CONCLUSIONS AND FUTURE SCOPE OF WORK

7.1 Conclusion

The research work embodies an innovative use of image processing and machine learning techniques in improving the efficiency of CAD system. There are many factors that contribute challenges for any CAD system performance in the medical diagnosis. The current challenges in the CAD system are addressed by the model developed as part of this research.

- The accuracy and efficiency of processing algorithms will be increased if the processing is limited to a specific target region in an image. Preserving the skin and nipple during the breast contour extraction and extracting the pectoral muscle is particularly important in automated mammogram image assessment. Segmentation of the pectoral muscle is a non-trivial, complex and demanding task. It is also complicated further by a number of factors. The challenges in breast contour extraction are addressed by proposed model which use image morphology and filtering techniques. The challenge of locating the minimal image area that contains pectoral muscle is well addressed by proposed model.

- The challenge in the detection of maximum available potential microcalcification is overcome by proposed modified entropy thresholding algorithm. The algorithm is able to detect maximum available potential microcalcification in the digital mammogram.

- Most of the current techniques of potential microcalcification classification depends on many traditional classifiers and leads to inefficiency in most of the cases. This further leads to high false positive microcalcification detections. This is mainly due to the problems in imbalanced dataset classification. This problem has been addressed by providing standardized techniques that handles the imbalanced class problems. Performance of CCW-kNN, CCP based
Conclusions and Future Scope of Work

decision trees, and techniques based on over sampling techniques are evaluated. Most of these techniques reduce the false positive detections.

- Microcalcification cluster classification is a difficult task and current techniques depend on many traditional classifiers. This in many cases contributes in the false alarms since traditional methods perform well during the testing time only when classes in data set are relatively balanced. Most of traditional learning methods predict only the majority class correctly but not the minority class. This problem is addressed by using standardized techniques.

Evaluation metrics are used to validate proposed techniques which includes CCW-kNN, CCP based decision trees, techniques based on over sampling, FURIA (Fuzzy Unordered Rule Induction Algorithm), and GA+NN.

It is evident from the above that the techniques developed as part of this research addresses the current challenges in CAD system. The techniques offer an improvement for the CAD system in preprocessing stage, detection of maximum available potential microcalcification and classification of potential microcalcification/ microcalcification clusters. Techniques offer simplicity and make these an ideal solution for the uses in CAD system where efficiency is critical. The benefits of implementing such techniques are

1. Preserving the skin and nipple during the breast contour extraction.
2. Reducing the processing time for pectoral muscle segmentation.
3. Detecting maximum available potential microcalcification in digital mammogram.
4. Obtaining high accuracy in classification of potential microcalcification and microcalcification clusters, thus to reduce the false positive detection rate.

7.2 Future scope of work

Although by now progress has been achieved, there are still remaining challenges and directions for future research, such as

- Smoothing the breast contour and pectoral muscle edge.
- Developing better enhancement and segmentation algorithms.
- Designing better feature detection and selection algorithms.
- Classifiers integration to obtain better Area Under ROC Curve