Evolution of Transfer Functions in Artificial Neural Networks

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PS Einführung in die Bioinformatik

Group Number 3

Introduction

- NETGen
- - Table of functions
- - Cubic spline interpolation
- – Smooth first and continuous second derivative
- Motivation : Monotonic vs Periodic Activation Functions by Sopena, Romero and Alquézar

Implementation

- SNNS activation function
- General Function Parameter (GFP)
- Cubic spline

Standard Benchmarks – Analytical Approach

XOR

- Net architecture
- Implemented sine vs interpolated sine vs adapted xor function.

Two Quadrants

- Heaviside - XOR
- Sine - XOR
- Adapted heaviside

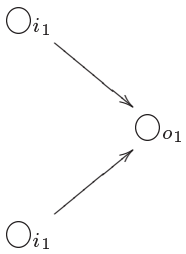

Figure 1: Architecture for the XOR problem.

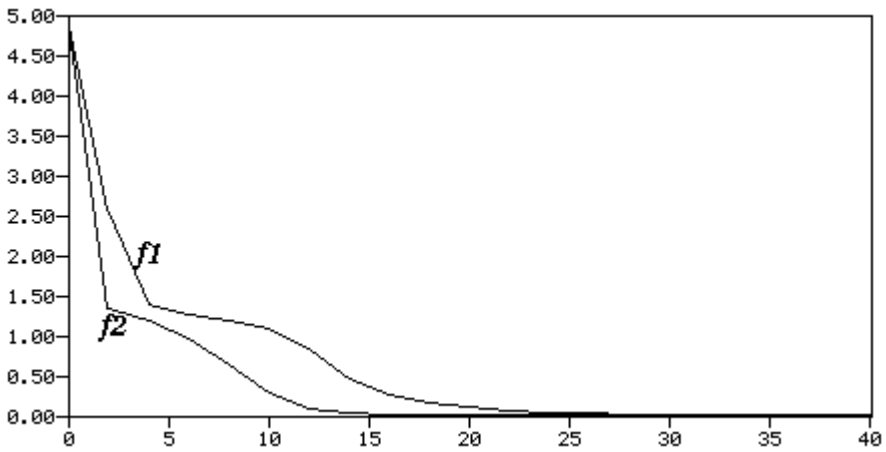

Figure 2: Comparation in learing the XOR Problem with sinus and cubic spline. Both used the same simple architecture network(figure 1) and the same learning pattern, only $f1$ used an interpolated sine as activation function in the output neuron, and $f2$ used the customized cubic spline.

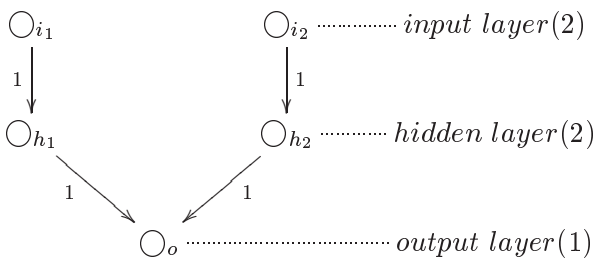

Figure 3: Architecture of the ANN for the Quadrants Problem.

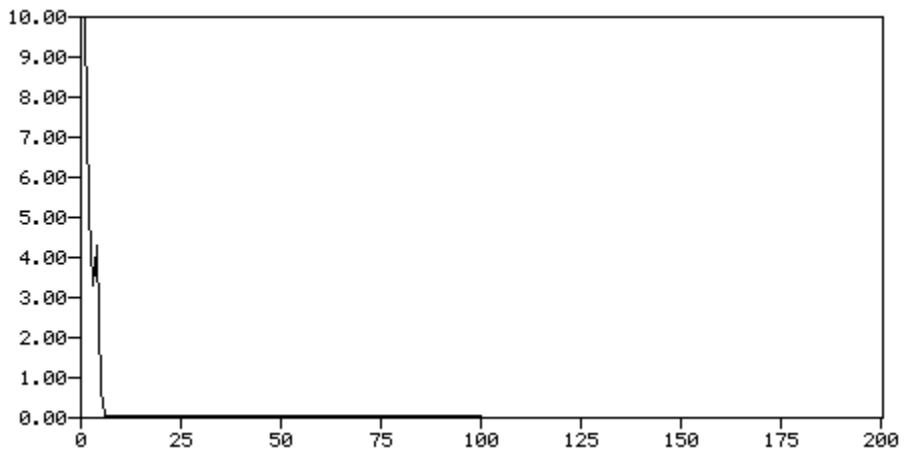

Figure 4: Error surface for quadrants problem using adapted heaviside functions in the hidden layer.

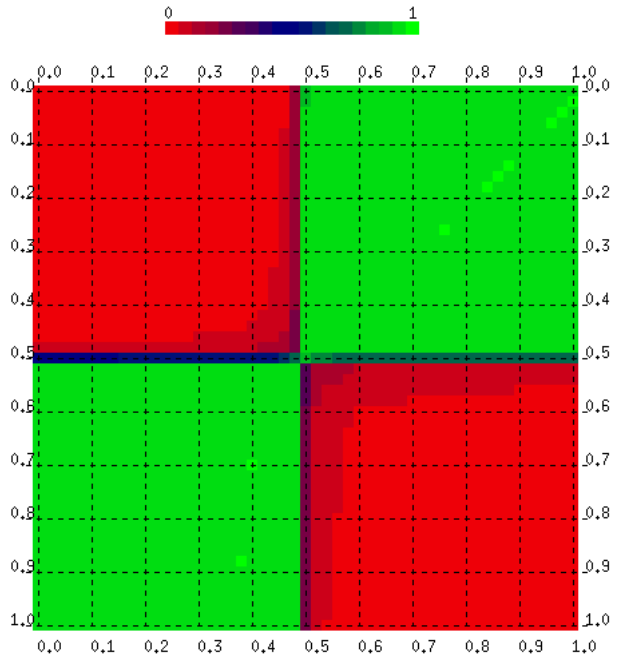

Figure 5: Actual output of the Quadrants Problem using the same architecture as in figure 3 with adapted heaviside as activation fuction.

Problems

- Computation time due to file access
- Learning nearly impossible in extrapolated part of the Cubic Spline
- Due to extrapolation the spline is not continuous in the terminal points

Outlook

- NetGen