A Review on Pattern Recognition Techniques using Soft Computing Methodologies

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***Abstract*— This work discussed about Soft Computing techniques used for pattern recognition dedicated to system solutions based on soft computing techniques. It provides rapid dissemination of important results in soft computing technologies, a fusion of research in evolutionary algorithms and genetic programming, neural science and neural net systems, fuzzy set theory and fuzzy systems, and chaos theory and chaotic systems. Soft Computing encourages the integration of soft computing techniques and tools into both everyday and advanced applications. By linking the ideas and techniques of soft computing with other disciplines, one can serve as a unifying platform that fosters comparisons, extensions, and new applications. This paper discussed about various existing work related to soft computing techniques.**

***IndexTerms*— Soft computing, pattern recognition, fuzzy logic**

I.INTRODUCTION

Pattern Recognition (PR) is the task of automatically detecting patterns in datasets and using them to characterize new data. PR is a form of machine learning, which itself is a field within artificial intelligence. Machine learning can be divided into two major groups. In supervised learning, or PR, a computer system is trained using a set of pre-defined classes, and then used to classify unknown objects based on the patterns detected in training. In unsupervised learning there are no classes defined a priori, and the computer system subdivides or clusters the data, usually by using a set of general rules. An example of supervised learning is automatic detection of protein localization, in which the computer system is trained using images of probes for known sub-cellular compartments. An example of unsupervised learning is clustering an expression profiling microarray experiment into groups of genes with similar expression patterns. Other approaches to PR include semi-supervised learning, which uses pre-defined classes to find new similarity relationships and define new groups, and reinforcement learning, in which decisions are improved iteratively based on a feedback mechanism and specified reward criteria. In this educational study we focus on the application of supervised learning to automated analysis of microscopy image datasets.

II. PATTERN RECOGNITION SOFTWARE AND TECHNIQUES FOR BIOLOGICAL IMAGE ANALYSIS

The applicability of PR in a specific imaging experiment depends entirely (and solely) on the availability and distinguish ability of control images. Thus, a PR approach to an imaging experiment is very closely tied to the biological experiment itself rather than intermediate measurements from image processing, or familiarity with the algorithms necessary to produce these measurements. PR can be used in tandem with segmentation algorithms when possible in order to exploit benefits provided by both approaches.

III. LITERATURE REVIEW

Pattern recognition using soft computing in Green and Renewable Energy Systems provides a practical introduction to the application of soft computing techniques and hybrid intelligent systems for designing, modeling, characterizing, optimizing, forecasting, and performance prediction of green and renewable energy systems. Research is proceeding at jet speed on renewable energy (energy derived from natural resources such as sunlight, wind, tides, rain, geothermal heat, biomass, hydrogen, etc.) as policy makers, researchers, economists, and world agencies have joined forces in finding alternative sustainable energy solutions to current critical environmental, economic, and social issues.

IV. SOFT COMPUTING HYBRID APPROACHES

Neural-Fuzzy system integrates the fuzzy logic representation of human knowledge with the learning capability of neural networks, which help in solving nonlinear dynamic control problems. For example in designing autonomous robotic systems, two important challenges are frequently encountered. The first deals with the nonlinear, real-time response requirements underlying the sensor–motor control formulation. The second deals with how to model and use the approach that a human will take for such a problem. Often the human experience and approach can best represented with a set of linguistic rules. Fuzzy logic controllers can mimic experts. Neural controllers learn, yet discrete input representations may cause such systems to be unstable. In addition, sufficient training patterns are usually difficult to obtain, and training time for the whole dynamic range is very long. It takes advantage of the best of fuzzy logic and neural networks-assimilating human expertise with continuous representation, combining with learning capability.

Neural-genetic system integrates the genetic algorithms with the learning capability of neural networks. For example, LG Electric developed an air conditioner that implemented a user-trainable NN trained by a GA . The NNs in air conditioners inputs room temperature, outdoor temperature, time, and user-set temperature, and outputs control values to maintain the user-set temperature. Suppose a user wishes to change the control to low to adapt to his/her preference. Then, a GA changes the characteristics of the NN by changing the number of neurons and weights.

Genetic-fuzzy system integrates the genetic algorithms with the fuzzy control applications. For example GA's are applied to fuzzy control of single link flexible arms. In GA learning hierarchical control architecture, the higher level module serves as a fuzzy classifier by determining spatial features of the arm such as straight, oscillatory and curved. This information is supplied to the lower level of hierarchy where it is processed among other sensory information such as errors in position and velocity for the purpose of determining a desirable control input. The control system is simulated using only a priori expert knowledge.

S. Sharma (2012) As the amount of data in medical databases increases, systems for medical data retrieval are growing in popularity. Some of these analyses include inducing propositional rules from databases using many soft techniques, and then using these rules in an expert system. Diagnostic rules and information on features are extracted from clinical databases on diseases of congenital anomaly. This study explains the most current soft computing techniques and some of the adaptive techniques encompassing an extensive group of methods that have been applied in the medical domain and that are used for the discovery of data dependencies, importance of features, patterns in sample data, and feature-space dimensionality reduction. These approaches pave the way for new and interesting avenues of research in medical imaging and represent an important challenge for researchers.

Rudolf Seising (2010) This contribution serves historical and philosophical reflecting cognitions on the role of Soft Computing in the 21st century. Referring to Magdalena's study in this issue, this study considers the aspects of mixtures of techniques, the opposite pair "Hard Computing" and "Soft Computing", and Computational Intelligence. From the historical perspective the study goes back to three studys by Warren Weaver that appeared after World War II. A concentrated study of these studys helps to understand that Soft Computing will be able to play a key role in the future development of science and technology.

Sankar K Pal (1996) This study discusses what soft computing is, the need for soft computing and real world computing (RWC) systems, the essential ingredients necessary to realise this, ie, neural networks, fuzzy logic and probabilistic reasoning and their role in soft computing. The development of hybrid computational paradigms is also explored and they are projected as a frontier research area in the evolution of sixth generation computing systems.

Liam Maguire (2010) The last fifty years has witnessed considerable activity in research that develops computational approaches inspired by nature. There are a number of umbrella terms used by researchers to classify their contributions. This can cause problems in disseminating and sharing results and potentially restricts research due to a lack of knowledge of the varied contributions. This study reviews research in spiking neural networks and attempts to determine if the term Soft Computing can be used to classify contributions in this area.

V. PROPOSED METHODS

Except in a limited sense, such as analyzing the confusion matrices of classification experiments as discussed in the Interpreting Image Classification Output section, most PR approaches do not yield the types of quantitative results one gets from segmentation algorithms. Instead, it can lead directly to a qualitative experimental result, such as finding the "hits" in a screen. In general, PR is useful as an exploratory imaging assay that is independent of any preconceptions of the nature or existence of morphological differences in the imaging experiment. PR requires little effort or expertise to try. It can be used to check whether morphological readouts exist and develop more specific imaging algorithms if warranted. The figure 1 represents proposed model system.

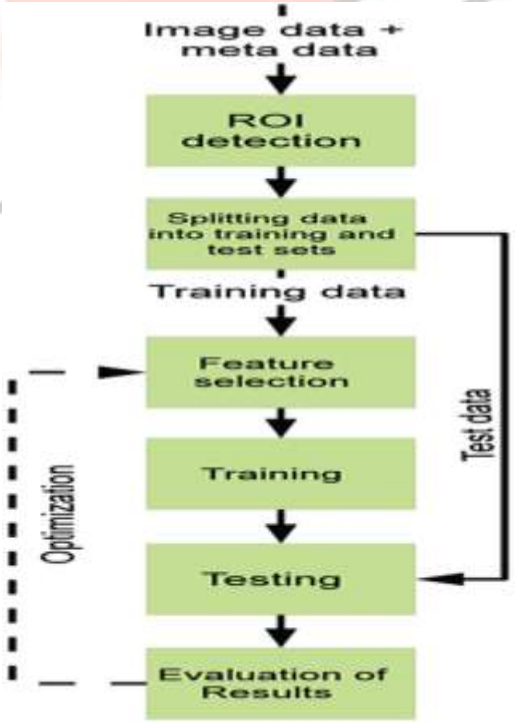

Figure 1: Proposede Model Diagram

A feed forward multilayer neural network is trained by Back propagation method for speaker independent isolated word recognition. Mel Frequency epstral Coefficients (MFCC) is extracted as speech features. These features are used to train the Multi Layer Feed Forward network (MLFFN) Network. The same routine is applied to signals during recognition stage and unknown

test patterns are classified to the nearest pattern. Analysis based on varying number of hidden neurons in the network is presented here. The network is trained with input waves captured in office environment and is tested against data in test database created in similar environment. It has been observed that the MLFFN works as good classifier for test data. For experimental purpose number of features extracted was changed and it has been observed that number of speech features extracted plays a very important role in recognition of isolated Hindi digits through machine.

VI.CONCLUSION

This work study about review on Soft computing for pattern recognition . Nowadays, the term is used often in computer science and information technology. It is possible to define SC in different ways. Nonetheless, SC is a consortium of methodologies which works synergistically and provides, in one form or another, flexible information processing capability for handling real life ambiguous situations. Its aim is to exploit the tolerance for imprecision, uncertainty, approximate reasoning and partial truth in order to achieve tractability, robustness and low-cost solutions.

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