CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1227

Project Title
Pattern Recognition Capabilities of Neural Networks

Abstract

Objectives/Goals
The aim of the project was to experimentally determine the pattern recognition capabilities of neural networks by presenting them with mathematically generated input of varying complexity and consequently measuring their performance as the network complexity and learning parameters were modified.

Methods/Materials
A computer application developed by the author was used to perform the experiment. The application used the neural networks back-propagation learning algorithm to conduct testing. The exclusive or (XOR) operation was used in preliminary testing followed by multidimensional geometric figures, which were used as a source of patterns presented to the networks.

Results
Results of testing with XOR revealed a greater number of neurons leads to the need for a higher learning parameter in order to maintain a lower rate of error. The particular method used in the experiment was unable to successfully classify the multidimensional figures. The experiment revealed that error decreases proportionally to the learning rate and is unrelated to the number of neurons when the network is incapable of successfully handling a pattern.

Conclusions/Discussion
The overall information gleaned from the experiment suggests what forms of behavior researchers should expect when experimenting with neural networks (specifically the back-propagation algorithm).

Summary Statement
Analyzes the learning capabilities of neural networks in specific situations and attempts to make broader generalizations of learning behavior from the resulting data.

Help Received
Work conducted independently.