Flower Image Classification based on Advanced Deep Learning Approach

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Abstract- **This work presents the concept of image classification using AlexNet. Generally, accuracy is an important parameter in image classification process which must be high during output. The CNN and DBN system has a problem with accuracy because of CNN uses only 2 or 3 convolutional layers for performing output. The fundamental test of picture classification is to devise effective and dependable calculations for recuperating however much data as could reasonably be expected from the given information. The use of DBN network in existing system works only to reduce error in system. Due to this, it requires better deep learning method for improving accuracy of system. The CNN method uses convolutional layers for feature mapping. But the proposed method uses 5 convolutional layers and 3 overlapping layers. Due to this, it helps to improve accuracy of system as compared to other existing methods. All simulations are done in MATLAB Tool.**

*Keywords-***Image Classification, Machine Learning, Deep Learning, MATLAB etc.**

I. INTRODUCTION

They have additionally been utilized in normal science, specifically in high vitality material science. In any case, there is a lot of potential in AI strategies that has not been used at this point. One significant motivation behind why physicist is cautious with their promise to AI is that these techniques are not yet completely comprehended. There is as yet lacking knowledge into the inside activity and conduct of neural systems and how they accomplish their prescient force. This investigation plans to give understanding into one of the best sorts of neural systems in the field of picture and example acknowledgment, the convolution neural systems. This part gives the diagram of picture preparing and its applications utilized in different fields. From the most recent couple of years, Digital picture becomes ubiquitous and this attractive change made conceivable by science. It has different applications in the fields of customer hardware, data innovation and stimulation field. Movement is taken as significant factor in video succession applications and this movement happens due to camera developments and moving things in 3-D scenes. Movement which can without much of a stretch be unmistakable to human eyes is considered optical stream and this catches the developments in the scene through the pixel changes. Examination to much further build the grouping exactness of ordinary SVM and RVM based arrangement is continuous. In, it is presented to join spatial and ghostly data of hyper spectral pictures to give higher precision in hyper spectral picture arrangement. In, spatial element vectors are acquired utilizing either the mean just, or the mean and standard deviation together of a specific neighborhood window of the relating highlight vector, and

portion lattices comparing to spatial and ghastly component vectors are registered independently and afterward joined utilizing diverse blend draws near. In it is proposed to utilize morphological profiles (MPs), which are acquired by applying opening and shutting tasks to the initial a few standard segments of the hyper spectral information, for expanded order precision.
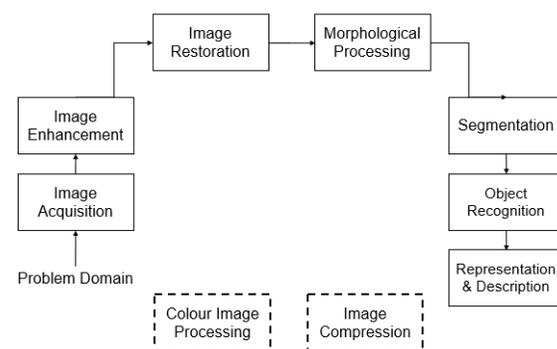

Fig. 1: Basic Block Diagram of Image Processing System

The general square chart of picture processing framework is appeared in figure 1. Begin with picture arrangement and end with picture investigation are the principle parts of picture handling framework. The most widely recognized kinds of pictures depend on the radiations from electromagnetic range, uncommon pictures in the x-beam and visual groups. A two-phase order calculation is proposed in to consolidate spatial and ghostly data. In, it is noticed that traditionally the class of any pixel and the class of in any event one of its neighbours is the equivalent and this is alluded to as "same class neighbourhood property". In, hyper spectral pictures are first characterized utilizing SVM grouping and the underlying classes of every pixel and its eight neighbours are distinguished in the main stage. At that point, every pixel is characterized by a parallel choice tree based various levelled classifier utilizing this data in the subsequent stage. In spite of the fact that the methodology proposed in employments a double choice tree based various levelled classifier in the subsequent stage to calibrate the principal characterization results that are acquired in a regular manner, an altogether progressive classifier had not been introduced up until this point. This paper proposes a novel totally various levelled characterization approach that utilizes a similar class neighbourhood property however utilizes a completely progressive methodology for the grouping of hyper spectral pictures achieved utilizing

staggered wavelet deterioration. Numerous progressive levels are developed from the full goal hyper spectral picture up to low goal, utilizing wavelet deterioration. Characterization is performed at the most minimal goal first, and afterward order results are dispersed downwards utilizing a similar class neighbourhood property.

1. Image Pre-Processing

In spite of the fact that appearance isn't of essential worry concerning arrangement shading varieties and the nearness of commotion will hinder the characterization procedure. Along these lines, picture pre-handling is significant to upgrade the picture quality and possibly improve the nature of the classifiers produced. Various diverse subtasks might be actualized as a feature of the pre-preparing stage. The most widely recognized incorporate picture cleaning and upgrade. Picture cleaning might be applied to evacuate commotion, yet may likewise be applied to expel undesirable items (normal articles that exist in a picture set that are not viewed as huge as for the order issue). Normal picture cleaning methods incorporate recurrence sifting, force thresh holding and object distinguishing proof and division.

- Image Restoration: It is diminished the information blunders clamour and contortion happened during the filtering and recording.
- Image Enhancement: It adjust the visual effect that the picture translator in the style with the goal that it improves the data substance
- Information Extraction: It uses the basic leadership ability of PC to perceive and characterize the pixels based on computerized signature.

2. Image Feature Extraction and Selection

Colour:

Shading data is additionally vigorous against object changes fit as a fiddle and position inside pictures. Instances of the utilization of shading data, and shading histograms specifically, for picture grouping can be found in. There is proof that proposes that the utilization of shading as the component of intrigue gives great arrangement results concerning picture sets where appearance is adequate to recognize pictures of various classes.

Texture:

Surface is characterized as far as picture properties, for example, perfection, coarseness and normality. Surface highlights portray standard examples in pictures and are valuable for characterizing pictures where specific examples (surfaces) are related with specific classes. Dissimilar to shading highlights, surface highlights are separated from gatherings of pixels utilizing measurable (shading implies, skewness and so on.), basic (customary example) or ghastly (Fourier range) strategies.

Shape: Shape based data can be separated utilizing shading-based picture division procedures. The most widely recognized technique for getting shape data is by distinguishing the edges of the state of intrigue. The utilization of shape highlights is generally fit to pictures that have clear form data. For instance, the utilization of shape highlights related with leaf pictures, processed utilizing a centroid-form separation bend, unpredictability and edge code histograms, is portrayed in to recognize plants that leaves have a place with (in actuality ordering the leaf). In histograms of edge direction inclinations were utilized to

characterize shapes in pictures; while in a limit was applied to distinguish states of enthusiasm before extricating the shape data and changing it into a period arrangement portrayal for use with a grouping framework. In the properties of picture shapes (for example Unconventionality and strength) were used for picture recovery and grouping.

3. Methods In Image Fusion

Picture combination strategies might be broadly ordered into as redesign space combination and spatial zone combination.

1. Transform Domain Fusion

In redesign region combination strategies the middle depictions are first changed over then melded and the outcome is changed again by methods for a backwards revamp. In those procedures the melding coefficients are determined with combination rules which can be either pixel based absolutely or region based.

2. Spatial Domain Fusion

In spatial area combination enter picture are dealt with right away. Loads are foreseen for each information picture and for each pixel with iterative strategies which advance a worth element. Another significant spatial area combination approach is the high sidestep separating based absolutely technique. Here the unreasonable recurrence data are infused into up-inspected adaptation of MS pictures. The downside of spatial area systems is that they produce spatial mutilation inside the combined picture. Ghostly contortion turns into an awful segment while we cross for furthermore preparing, for example, class inconvenience.

The remainder of the paper's association is as per the following; Section II presents the survey related to image classification. Section III described the proposed work presented by author related to image classification. The results are presented in section IV. Section V presents the conclusion and its future scope.

II. LITRATURE SURVEY

Sakthidasan K. et al. [2014] [7] introduced that the picture reclamation needs to catch an uproarious picture and assessing the first picture that plan of picture rebuilding needs to deserts which can ruined the first info picture. In the three techniques can be executed and the clamor to make littler by iterative strategy. The level included has been made steady and emphasis performed. The proficiency of picture rebuilding improved denoising and in painting was accomplished. High change commotion has been added to the info picture and expelled by emphasis strategy acquiring the better quality picture and their presentation diagrams has strategized and esteem has determined. Chen T. et al. [2014] [8] exhibited that another single picture reclamation strategy has been self-versatile to the layer shading. It was utilized to take care of the issue that solitary picture condition of being obvious has restricted flexibility for condition. Engendering medium layer from input picture caused perceivability picture rebuilding figured it out. Tests technique has been proposed by adaption capacity for dielectric layer shading. The perceivability and difference proportion of pictures obtained submerged or in haze climate. This strategy was not ready to acquire the icon handling impact. Lei Y. et al. [2015] [9] introduced the issue of untrustworthy endured and in the calculation in

question. It was presented by the great terms of portrayal. The acknowledgment task and the reclamation task have been illustrated. The traditional strategies for treated improved the application be illustrated. In down to earth picture or video preparing application framework was tedious and untrustworthy. The blue portion redressed and caught the preparation pictures, It can be fused into our system to took in the preparation pictures straightforwardly and its intriguing and its of examination. Ping S. et al. [2015] [10] introduced a significant research field of picture handling. Rebuilding needs to improve the watched enhanced visualization of picture. Picture rebuilding Model was presented dependent on the corruption capacity to take care of the not well presented issue of the picture reclamation. More picture subtleties of emphasis can be recognized. They depended on confined versatile picture rebuilding calculation. To improved the recuperation of versatile control capacities. Possibility and adequacy of the picture reclamation of smoothness limitations adaptively helpful by Fuzzy Edge assessment work. The re-established picture was progressively steady with the human eye of the visual qualities.

Ghimpeteanu G. et al. [2016] [11] displayed that a system for picture denoising. Model was acquainted with register the parts of picture to be prepared in moving in structure and denoise the segment of picture in moving system and was save the nearby geometry and progressively influenced on the off chance that we were handled the picture straightforwardly. It gives preferable outcome over denoising the picture legitimately. Qin Z. et al. [2017] [12] displayed another multi-phantom remote detecting picture reclamation technique dependent on scanty portrayal. The strategy can isolate three-dimensional picture into various squares and model the issue of multi-phantom remote detecting picture, and the multi-otherworldly pixel squares of the investigation region is re-established by inadequate estimation. The analysis demonstrates the proficiency of the calculation, and the proposed strategy is significant in remote detecting picture preparing. Ghulyani M. et al. [2018] [13] proposed an Alternating bearing strategy for multipliers based quick calculation for picture rebuilding utilizing definite Poisson-Gaussian Likelihood capacity and TV regularization. In particular, it proposed a novel variable parting approach that empowers confining the multifaceted nature in the precise MLE useful from the picture obscuring activity, permitting a quick Newton-like emphasis on the MLE useful. Motohashi S. et al. [2018] [14] proposed a novel visually impaired de-convolution strategy to on the other hand gauge PSF and the dormant picture. Furthermore, it joined the inclination dependability map (R-map) that empowers edge determination fitting for PSF estimation preparing. This technique improved reclamation execution by barring commotion that antagonistically influences the estimation, and the test results indicated that power was improved in our proposed strategy. Mahapatra S. et al. [2018] [15] exhibited a green method for combination of multi consideration photos dependent on change determined in DCT territory. Because of straightforwardness of our proposed strategy, it tends to be easily utilized in genuine time applications. The exploratory impacts avow the exhibition improvement of our methodology each in yield fine and multifaceted nature markdown in assessment with

a few most recent proposed procedures. Abidi Z. et al. [2018] [16] depicted to upgrade basic leadership on the region of the Moroccan beach front upwelling territory by utilizing photo combination thought. In truth, this region can be recognized by means of remote from ocean surface chlorophyll (SSC) or ocean bottom temperature photos. In this unique situation, It prepared photos of the yr 2014 for each kind of the 2 parameters with an end goal to join them directly into an unmarried picture extra enlightening and fitting for visual idea. In this way, on this work, it proposed a gathering set of rules for trademark arrange combination the utilization of Alpha Blending technique set to decide execution and just the educated area. Hou B. et al. [2018] [17] proposed another semi-administered PolSAR picture grouping strategy utilizing profound conviction organize (DBN) and tensor dimensionality decrease, which utilized multi straight guideline part examination (MPCA) to lessen the component of tensor structure PolSAR information, and respects the numerous highlights of PolSAR information as the contribution of DBN. So as to exploit neighbourhood data of every pixel of PolSAR information, it took every pixel and its neighbourhood as tensor structure.

Treebupachatsakul T. et al. [2019] [18] proposed the usage strategy for microscopic organisms acknowledgment framework utilizing Python programming and the Keras API with Tensor Flow Machine Learning system. The execution results had affirmed that microorganisms pictures from magnifying lens can perceive the class of bacterium. The exploratory outcomes analyzed the profound learning system for precision in microscopic organisms acknowledgment standard goal picture use case. Proposed technique can be applied the high-goal datasets till standard goal datasets for forecast microorganisms type. Nonetheless, this first investigation is restricted to just two genera of microscopic organisms. Liu S. et al. [2019] [19] introduced a novel multi scale super pixel-guided channel (MSGF) approach for exceptionally high goal (VHR) distant detecting picture arrangement. Unique in relation to the conventional guided channel (GF) arrangement technique, the proposed strategy used a direction picture that developed from the super pixel division picture, which was able to give more plentiful and exact edge data of land objects introduced in the picture. Multi scale highlights were removed by the super pixel-guided channel so as to appropriately demonstrate the spatial data of these items at various scales subsequently to improve the order precision.

III. PROPOSED WORK

Machine learning is a subfield of software engineering. At its center, it is the establishment for a lot of measurable instruments that gauge entangled capacities by gaining from information. AI can be isolated into two principle draws near, regulated and solo learning. Administered adapting by and large implies that the program is given both information and the ideal yield, for instance, pictures of articles with comparing marks of what is delineated. The objective of the learning (or preparing) is to develop a guide between those two. Rather than administered learning, the solo learning approach doesn't furnish the program with the right yield. Preparing an AI calculation can be viewed as approximating two capacities $y(x)$ and $yi(x)$, where the calculation attempts

to locate the nearest good ways from y(x) to yi(x) in a given measurement. The fundamental standards of preparing can be shown by eq. (1)

$$y_i(x) = w^T x \qquad (1)$$

Here, w is a vector of boundaries that the calculation can improve, which in an AI setting, are called loads. They decide how includes x relate with the yield yi. A potential learning technique can be to limit the mean squared blunder (MSE) from condition 2 on the preparation set x:

$$MSE = \frac{1}{n}\sum(Yi - Y)^2 \qquad (2)$$

Here, n is the quantity of occasions x. By and large, the client needs to characterize a model that portrays the yield y regarding input and a learning technique. This prompts an extremely straightforward lattice vector-calculation, yet it likewise prompts an exceptionally huge arrangement of teachable boundaries. A neural organization that comprises of thick layers can be effective for low dimensional information; however calculation can turn out to be pricey for high dimensional information like pictures. To deal with such errands, profound learning layer with weight sharing are presented.

a. Image Classification Model
In this work, it proposes image classification using CNN based network and another deep learning network for improving accuracy of system. It saves and encode the spatial installing of each example in the space spread over by k bunching centroids of the preparation tests, intending to accomplish great execution with double codes and straight intricacy. In the preparation arrange, it first parcels the preparation tests into k groups by a direct CNN technique.

b. *Use of PCA & Deep Belief Network*
Head segment investigation is a valuable instrument for information pressure and data extraction dependent on generally speaking data. It can change over various crude markers into a couple of thorough records without loss of data. Every one of these vital parts is a straight blend of the first records, which are not identified with one another. As a regularly utilized measurable way, PCA has been applied generally to design acknowledgment and picture activity.
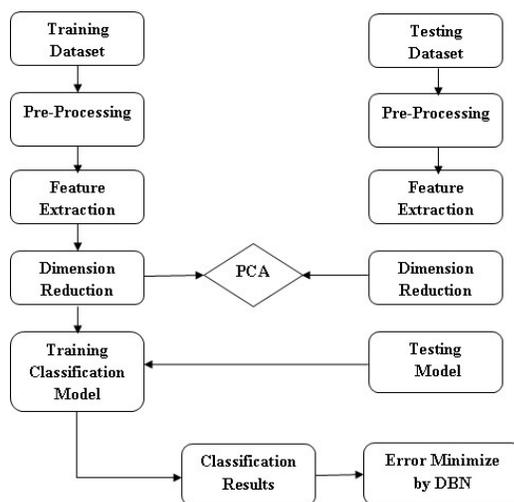

Fig 2: Image Classification using PCA & DBN

In this strategy, the profound component is extricated from the RGB perspectives and profundity sees independently, when the high dipartite degree shows up, prompting the higher precision in picture grouping. Second, the diminishing measurement activity is actualized through the traditional PCA. At last, the mainstream DBN is utilized for picture characterization. The utilization of DBN gives an organization chart containing some arbitrary factors. It is utilized with profound hashing to lessen mistake in network. It performs with high precision with least mistake. The means of DBN are:

- Training features values that was getting from deep hashing output
- Activate the training function and perform learning features in hidden layer
- Provides a desired output with minimum error after output layer

c. Image Fusion Model
The current work introduced another multi-unearthly remote detecting picture reclamation strategy dependent on meager portrayal. The technique can isolate three-dimensional picture into various squares and model the issue of multi-ghostly remote detecting picture, and the multi-otherworldly pixel squares of the examination zone was reestablished by scanty estimation. The guideline of remote detecting picture handling dependent on inadequate deterioration and word reference learning was considered insistently. The serious issue in existing work is PSNR estimation of sign during picture reclamation that influences the exactness of framework.

d. Proposed Work
The image Datastore automatically labels the images based on folder names and stores the data as an Image Datastore object. An image datastore enables you to store large image data, including data that does not fit in memory, and efficiently read batches of images during training of a convolutional neural network. Divide the data into training and validation data sets. Use 70% of the images for training and 30% for validation.

An important feature of the AlexNet is the use of ReLU (Rectified Linear Unit) Nonlinearity. Tanh or sigmoid activation functions used to be the usual way to train a neural network model. In a single convolutional layer, there are usually many kernels of the same size. The first two Convolutional layers are followed by the Overlapping Max Pooling layers that we describe next. The third, fourth and fifth convolutional layers are connected directly. The fifth convolutional layer is followed by an Overlapping Max Pooling layer, the output of which goes into a series of two fully connected layers. The second fully connected layer feeds into a softmax classifier with 1000 class labels. ReLU nonlinearity is applied after all the convolution and fully connected layers. This helps to improve accuracy of large database classification at a time.

IV. RESULTS AND DISCUSSION

B. Results Using CNN & Proposed Network
This work presents the idea of picture arrangement utilizing CNN and proposed profound learning strategy. The CNN framework objects to precision, at that point

proposed technique is utilized for improving the framework. This work portrays the execution of two more profound variations, in particular with 2 and 5 convolutional layers. The 2-layer design has two sequential layers, after this a shrouded layer and delicate max activity is performed. The 3-layer design has an extra convolutional + pooling layer before the covered up and delicate max ones. This work presents a picture arrangement investigation under profound learning approach. It likewise performs correlation of CNN based methodology with profound hashing as far as precision. The information is taken from flower dataset. After this, preparation information is created utilizing CNN as appeared in fig 3. These are the pictures taken for preparing information. The proposed framework model is introduced for streamlining of information. In this, information base of blossoms pictures is taken and afterward different tasks are applied on it before it goes to grouping. At that point, inadequate installing are applied on it for zero cushioning and expulsion of undesirable information from framework before profound learning is applied for upgrading the information.
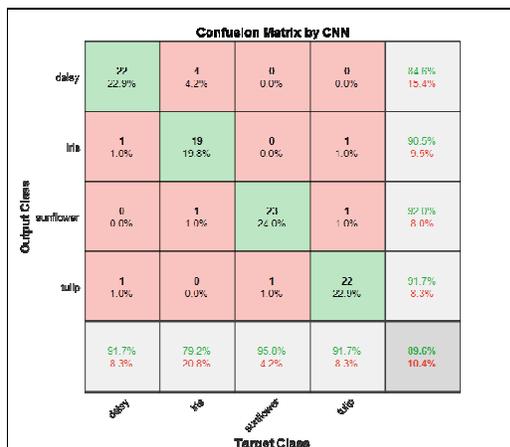

Fig 3: Confusion Matrix of Image Dataset using CNN

The exactness is characterized as the how much information is precise in totally set of pictures. The exhibition exactness of Flower dataset is determined by CNN as appeared in Fig 4 and shows 89% outcomes. In CNN, the layers-based methodology is fundamental part in this framework and convolutional layer is the primary layer, at that point follows the shrouded layer and yield layer. The main layer plays out the convolution for giving highlights yield framework. Each time channel esteem is increased with weight of neurons and gives yield to next layer. The disarray network is likewise called as mistake framework that shows the introduction of precision of picture characterization by quantitative technique as appeared in Fig 3. AlexNet is a convolutional neural organization that is 8 layers profound. It comprises of 5 convolutional layers and 3 completely associated layer organizations. It partitioned the information into preparing and approval informational collections. It utilizes 70% of the pictures for preparing and 30% for approval.The exactness results by proposed network is appeared in Fig 4 and its disarray grid portrayal individually.
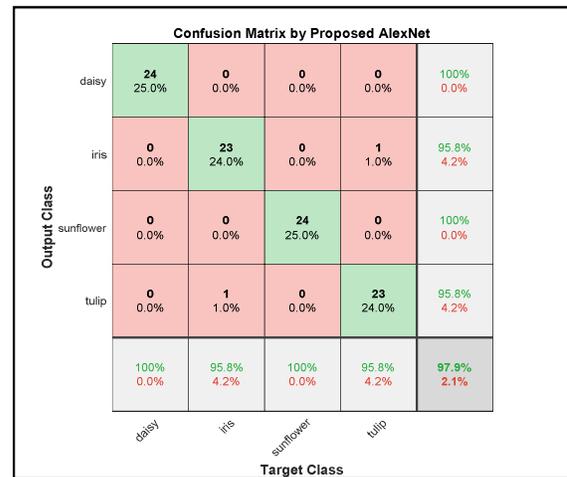

Fig 4: Confusion Matrix of Image Dataset using Proposed Method

Table 1: Performance Comparison of CNN and Proposed Method

Dataset	CNN	Proposed Method
Daisy Flowers	84.6 %	100 %
Iris	90.5%	95.8 %
Sunflower	92 %	100 %
Tulip	91.7%	95.8 %

Table 1 shows the confusion matrix accuracy representation by CNN and proposed method for different set of images. These are the images generated from validation dataset images.
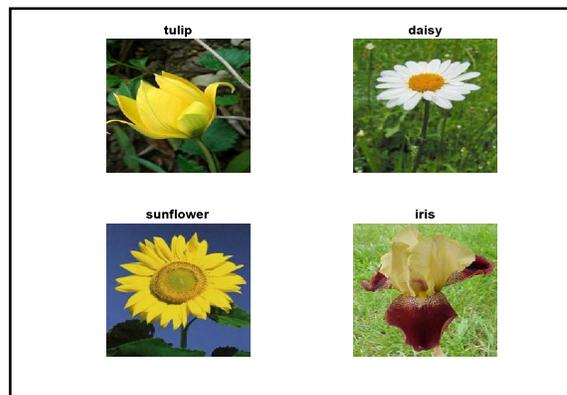

Fig 5: Flower Image Classification Output using Proposed Method

Image classification of flower database is shown in Fig 5. Table 2 shows the performance comparison of proposed system with actual CNN and DBN method. This shows that proposed AlexNet shows better improvement in accuracy of datasets as compared to other methods and hence proves better.

Table 2: Performance Comparison of System

Parameter	MPCA+DBN	CNN	Proposed
Accuracy	46%	89.5%	97.9%

V. CONCLUSION

The CNN method uses only 2 convolution layers for feature mapping. But the proposed method uses 5 convolutional layers and 3 overlapping layers. Due to this, it helps to improve accuracy of system as compared to other existing methods. It shows an idea of picture combination on two obscuring pictures by utilization of DCT. For this, it utilizes vitality of Laplacian and difference of Laplacian. In CNN, the layers-based approach is main part in this system and convolution layer is the first layer, then follows the hidden layer and output layer. This shows that proposed Alex Net shows better improvement in accuracy of datasets as compared to other methods and hence proves better. This work presents the concept of image classification using CNN and proposed deep learning method. The CNN and DBN system have a problem with accuracy, then proposed method is used for improving the system. The use of PCA method provides only identification of features in images but it does not help to improve accuracy of system. The use of DBN network in existing system works only to reduce error in system. Due to this, it requires better deep learning method for improving accuracy of system.

REFFERENCES

[1]. Dong C., Xie M., (2012), "A Blind Image Restoration Algorithm Based on Nonlocal Means and EM Algorithm", IEEE International Conference on Audio, Language and Image Processing, pp.485-489.

[2]. Dong W., Zhang L., (2013) "Non-locally Centralized Sparse Representation IEEE Transactions on Image Processing, Vol. 22, No. 4, pp. 700-711.

[3]. Marques M. and Freitas C., (2013) "Document Decipherment-restoration: Strip shredded Document Reconstruction Based on Color", IEEE Latin America Transactions, Vol. 11, No. 6, pp. 1359-1365.

[4]. Coumal S., Rajesh P., (2013) "Image Restoration Using Filters and ImageQuality Assessment Using Reduced Reference Metrics", IEEE International conference on Circuits, Controls and Communications, pp. 1-5.

[5]. Cho C., Jeon J., (2014) "Real-Time Spatially Adaptive Image Restoration Using Truncated Constrained Least Squares Filter", IEEE International Conference on Consumer Electronics, pp. 256-257.

[6]. Zhang Y., (2014) "An EM- and Wavelet-Based Multi-Band Image Restoration Approach", IEEE 19th International Conference on Digital Signal Processing, pp.617-620.

[7]. SakthidasanK., Nagarajan V., (2014) "Non-Local Image Restoration Using Iterative Method", IEEE International Conference on Communication and Signal Processing, pp.1740-1744.

[8]. Chen T., Yi X., (2014) "Image Restoration Method Self-Adaptive to The Dielectric Layer Color", IEEE 3rd International Conference on Cloud Computing and Intelligence Systems (CCIS), pp.124-129.

[9]. Lei Y., Xiaoguang D., (2015) "Image Blind Restoration Based on Blur Identification and Quality Assessment of Restored Image", IEEE Chinese Control Conference, pp. 4693-4698, July 28-30.

[10]. Ping S., (2015) "Image Restoration Algorithm of Smoothness Constraints Constructed by Adaptive Fuzzy Edge Evaluation Function", IEEE Seventh International Conference on Measuring Technology and Mechatronics Automation, pp. 302-305.

[11]. Ghimpe G.¸ Bertalmío M., (2016) "A Decomposition Framework for Image Denoising Algorithms", IEEE Transactions on Image Processing, Vol. 25, No. 1, pp. 388-399, January 2016.

[12]. Qin Z., Yang R., (2017) "Study on Multi-Spectral Remote Sensing Image Restoration Based on Sparse Representation",

International Congress on Image and Signal Processing, Bio-Medical Engineering and Informatics, pp. 1937-1940.

[13]. Ghulyani M. and Arigovindan M., (2018) "Fast Total Variation Based Image Restoration Under Mixed Poisson-Gaussian Noise Model", IEEE 15th International Symposium on Biomedical Imaging, April 4-7, pp. 1264-1267.

[14]. Motohashi S., Nagata T., (2018) "A Study on Blind Image Restoration of Blurred Images using R-map", IEEE pp. 2615-2618.

[15]. Mahapatra S., Dhar Sa K., (2018), " DCT Based Multi focus Image Fusion for Wireless Sensor Networks", International Conference on Inventive Communication and Computational Technologies, pp. 871-875.

[16]. Abidi Z., Minaoui K., (2018), "Detection of Moroccan Coastal Upwelling Using the Alpha Blending Fusion Technique of Sea Surface Chlorophyll Images and Sea Surface Temperature Images", International Conference on Advanced Technologies, pp. 01-05.

[17]. Hou B., Guo X., Hou W., (2018), " PolSAR Image Classification Based on DBN and Tensor Dimensionality Reduction", IEEE IGARSS, pp. 8448-8451.

[18]. Treebupachatsakul T., Poomrittigul S., (2019), " Bacteria Classification using Image Processing and Deep learning", IEEE, pp. 01-03.

[19]. Liu S., Hu Q., Samat A., (2019), " A Multi-scale Super-Pixel-Guided Filter Approach for VHR Remote Sensing Image Classification", IEEE IGARSS, pp. 1017-1020.