**ABSTRACT**

Subsequent to the process of classification, the more prevalently used part in most of the applications of image processing and computer vision is the image segmentation. The entire study concerning the Computed Tomography (CT) holds image segmentation as a very essential or even an inevitable part in identifying the different kinds of tumor in the different levels. Once the classification of the parts or portions in the images as tumorous and non-tumorous is over, what follows next is the process of segmentation of the tumor regions in the CT images and it is the proposed methodology that takes the entire care of these both, classification and segmentation as well. For the purpose of classifying, the Support Vector Machine (SVM) with different kernels and optimization techniques is put into use. When it amounts to classification and optimization, the SVM classifier with Sequential Minimal Optimization (SMO) enjoys a clear predominance over the other methodologies in the analysis of classification process. Following the classification process, the Modified Region Growing (MRG) with threshold optimization fulfills the segmentation process. Apropos of the threshold optimization, certain algorithms like Harmony Search (HS), Evolutionary Programming (EP), Grey Wolf Optimization (GWO) and Lion Algorithm (LA) are brought into use. The results are displayed with the help of a wide set of performance measures. The comparative analysis in terms of sensitivity, specificity and accuracy is conducted in the optimization techniques mentioned earlier. The implementation of the proposed methodology takes place on the working platform of MATLAB 2012a.
The outcomes obtained in the analysis of the segmentation process speak of the average accuracy of the MRG-GWO technique as 99.05% and that of the MRG-LA technique as 99.46% when estimated using various CT brain tumor test input images. Divergences sensed in the sensitivity of GWO in relation to the HS and the EP were found to be 10.20% and 8.24% respectively. The combination of the MRG and GWO did its best in segmenting the tumor parts in the CT images. The specificity of the GWO was seen to have risen to a mammoth 98.6% and coming in contrast with the other two techniques namely the EP and the HS, only a minute variation of 0.56% and 9.24% respectively was noticed. In the sameness, 99.05% being the accuracy rate of the MRG with GWO, it seemed to have gone down a bit by 1.16% and 7.48% in the cases of HS and EP respectively. The rate of sensitivity enjoyed by the MRG-LA combination rose to a height of 91.52% in total contrast to the MRG-GWO combination in comparison. As to the sensitivity of the LA in contrast to the GWO method, the stunning increase was as big as 3.01%. Everything having been taken into account, the peerless highlight of this whole analysis episode, was found grabbed by the stipulation of the LA with an eye catching 99.46% in the aggregate.

On the whole, the MRG-LA with an accuracy rate of 99.46% and its close or nearest competitor the MRG-GWO with that of 99.05%, the difference in their rates being as slight or low as 0.41% in terms of the specified parameters, they both unquestionably deserve being looked upon as the winner and the runner respectively. The other competitors HS, EP and the like are just or no better than mere also-runs in the sensational running race in which the neck-and-neck race lies only between the exuberant winner MRG-LA and the unremitting runner MRG-GWO. This soundly reiterates and even avows that the proposed techniques viz., the MRG-LA and the MRG-GWO sharing the credit between them and the best recommended ones to serve the purpose intended as well as desired in segmenting the regions afflicted with tumor in the brain CT images.