PROBabilistic PotentIal FunCTion Neural NetworK ClassIfier

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Desired Properties of Proposed Classifier

♦ Real-time training and classification

♦ Multi-modally distributed classes

♦ Classes formed from a set of disconnected subclasses

♦ No initial guess for the network topology

♦ Discover clustering properties of training data

♦ Adapt to a minimal network topology

♦ Implement incremental learning procedure

♦ Form optimal decision boundaries - a theoretical Bayesian classifier.
Significant Neural Classification Paradigms

- **The Multi-Layer Feedforward Network**
  Initial network topology - needs guessing
  slow training speed - unsuitable for real-time implementations.

- **The Radial Basis Function Network**
  Initialization of network - clustering properties of training data ($k$-means)
  Hidden layer node count

- **The Probabilistic Neural Network**
  A pattern layer node for each training pattern
  Potentially large node counts

- **Learning Vector Quantization Networks**
  Codebook vector initialization - no well-defined procedure exists
Topology of PPFNN.
NETWORK CREATION PROCESS
Classification rate in %

2-Spiral Data

Iris Test Data
Classification rate in %

LVQ RBF MLP PNN PPFNN

Classification algorithms

Sonar Test Data

Classification rate in %

LVQ RBF MLP PNN PPFNN

Classification algorithms

Vowel Test Data
CONCLUSIONS

Performance of Proposed Algorithm

◊ Initial findings are very promising
◊ Benchmark Problems tested include 2-Spiral, IRIS, Vowel, and Sonar

Simulation Results

◊ Fast training and classification
◊ High classification rate on problems tested
◊ Minimal network size
◊ Small number of empirically determined parameters
◊ Room to improve performance
CURRENT WORK

⇒ More benchmark problems

⇒ Determine a way to define optimal values for potential function spread

⇒ Determine an optimal sequence for weight values

⇒ Improve classification performance - optimality