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Intelligent Assessment of Sun Flower Seeds Using Machine Learning Approaches

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Abstract
Pakistan is an agricultural country. Sun flower is the major crop of Pakistan which is being sowing in many areas of country. It fulfills the requirement of edible oil. In this paper we are trying to identify the best quality from different sun flowers seeds verities by using machine learning approaches. We take the images of four kinds of sunflower seeds which names Top sun**(A)**, High Sun**(B)**,US666**(C)** and Seji**(D)** for classification. We get eight different images of each kind of sunflower. In this paper sun flowers seeds varieties were categorized by using Computer vision image processing tool (CVIP). The experience and knowledge of inspectors are required to perfectly perform this assessment process. We use the RST-Invariant Features, Histogram Features, Texture Features, and Pattern Classification and also use the nearest neighbor and k-nearest neighbor algorithms for final classification. We achieved the final results of four kinds of sunflower using nearest neighbor on distance one and two 89% and 72% average and on k-nearest neighbor 89% and 73% average percentage. These are the best percentage results using these algorithms for classification. In this way we can easily classify the sunflower seeds and also these methods provide opportunity to farmer and other people for identify and select the different better and healthy sunflower seeds for better benefits.
Keywords: RST-Invariant Features, Histogram Features, Texture Features, Classification Algorithms

1. Introduction

In agriculture it is focused that the performance of food quality at reduce cost with other advantages should enhanced. Sunflower seed identification from different sunflower verities by using texture features is much important. A different researcher has different approaches for classifications and has different results for getting correct identifying the healthy seeds. [1] Described that the ANN (Artificial neural network) classification of linear and K-NN (K- nearest neighbor) nonlinear classification was used to identify and classify pictures of four kinds of wheat seeds. According to [2] that using digital image analysis to identify Grain is known as a valid method. As suggested by [3] that to measure the voltage level that is normal talk to any elastic and seed clone, sensors utilized measure reflected from the surface of the sensing variable seed. [4] Described that corn seed quality assessment becomes into an exceptionally essential part in guaranteeing protected and elevated requirement item. The traditional quality check system is extremely boring and it is exceptionally depend on human skill and experience. To characterize more than ten classes of seed types by utilizing shading, texture and Support Vector Machine (SVM) types classifier. A study by [5] told that the nominee program weeds herbicides in the early stages of product development is an important aspect site management of crops, both economically and environmentally. Using neural network classification sun flower distinguish between 2 and 3 weeks plants and weeds common to low, similar in size, shape and color. [6] Described that the missing values in the data set may be different origins such as mortality, malfunction of the equipment, the refusal of the respondents to answer specific questions, and So on. A new method for classifying and attributing established KNN incomplete information on the concept of MI. The proposed method selected KNN with respect to the closest relationship to the target class. According to [7] that the computer vision can be applied to precision farming problems from outdoor to be resolved: changes in the home, uncontrolled conditions, and so on to describe the effects of light, color variation analysis Sun flower plants are built. The quantitative characteristics of human skin tissue is one of the tasks recently approached by image processing. This analysis is twofold interesting texture. It is a computational modeling of real skin to render computer graphics, the possibility to request an analysis of the computer-aided detection Skin [8]. After reading different researcher methods we conclude that the following methods are slow and difficult, we introduce new methods for classification of sunflower seeds which are easy and faster.

1.1 Problem Statement

Latest varieties and their growth rate is main focus of every former especially in different environmental factors like not more raining season, lake of sun light or lake of water. So, human perception varies and on bases of perceptions it is difficult task to identify best quality healthy seed from seed varieties. In this paper we provided efficient result by using machine learning approach.

1.2 Objective

The object of this research is:
To identify the different sun flower seeds variety by using machine learning approach.
To develop algorithms to detect the different sun flower seeds verities.
To propose a new domain among the different kinds of sun flower plants.
To obtain the result by using CVIP tool.

2. Related Work

The automatic classification by computer vision and weeds plants received increased attention. For example, some of the machine vision algorithms can be classified two production plants or weeds so; it is possible to build for mechanical weeding and herbicide application choice [9]. The food products such as seed selection. Wheat, maize, rice, etc., under the my three main goals to a maximum performance under specific environmental factors such as reproductive right to water weather conditions better seed nutritional content and third better patient safety [10].

[11] Described that the research on content-based image retrieval has gained tremendous momentum in the last decade. A lot of research work has been done by many scholars on image recovery, developed in both depth and breadth. A new approach to content-based image retrieval by combining color and texture features of the wavelet based image retrieval color histogram (WBCHIR) are presented. The sun flower is the main oil seed crops worldwide, high quality sun flower seed oil rich in recent years, average sun flower yield is about 510 kg in Iran, however, yield potential more than 6 tons per hectare research shows that one of the most sun flower is an important factor to increase performance weight and grain properties [12]. [13] Described that the development and production of food sufficient to ensure that Sufi healthy eating, and one is a real issue now a days. In sinful frame work with flower seed is DE hulling process freezing in liquid nitrogen was used. As [14] explained that the supervised approach where predefined category labels are assigned to documents on the basis of possibility suggested by at raining set of documents labeled. A supervised learning method for classifying images is presented which it is independent of the type of images to be processed. The algorithms related-KNN works well as compared with Green Bayes and decision trees. It is a representative KNN approach combined with naïve Baye Perform improve classification of KNN, and presented a duplicating method based example to meet the problem of lack of training data for local simple Bayes [15]. The textures defined as are pleating pattern and is represented on the surface or structure of an object. An approach to image classification based on the texture by the possibility of gray level co-occurrence (GLCP) and support vector machines (SVM) presents methods [16]. According to [17] that the artificial intelligence has been shown to give hopeful results in digital image processing and analysis when absent, confusing or partial data is available [17]. The texture classification has received much attention in image processing and computer vision Scientific methods have been proposed from 1980s [18]. According to [19] described that the seed investigation and arrangement are made to get data about seed type, mixture, quality and the generation [19].

Sunflower seed identification is a matter of interest for science test. The goal of texture classification is to partition an unknown sample image into regions belong to one of set of known texture classes. Major goals of texture research in computer vision are to understand, model and process texture and human visual learning process using computer skills.

3. Methodology

In our research data was collected physically and we use the quantitative and empirical research. Different images of sunflower seeds are taken by specific digital camera. The four kinds of sunflower seeds was used in this research. We got eight different images of each kind of sunflower. In this way we use the 8*4=32 images of sunflower seeds. In a figure the one snapshot of each kind of sunflower seeds is shown:

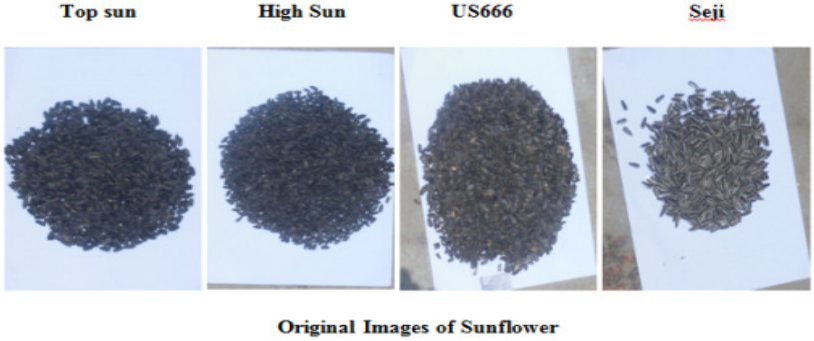
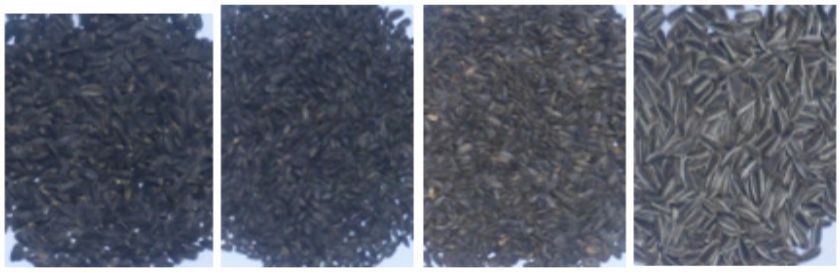


Figure 1: Original Image of Sunflower

In above the original images of sunflower, each one image presents one kind of sunflower. After taking

these images, the first work is to removing the noises of all images and making a clear for better result such as:



Cropped Images after Removing the Noises

Figure 2: Clear Images

The above the clear images of sunflower has been shown after removing the noises of images. In first step image preprocessing was done by applying different technique like edge detection noise background remover, color gray leaver conversation etc. In next step image is analyzed by using texture base analysis. Then at the end by applying different machine learning approaches like nearest neighbor and k-nearest neighbor. For using these approaches we process every image in following way:

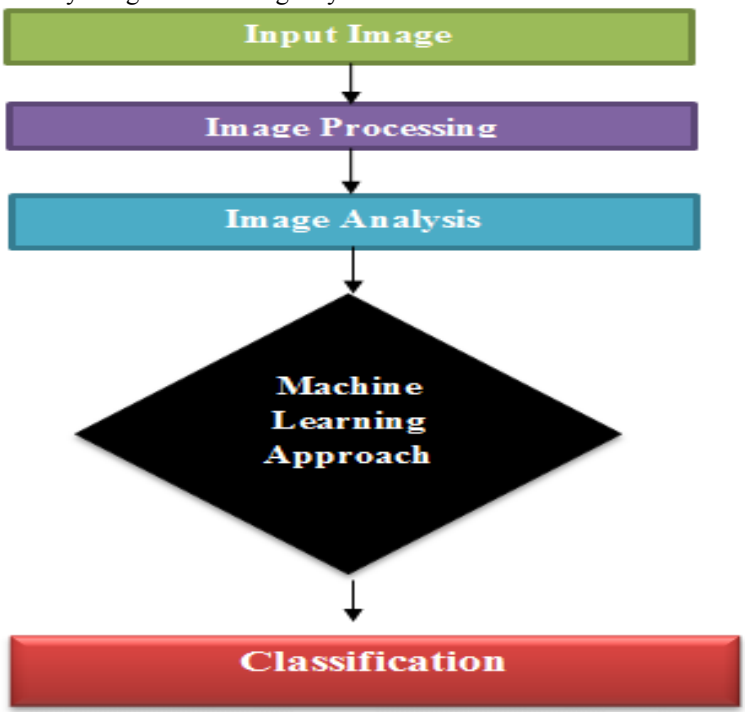


Figure 3: Image Process

The figure steps will be explained one by one such as:

- **Input images**

In input images we took the images of four kinds of sunflower seeds with digital camera, then the images arranged in sequence wise according to their kinds, after that the images were cropped and their noises were removed and a get a clear image of each kind of sunflower. Then was be ready for getting the process.

- **Image Processing**

After input the images of sunflower, the clear images of each king of sunflower used for process in CVIP tools, in this tool we take the one by one all images and create the border masks of each image then it was used for analysis.

- **Image Analysis**

When the each image of sunflower used in image process we created the five border masks of each image, we can analysis of every border mask of image and use the different functionalities of CVIP tool such as the Features, which we get the histogram features, RST-invariant features and texture features.in this way we can get a different feature results of each border mask of images.

- **Machine Learning**

When we can analysis on different images of different border mask we get different results, after taking these features results we can collect all the results and using this classification approaches such as nearest neighbor

and k-nearest neighbor in machine learning.

- **Classification**

After using different machine learning approaches we achieve the goal of this research and reached at final results, then the classification became easy and we classified the different seeds of sunflower using the final results.

I. CVIP Tool

A CVIP tool is Windows-based software which is used in computer vision and image processing developed at the Computer Vision and Image Processing Laboratory at Southern Illinois University at Edwardsville.

CVIP tools can read different many image formats including JPEG, BMP, TIFF, PNG, and GIF as well as the raw formats images. CVIP tools supports the standard image processing functions such as image restoration, image compression, logical and arithmetical operations between images, image sharpening, Frequency transform, edge detection, contrast manipulation, segmentation and geometric transformations.

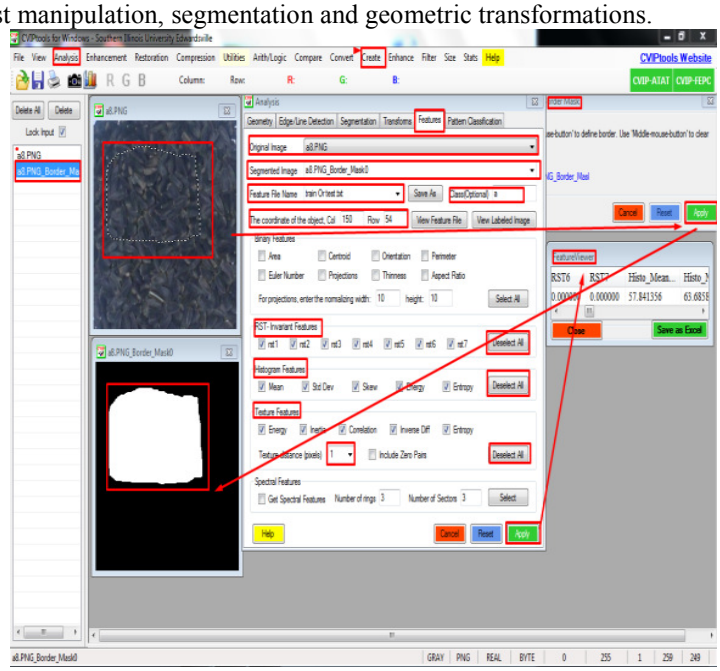


Figure 4: Uploading the Image in a CVIP Tool and Get the Train Test Data Results

- **RST-Invariant Features**

In a CVIP tool we select the RST-Invariant features. In this way we can use all features of invariant.

- **Histogram features**

In a CVIP tool we select the histogram feature. In a histogram feature we select the all histogram feature such as mean, Std Dev, Skew, Energy and Entropy. We get all the results of each image of sunflower seeds.

- **Texture features**

In CVIP tool features we also select the texture features. In a texture features we select all the texture features such as Energy, Inertia, Correlation, Inverse Diff and Entropy. In this way we get all the results of texture features using all categories of images. In this way we collect train and test data of all images of sunflower seeds.

II. Pattern Classification

Then these results of train and test data sets are used for pattern classification compare train and test data sets and applying the nearest neighbor and k-nearest neighbor for final classification such as shown in figure. When we compare the train and test data results the final pattern classification results achieved which are best for classification of sunflower seeds.

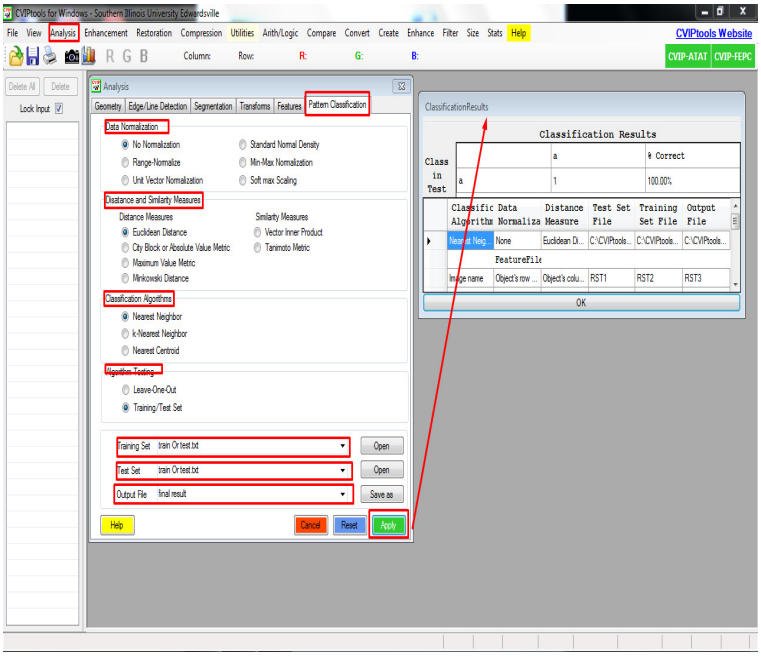


Figure 5: Applying Algorithms in Pattern Classification

After taking the all results train and test using distance 1 and 2. Now we go to next step pattern classification. We can compare the train and test using four distances and go to the final result of pattern classification such as shown on above figure.

4. Results and Discussions

In this paper we get the images of sunflower and then these images processes in the CVIP tool. We give the name to all four kinds of sunflower suppose as A, B, C, D and use eight images of each class. We get five border mask of each image such as total border mask of each kinds are 8*5=40 for train and then get 40% border mask of train such as 16 border mask of each class for test. In this way total 160 results will be shown. RST-invariant features, Histogram and texture features will be taken.

Figure 6: Nearest Neighbor Classification Result Diagram on Distance 1

After upload the train and test result using distance one then apply and get the final result of nearest neighbor as a pattern classification which shown above. In above table the final result percentage are shown A=68.75%, B=87.88%, C=100% and D=100%. The above result average percentage is 89%.In above chart the all categories final classification results will be shown as percentage wise which is the best classification result.

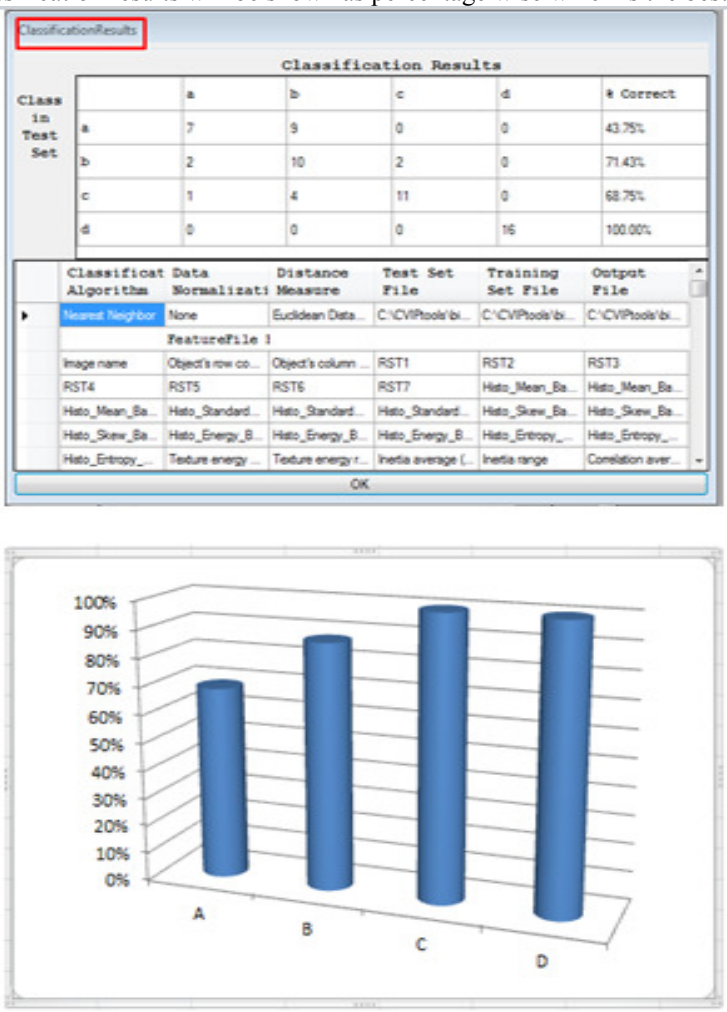


Figure 7: Nearest Neighbor Classification Result Using Train and Test Distance 2

In above table the final classification result using distance two will be shown which average percentage is 72%. This percentage is also best for classification of sunflower images. This percentage is also differing from the distance one.

When we use the distance two train and test the difference and best result achieved which is also best for classification. It is shown in above chart.

In this way we can get other results using different distance and so on for pattern classification using nearest neighbor approach.

In above chart the all categories final classification results are shown as percentage wise which are the best classification result.

The following showing results for classification the best classification result. In this way we can get other result of distance 1, 2 and so on for pattern classification using k- nearest neighbor approach.

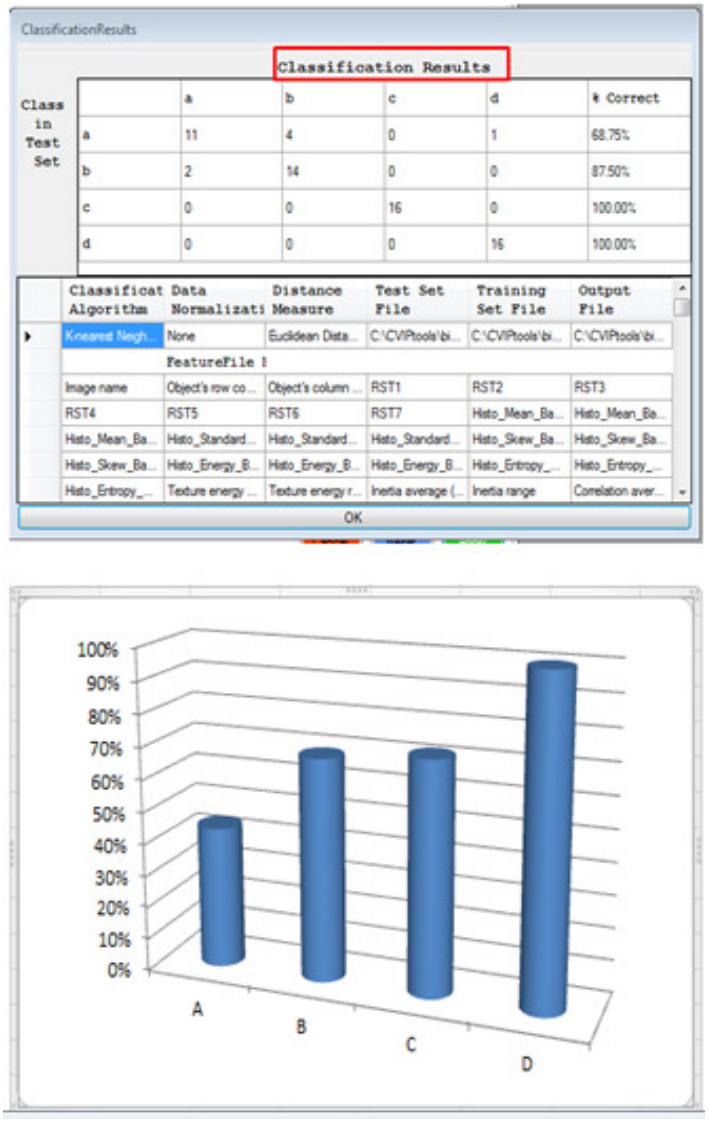


Figure 8:K- Nearest Neighbor Classification Result Using Distance 1 and K=2

When we use the distance one of train and test and k=2 then the following above result achieved as best percentage wise all categories of sunflower. The average percentage of above pattern classification is 89% which is better for classification. If we use the all distance on k=2, then the different result will be achieved which all are the best for classification using k-nearest neighbor.

In above chart the final all categories results will be shown as percentage wise which all are the best. It will be also used for any classification of sunflower images. Now next we change the train and test distance and k values for more result.

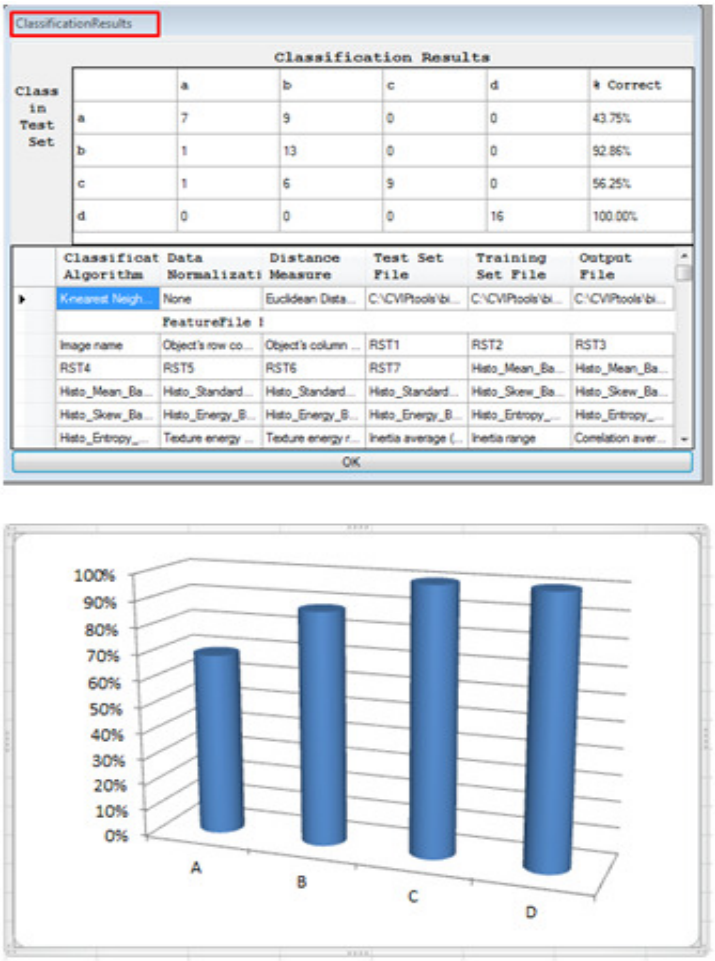


Figure 9:K- nearest neighbor classification
Result using distance 2 and k=3

When we change the k=2 with k=3 the following above result appear. In above result the distance two is used for train and test. The average percentage of all four categories is 73%. It is the best classification result. It is the final percentage result of four categories which is the best for classification of sunflower seeds.

Finally, in this research paper we get different results on changing the distances or k values or changing the classification algorithms the all result are best for classification of seeds.

5. Conclusions

In this paper four varieties of sunflower seeds were discriminated on the basis of quantitative parameters were taken and the RST-Invariant, Histogram and texture features were implemented for the analysis of images which made our approach faster than the other approaches in which morphological, Color and other textural features were used. K-nearest neighbor (KNN) and nearest neighbor methods were implemented very successfully for the discrimination of four varieties of sunflower seeds. When we use distance one of train and test the final result percentage of nearest neighbor are shown in fig A=68.75%, B=87.88%, C=100% and D=100%. The result average percentage is 89% which is the best classification result. In this way we can get other result of distance 2, for pattern classification using nearest neighbor approach the average percentage will be achieved 72%. In this way when we apply the k-nearest neighbor on distance one of train and test and k=2 then the following result achieved as best percentage 89% wise all categories of sunflower. The average percentage pattern classification is 89% which is better for classification. This result of k-nearest neighbor is also same as nearest neighbor. Therefor now we change the k values for different result, when we change the k=2 with k=3 the other results will be appear shown in fig. The distance two is used for train and test. The average percentage of all four categories is 73%. It is the best classification result. In this way we can get different results on changing the k values or distances of train and test data and go to better classification of sunflower seeds. In future the effect of light intensity and effect angle of incident light will be verified.

6. Limitation and Recommendation

In limitations we faced lack of advance technologies instruments and other environmental factors. In this way if the limitations are resolved we can easily classify the sunflower seeds and also these methods provide opportunity to farmer and other people for identify and select the different better sunflower seeds for beneficial.

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