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*Summary and Conclusion*

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## 5. SUMMARY AND CONCLUSION

Over the last decade, the classifier combination have enjoyed a growing attention and popularity due to their many desired properties and the broad spectrum of applications that can benefit from them. This research work is motivated by the need for effective and efficient image classification needed by the Tamil Character Recognition System proposes the use of Classifier combination for grouping similar character images and predict a group to a new image. Image classification is an area in image processing where the primary goal is to separate a set of images according to their visual content into one of a number of predefined categories.

Three classifiers, namely, K Nearest Neighbor, BackPropagation Neural Networks and Support Vector Machine were considered. From these three base classifiers, four classifier combinations were proposed (three 2-classification systems and one 3-classification system). They are

1. Neural Network + KNN + SVM
2. Neural Network + KNN
3. KNN + SVM
4. Neural Network + SVM

The possible advantages expected to be derived by the proposed fusion models are

- If one algorithm fails to identify a character, another algorithm may support in identifying the character.
- If one algorithm gives wrong character another may give a correct one.
- The possibility for same wrong identification by all the algorithms is less.

Six image features were considered for this purpose, namely, mean, standard deviation, median, area, minimum and maximum intensity of the image. A hold-out method that partitions the dataset into 60% training and 40% testing is used during experimentation. The aggregation method used to combine the results of the various classifiers is the majority voting scheme. Moreover, the proposed fusion classifiers have the advantage that the training of individual classifiers is more than enough to produce high performance and does not require further training during aggregation.

Three performance metrics, namely, classification error rate, accuracy and speed were considered. Experiments results show that the fusion of KNN with SVM, NN with SVM and KNN + SVM + NN is efficient for image classification. The classification system that combines KNN + NN shows poor performance than single classifier system. The same trend was observed with all the selected performance metrics. While comparing the four proposed fusion models, the two-classification fusion model, KNN + SVM was efficient when compared with single classifiers and other 2-classification and 3-classification model.

## **FUTURE RESEARCH DIRECTIONS**

1. The present research work considers only the basic image features, which can be extended to include other features like geometric and shape features. The effect of adding these features to the proposed classification systems can be analyzed.
2. The aggregation method used by the proposed classification system is majority voting schemes. Other methods like weighted majority voting schemes, minimum, maximum, sum, average, product, bayes, decision templates, behavior knowledge space can be considered. Their performance can be compared and the best one can be used to improve the proposed classifier combinations.