5.1. Conclusion:

This research work proposes Fingerprint and Iris based multimodal biometric system based on feature level fusion and neural network approach. The experiment is performed with different databases and techniques. In this thesis, first we developed a unimodal biometric recognition system for fingerprint and iris modalities using neural network with three different databases of each to evaluate the performance of the dataset and feature level algorithm. Afterword feature level fusion approach is used to fuse fingerprint & iris modalities features. This fused feature set scaled and classified using different neural network classifiers. The proposed methodology techniques is evaluated based upon False Acceptance Rate (FAR) and False Rejection Rate (FRR) and operations done on standard KVK fingerprint and KVK Iris databases. The performance of the multimodal biometric recognition system is also evaluated with the help of different plots and graphs which provide feature information of a fingerprint and iris images.

At the preliminary stage of experiment Fingerprint recognition is done using FVC 2002 fingerprint database, FVC 2004 fingerprint database, KVK-Fingerprint database and iris recognition is done using CASIA-Iris database, MMU-Iris database & KVK-Iris database. As we can see from the results, the recognition rate of this proposed method of fingerprint recognition system using neural network is 90.06. The recognition rate of this proposed method of iris recognition system using neural network is 96.80. The fingerprint and iris based multimodal biometric system based on feature level fusion and neural network approach recognition rate is 99.23.

This work focuses on minutiae based fingerprint recognition for person identification. The Crossing Number (CN) method is used to perform minutiae extraction. Daugman's localization algorithm operation for iris recognition algorithm
removes pixel having less number of counts than threshold. We extract the features with the help of Gaussian filter and Haar Wavelet.

The main objective of this experiment was to select good databases and feature extraction technique in order to extend the proposed technique. The integrated feature set is then classified by employing different neural network classifiers. Performance of this fused feature set are evaluate using three classification techniques that are Multilayer perceptron, nprtool, SVM classification approach. We obtain 99.23% accuracy with the nprtool and using SVM we obtain 90.10% accuracy respectively. On the basis of this overall experiment and we may conclude that much better results can be obtained from neural network approach like,

1. Our proposed method implemented and achieved successful results on any type of database and neural network.
2. This research we suggest that the combination of Fingerprint and Iris is much suitable among existing biometric and it can reduce the flexibility of the system.
3. The main aim of this thesis is to develop an efficient multimodal biometric recognition system to provide good recognition by selecting good algorithms for feature extraction and recognition.
4. Neural network approach offer potential advantages i.e. the processing element (neuron), that operates in parallel, hence this can extensively use in a variety of computational and optimization problem.
5. With this experiment we can conclude that, feed-forward back propagation algorithm (supervised training) can improve the performance in terms of reliability and simplicity because it allows itself to learn and improving itself.
6. The feature level fusion scheme formulated in this research work can also achieve improved performance.


5.2. Limitations:

1. Through this study it has been found that feed-forward back propagation algorithm has its problem such as slow convergence rate with large dataset.
2. At the feature level fusion concern, features has to be normalize before applying neural network based classifier it has to be scaled features.
3. This has been seen that, many of the linear networks can classify objects only if the object is linearly separable.
4. The training outcome can be nondeterministic and depend crucially on the choice of initial parameters.
5.3. Future Scope:

Performance of all the methods presented in the thesis has been carried out. The method has been tested using three different classification schemes, and it has been proven to perform satisfactorily. FRR, FAR, Percentage Recognition has been considered for comparison.

1. Concept of Soft Computing can be used for Multimodal Biometric recognition system.
2. Using Soft Computing, neural network can be combined with fuzzy logic to enhance the performance of this recognition.
3. Another avenue for research would be to implement other feature extraction techniques on the same data set.
4. Combination of various machine learning techniques can be implemented.
5. In future, we can implement same technique using Fuzzy logic.
6. The efforts will be taken for experimentation in order to identify which specific features with different multi-wavelet are extracted easily and efficiently with less number of coefficients.