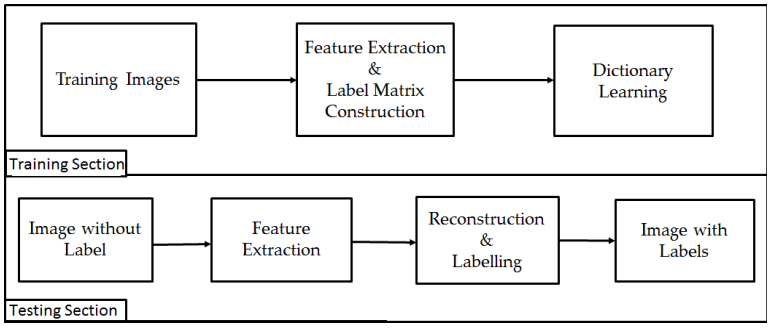
II. RELATED WORK

Xiao-Yuan Jing, Fei Wu, Zhiqiang Li, Ruimin Hu et al [1], proposed a novel multi-label learning approach, named Multi-Label Dictionary Learning with label consistency regularization which conducts [3]multi-label dictionary learning and partial-identical label embedding simultaneously. In the input feature space, incorporation of the dictionary learning technique into multi-label learning and design the label consistency regularization term for better representation of features. In the output label space; using multi-label dictionary labels have been embedded using the features extracted from given input image.

In this approach, we have used edge feature extraction along with RGB features for creating a feature vector matrix for representation of an image. This feature vector matrix is further used in classifier algorithm for grouping the images for training the classifier.

III. DETAILS OF PROPOSED METHOD

This project divided into two modules
-Training Classifier Module
-Testing Module



1) Training Module 1:

In this module, Image feature is being extracted and details are displayed.
Feature Vector is calculated is using RGB feature vector method.
Edge Feature vector is calculated using SIFT algorithm.

2) Training Module 2

Similarity between each image found out on the basis of feature vector using KNN Algorithm.

3) Training Module 3

In this module grouping of images are done using Naïve Bayes classifier.
Using Cosine similarity function, it provides ranking of images.

4) Testing Module 1

In this testing module, end user is selecting image for feature extraction of the image.

IV. ALGORITHM

ALGORITHM:

I. Feature Vector

- Input- Dataset Images
- Output-Feature Vectors
- Steps:

1. Traverse through entire input image array.
2. Read individual pixel color value (24-bit).
3. Split the pixel color value into individual R, G and B 8-bit values.
4. Make the color intensity range for each R, G, B color component of pixel into 10 bins i.e. 0-25, 25-50, 50-75…225-250.
5. Read the color intensity value of R, G, B component of first pixel, increment the count of bin to which the intensity value belongs.
6. Repeat the above step for each pixel.

II. Naive Bayes Classification:

- ***The Bayes Theorem:***

$$P(C/X) = \frac{P(C)\ P(X/C)}{P(X)}$$

- P(C): Prior probability of Class C having given image.
- P(X): Prior probability of training data X.
- P(C/X) : Probability of C given X
- P(X/C) : Probability of X given C

Input – Image, Class C, Trained dataset.
Output – Images which belongs to Class C.
Steps:

1. Extract the features of input image.
2. Find out the probability P(C) of Class C that may contain the features of input image (Prior Probability).
3. Find out the probability $P(X/C_i)$, probability of occurrence of input image in given Class C_i (Likelihood).
4. Find out the probability P(X) , probability of occurrence of input image among all classes. (Evidence).
5. Find out the probability $P(C_i/X)$, Probability of Class C_i that contain given input image X, is the possibility of that X can be labeled C_i
6. Repeat the step 2 to 5 for all Classes.
7. Assign the label of class to Input image, who has the maximum posterior probability among all classes.

III.KNN Algorithm

Step 1: Read the training data from a database.
Step 2: Read the testing data.
Step 3: Set K to some value.

Step 5: For each testing example in the testing data set, find the K nearest neighbors in the training data set based on the Cosine Similarity measure

Step 7: Predict the class value by finding the maximum class represented in the K nearest neighbors

V. CONCLUSIONS

Image annotation has attracted lots of research interest. Image annotation which is also known as Image Tagging is the process by which a computer system automatically assigns meta-data in the form of captioning or keywords to a digital image. Previously, Multi-label Dictionary Learning approach has been implemented for image annotation. But now for elective and accurate labelling, we have implemented SURF Algorithm. In this, we are giving test image for label prediction. System will extract features from trained database and store features into the database. System have train classifier for data set features. We will accept and extract feature from user submitted image and assign label using train classifier by displaying label list to user. In this approach we are taking image as input and then applying SURF algorithm for image tagging. Thus output will contain labels of objects in the images.

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