ABHIYANTRIKI
An International Journal of Engineering & Technology
(AIJET)
Vol. 1, No. 1 (November, 2014) http://www.aijet.in/ eISSN: 2394-627X

Image Classification Using GSM-PAF and Genetic Algorithm

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Abstract

Every day thousands of images are generated which are importantly classify in a faster way for classification in a different categories. Multiview learning aims to unify different kinds of features to produce a consensual and efficient representation. This paper redefines part optimization in the PAF (Patch Alignment Framework) and develops a GSM-PAF (Group Sparse Multiview Patch Alignment Framework) and also use the GA (Genetic Algorithm) for optimizes the feature of each image in data set. The new part optimization considers not only the complementary properties of different views, but also views consistency. We have to extract the various kinds of features for each image and then generate the different view based on the features, then optimize the features of each image using genetic algorithm and classify the images from the real world image dataset and then generate different views based on the features.

Keywords*: GSM-PAF, Joint Feature Extraction and Feature Selection, Genetic Algorithm.*

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1. Introduction

Every day thousands of images are generated, which are necessity to classify and access by an easy and faster way. Classification is an information processing task in which image are categorization into multiple groups and classify images with another. We are never to be classifying the images from real world image data set by using single feature. In this paper, we extract various kinds of features for each image, and then generate different views based on the features of the image. The views of images are regarded as multiple views (Multi-view) of an image. Each view is assumed to have a physical meaning and statistical property.

Recently, a large number of methods of learning from multi-view data (Multi-view Learning) by considering the diversity of different views have been developed. These views may be obtained from different visual views, multiple sources or different subsets. In this topic, we focus on image classification and each image has multiple features. In the high-dimensional space of each view's representation, it is hard to distinguish images of different classes (e.g. features that do not carry discriminative information weaken the capability of a trained model to separate

samples from different classes). We apply this framework in image classification to investigate the effectiveness of the proposed algorithm. We first project the multi-view data into a low-dimensional space and then perform classification in this space using conventional classifiers such as KNN (k-nearest neighbour) Classifier or SVM (Support Vector Machine) classifier.

2. Review of Literature

Jie Gui [1] describes a new linear multi-view feature extraction method based on PAF. GSMPAF is flexible and can be either unsupervised or supervised. GSM-PAF is a further yet comprehensive development of patch alignment framework which unifies many dimensionality reduction algorithms a framework of joint feature extraction and feature selection for multi-view learning. Z. G. Fan [2] explained a large number of methods of learning from multi-view data (multi-view learning) by considering the diversity of different views. These views may be obtained from different visual views, multiple sources or different subsets. For example, any object can be captured from a range of visual views, e.g., (frontal and profile views of faces); a person can be identified by face, palm print or iris with information obtained from multiple sources; or an image can be represented by its color or shape features, which can be treated as multiple features of the image. It also describes a discriminative feature selection method utilizing support vector machine for challenging task of multi-view faces recognition.

C. M. Christoudias [3] studies how the accuracy can be improved of object recognition when information from multiple views are integrated, but information in each view can often be highly redundant. The author consider the problem of distributed object recognition or indexing from multiple cameras, where the computational power available at each camera sensor is limited and communication between cameras is prohibitively expensive. There is an unsupervised multi-view feature selection algorithm based on a distributed coding approach. With our method, a Gaussian process model of the joint view statistics is used at the receiver to obtain a joint encoding of the views without directly sharing information across encoders. There is recognition and indexing tasks with multi-view image databases and show that our method compares favorably to an independent encoding of the features from each camera. Tianhao Zhang [4] discusses about spectral analysis based dimensionality reduction algorithms and applied in data mining and computer vision applications. Many algorithms have been developed, e.g., principal component analysis, locally linear embedding and local tangent space alignment. There is a framework, named “patch alignment”, which consists of two stages: part optimization and whole alignment. There is a new dimensionality reduction algorithm, termed Discriminative Locality Alignment (DLA), by imposing discriminative information in the part optimization stage. Z. Y. Zhang [5], in that Non-negative Matrix Factorization (NMF) mainly focuses on the hidden pattern discovery behind a series of vectors for two-way data. Tri-ONTD model performs adaptive dimension reduction for tensors as it integrates the subspace identification and the clustering process into a single process. The Tri-ONTD model can also be regarded as an extension of the Tri-factor NMF model. Tri-ONTD model performs adaptive dimension reduction on tensors as it integrates the subspace identification and the clustering process into a single process. C. Xu [6] discusses about the multi-view learning such as dimensionality reduction (feature extraction and feature selection, classification and clustering). A great many methods of learning from multi-view data by considering the diversity of different views have been developed. These views may be obtained from multiple sources or different feature subsets.

V. Bolón-Canedo [7], in this context, the important of feature selection is beyond doubt and different method has been developed. However with such a vast body of algorithm available, choosing the adequate feature selection is not an easy to solve question and it is necessary to check their effectiveness on different situation. S. T. Roweis [8] explained many problems in information processing involve some form of dimensionality reduction. Here LLE (Locally Linear Embedding); an unsupervised learning algorithm that computes low dimensional, neighbourhood preserving embeddings of high dimensional data. LLE attempts to discover nonlinear structure in high dimensional data by exploiting. X. He [9], LPP (Locality Preserving Projection), as a linear version of manifold learning algorithm has attracted considerable interest in recent years. When LPP is applied to image representation and recognition, PCA is used for dimensionality reduction first. We prove that LPP can be directly implemented in DCT (Discrete Cosine Transform) domain. Blum [10] explains multiple view learning introduced in semi-supervised learning. There is a co-training algorithm to use both labelled and unlabelled examples to train a classifier from two representations. The co-training algorithm trains one classifier on each view of the labelled examples and then iteratively allows each classifier to label the unlabelled examples it predicts with the highest confidence.

3. Objectives of the Study

The objectives of the paper are:

a. To extract various kinds of features for each image and then generate different views based on the features.
b. GA is used for optimize the number of features.
c. GA is used to speed up the process of image classification with view consistency.
d. KNN and SVM Classifier are to be used for Image Classification.

4. Research Methodology

In the proposed work, for better classification of image, we use the Genetic Algorithm and GSM-PAF. We first project the Multi view data into a low dimensional space and then perform classification in Genetic space using conventional classifier. Here, first we take the Image Dataset as an Input then by using GSM-PAF algorithm we have to extract feature of each Image from Image Dataset. Then generate the Graph depend on the features of the image. After that for better classification of Image, we have to optimize the feature of each Image using Genetic algorithm. The process of Image classification is shown in the figure 1.

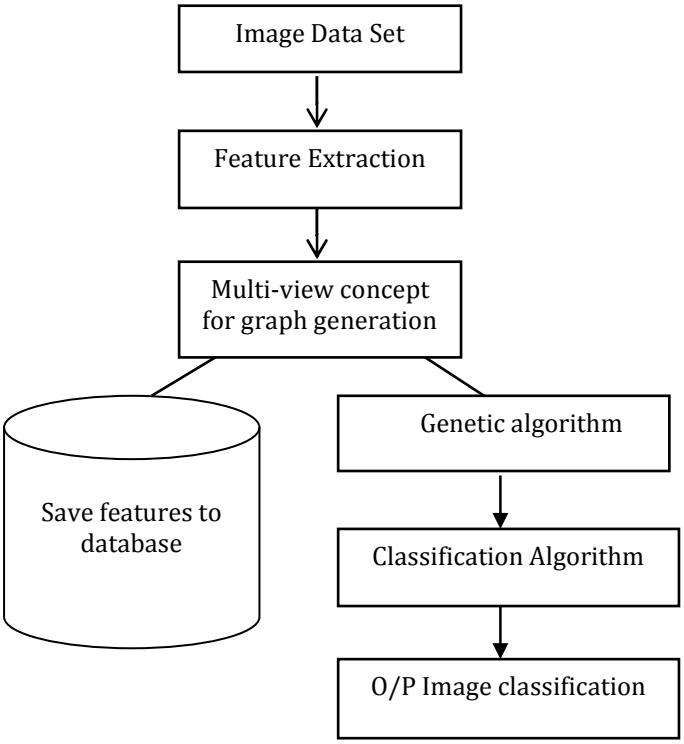

Fig. 1: Image Classification

5. Research Analysis & Discussion

GSM-PAF is extraction method based on Patch Alignment Framework. Patch Alignment Framework (PAF) is proposed as a framework for dimensionality reduction. PAF unifies popular dimensionality reduction algorithms, e.g., PCA (Principal Component Analysis). GSM–PAF is a flexible and can be either un-supervised or supervised.

The GA is a population optimization method. Instead of just pushing iteratively a single candidate toward the optimal solution, it acts on a set of such solution candidates by simultaneously exploring several zones of the search space and by combining promising solution candidates, hopefully for the better. Here we would be performing classification based on the Genetic algorithm so that we can get better and optimized Classification and it can optimised the feature of the images in image database. A genetic algorithm (GA) is a search heuristic that mimics the process of natural selection. This heuristic is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

Basic Genetic Algorithm

[1] **[Start]:** Generate random population of *n* chromosomes (suitable solutions for the problem).
[2] **[Fitness]:** Evaluate the fitness *f(x)* of each chromosome *x* in the population.
[3] **[New population]:** Create a new population by repeating following steps until the new population is complete.
   a. **[Selection]:** Select two parent chromosomes from a population according to their fitness (the better fitness, the bigger chance to be selected).
   b. **[Crossover]:** With a crossover probability cross over the parents to form a new offspring (children). If no crossover was performed, offspring is an exact copy of parents.
   c. **[Mutation]:** With a mutation probability, mutate new offspring at each locus (position in chromosome).
   d. **[Accepting]:** Place new offspring in a new population.
[4] **[Replace]**: Use new generated population for a further run of algorithm.
[5] **[Test]**: If the end condition is satisfied, stop, and return the best solution in current population.
[6] **[Loop]:** Go to step 2.

6. Conclusion

Using Group Sparse Multiview Patch Alignment Framework Algorithm and Genetic algorithm, the process of feature optimization is fast. GSM-PAF provides a flexible platform for designing various algorithms such as exploring supervised information in the part optimization and various optimization techniques for solving e.g. the smooth approximation of the cost function. Genetic algorithm generates a population of points at each iteration for optimizing a feature of the Images in image data set.

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