Chapter 6

Conclusion & Discussion

6.1 Introduction

In this thesis a study on the evaluation and selection of features in a pattern recognition problem has been done. In the first part a measure from the concept of fuzzy set theory has been developed to evaluate the effectiveness of a particular feature and a group of features in a feature set. The usefulness of the measure has been compared with the previously developed statistical measures. In the second part a knowledge based approach to the problem of feature selection has been developed and a guideline for the design of a connectionist expert system for feature evaluation has been devised.

6.2 Summary of the Work done

Feature Selection is an important preliminary step to a pattern recognition system. For proper selection an effective evaluation criterion is urgently needed. Lots of statistical measures have been developed in the past to fulfill the need. In this work measures have been developed from the concept of fuzzy set theory as:

- Fuzzy set theory is more justified for modelling real life cognition tasks than statistical theory.
- Evaluation of the criterion function is computationally simpler.

In chapter 2 the measures have been developed and implemented on different data sets. Features in different data sets are ranked according to
the developed measures. In chapter 3 same data sets have been used with statistical measures to obtain the ranking. Effectiveness of the proposed measures have been evaluated by comparing the rankings obtained by different measures. The proposed measures have been found equally efficient in finding out the effectiveness of any feature in a feature set as the statistical measures with the added advantage of being computationally simpler.

In chapter 4 the discriminatory power of a group of features in a feature set has been investigated. A multidimensional measure have been proposed as an extension of the unidimensional measure and has been implemented on different data sets to rank subsets of features. The proposed measure being monotonic can be satisfactorily used with the branch and bound technique to obtain the best feature subset of \( m \) features from the all possible subsets from a set of \( n \) features.

Finally in chapter 5 an knowledge based approach has been proposed. Cognitive tasks are basically well done by human being than most powerful computing machines. ANN models may be the proper solution for designing automatic feature evaluation system. In this chapter a simple ANN model has been designed for expressing the relationship of a particular feature to a class in the connection weights. The initial configuration of the net has been set up from the knowledge of the data set. The error in the output node in the supervised mode has been used to adjust the connection weights when the sample data is applied to the input. In this chapter a very simple prototype connectionist expert system has been written in CLIPS for the classification of Iris flower data set. Though it is a very simple system still it gives an idea of how to use ANN and Expert system technology for designing a hybrid system for feature evaluation.

The salient features of the developed system are:

- The system is capable of exploiting human knowledge as well as knowledge inherent in the collected data to design the neural knowledge base.

- The neural model can be used as the knowledge base for further processing or rules can be extracted from it to be written in a production system language for future use.

Iris flower data being very simple for classification a simple two layer perceptron like model is sufficient for extraction of rules for feature evaluation. The architecture of the model may become complex depending on the data set.
6.3 Future Scope of Research

The work may be extended in future in several directions. The main interest for further research are:

- To develop a general architecture of neural net for extraction of knowledge on feature from different data set.
- The prototype expert system may be extended to cope with real life problems and to investigate its merits and demerits.