Review on: Performance Analysis of LRMR and SVM for Image Restoration

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Abstract

In image restoration noise is removed from image to obtain the original image. There are many ways to process the images such as optical, photographic or electronic way to process the images but the use of digital computers in image processing is fast and convenient way to process the images. Image Restoration is a process in which high quality images are obtained from degraded images. In this process distorted images are recovered to their original state. In this paper, Restoration of the degraded image is done using various advance restoration techniques such as low rank matrix recovery(LRMR) and support vector machine(SVM).In case of normal biogeography and then examine how it can be used to improve various problems related to degraded images. We observe that SVM has various features such as classifier in the same manner as other biology-based optimization methods such as GAs and particle swarm optimization (PSO). This makes SVM appropriate to many of the same types of issues that GAs and PSO are used for specifically and high-dimension problems with multiple local optima.

Keywords: Image Restoration, Low Rank Matrix Recovery (LRMR), Support Vector Machine (SVM) particle swarm optimization (PSO)

I. INTRODUCTION

Optimization is way to amend any design or resolution as unique as possible. There are various optimization formulas which have been induced to haul out best solution. Particle Swarm optimization (PSO), Low Rank Matrix Recovery (LRMR), Genetic algorithm (GA) are some of the techniques of optimization. In this paper, we utilized LRMR and SVM technique.

The LRMR model was first proposed by Wright et al. and is idealized as a “robust principal component analysis” (RPCA) problem. Assuming that a low-rank matrix L ∈ R m × n is corrupted by a sparse error matrix s ∈ R m × n, then the observed data matrix D ∈ R m × n can be decomposed as the sum of a sparse matrix and a low-rank matrix, i.e., D = L + S. The ideal RPCA problem can be described as follows: Given the observed data matrix D, the low-rank matrix L and the sparse error matrix S are unknown, and the goal is to recover L. The formulation of this optimization problem is min L, S rank(L) + λ_S_0 s. t D = L + S. (1) Unfortunately, (1) is a highly non convex optimization problem, and no efficient solution is known. We can obtain a tractable optimization problem by relaxing (1) and replacing the _0-norm with the _1-norm and the rank with the nuclear norm , yielding the following convex surrogate: min L, S _L_∗ + λ_S_1 s. t D = L + S (2) where λ is the regularization parameter used to balance the relative contribution between the nuclear norm and the _1-norm. Can deset al. have proven that, when the rank of the matrix L and the sparsity and distribution of S obey certain conditions, there is a high probability of recovering the low rank matrix L and sparse matrix S. On the basis of Candes and Plan’s work in , Zhou et al. improved the model of RPCA and studied the problem of recovering the low-rank matrix (the principal components) from a high-dimensional data matrix corrupted by both small entry wise noise and gross sparse errors. The revised measurement model assumes that D = L + S +N, where D, L, and S are as introduced earlier and N is the noise term, i.e., independent and identically distributed Gaussian noise on each entry of the matrix. The optimization problem of this model is introduced as min L, S_L_∗ + λ_S_1 s. t _D − L − S_F ≤ δ (3) where δ is a constant related to the standard deviation of random noise N. Zhou and Tao proposed an equivalent formulation of (3) minL,S_X−L−S_2F s .t rank(L)≤r, card(S)≤k (4) where r and k, which stand for the upper bound of the rank of L and the cardinality of S, are set to be the known information. In this thesis, a revised model which considers Gaussian noise is utilized. The low rank matrix recovery algorithm (LRMR) is a probabilistic technique for solving many issues like, blurriness, MSNR and MPSNR which can be reduced to discovering great ways through graphs. Although genuine ants are blind and fit for finding shortest path from food source to their nest by exploiting a liquid substance is called pheromone which they release on the transit route.

SVM is mainly a classifier in which thickness between the classes is the optimization principle, i.e. empty area around the decision edge distinct by the distance to the nearby training patterns. These are called support vectors. The support vectors change the prototypes with the major difference between SVM and traditional technique matching is that they characterize the classes by a choice limit. This decision boundary is not only defined by the least distance function. The concept of (SVM) Support Vector Machine was first introduced by Vapnik. The aim of any machine that is capable of learning is to achieve good generalization performance, given a finite amount of training data.

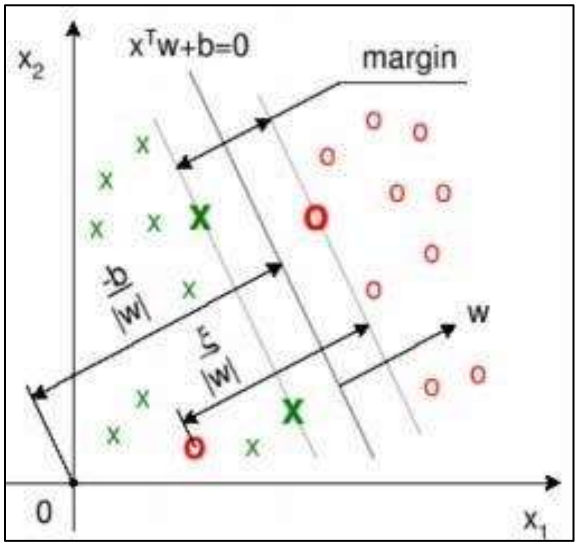

Fig. 1: Geometrical Representation of SVM

The support vector machines have proved to attain simplification performance with no advance knowledge of the data. The principle of an SVM is to map the input data onto a higher dimensional feature space nonlinearly related to the input space and determine a separating hyper plane with maximum margin between the two classes in the feature space. The SVM is a maximal periphery hyper plane in feature space built by using a kernel function. This results in a nonlinear boundary in the data space. The optimal separating hyper plane can be determined without any computations in the higher dimensional feature space by using kernel functions in the input space. There are some commonly used kernels include:-

1) Linear Kernel: K(x,y) = x,y
2) Polynomial Kernal: K(x,y) = (x,y +1)

A. SVM Algorithm

– Define an optimal hyper plane.
– Extend the above definition for non linear separable problems.
– Map information to high dimensional space where it is simpler to classify with linear decision surfaces.

II. PREVIOUS WORK

[1] AbhaChoubey2011proposed a Hybrid Filtering Technique in Medical Image De-noising: Blending of Neural Network and Fuzzy Inference. The proposed technique confiscates the Additive white Gaussian Noise from the CT images and improves the quality of the CT images. The proposed work is comprised of three phases: they are preprocessing, training and testing. In the preprocessing phase, the CT image which is affected by the AWGN noise is transformed using multi wavelet transformation. In theTraining phase the obtained multi-wavelet coefficients are given as input to the Adaptive Neuro-Fuzzy Inference System (ANFIS). In the testing phase, the input CT image is examined using this trained ANFIS and then to enhance the quality of the CT image thresholding is applied and then the image is reconstructed. Hence, the de-noised and the quality enhanced CT images are obtained in an effective manner

[2] Wang 2014 In this paper, authors firstly studied the SIFT-preserving compression of license plate images for recognition correctness rather than visual quality. According to extracted SIFT features, each image is separated into SIFT coding-units and non-SIFT coding-units. Each coding-unit is assigned with a different quality parameter when using JPEG for compression. They compared their proposed scheme with the standard JPEG that uses a unified quality parameter.

[3] Simranjeet Kaur, Prateek Agarwal and Rajbir Singh Rana in 2011. He proposed Low rank matrix recovery: A Technique used for Image Processing. Low rank matrix recovery is an optimization technique that is based on the foraging behavior of real ant colonies. Low rank matrix recovery is applied for the image processing which are on the basis continuous optimization. This thesis proposes a Low Rank Matrix Recovery (LRMR) with SVM based algorithm for continuous optimization problems on images like image edge detection and image compression and image segmentation and structural damage monitoring etc. in image processing. This thesis represents that how LRMR with SVM is applied for various applications in image processing. The algorithm can find the optimal solution for problem. The results show feasibility of the algorithm in terms of accuracy and continuous optimization. Low rank matrix recovery is a technique which is used for image processing such as edge detection, image compression, image segmentation, image restoration etc. As LRMR is used for optimization of continuous problems, so it is used for various applications of image processing which shows continuous behavior. The Low rank matrix recovery gives the optimal solutions which are further processed to find the actual results. It gives many outputs on different threshold values. The shortest path of ants has more pheromone than longest paths. So the pheromone updating information is necessary in LRMR.

III. PROPOSED WORK

A. *Stage 1:*

Initially we will develop a code for the uploading the image in the database of the MATLAB. This is done for the loading the image pixel value in the workspace of the MATLAB.

B. *Stage 2:*

In this step we will develop a code for the Low Rank Matrix Recovery (LRMR), also we develop a code for the Support Vector Machine (SVM).

C. *Phase 3:*

After that we do code for the image restoration with the help of the correlation of LRMR and SVM algorithms.

D. *Phase 4:*

After that we do code for the analysis of our result with previous paper on the basis of MSE, MPSNR and MSSIM.

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