NeuroGrubi: a Web Application of Artificial Neural Networks Simulator

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Abstract. This paper aims to develop a methodology that facilitates the use of Artificial Neural Networks and more broadly to initiate a process of using the revolutionary techniques of Artificial Neural Networks in day-to-day, especially in business. For this, we first proposed the development of a prototype simulator Artificial Neural Networks as web application, named NeuroGrubi, so people can not only use it, but also have access to the code. The Web was chosen because the easy access and availability offered to potential users of such systems. The work will also indicate how this prototype can then be optimized and improved in the future to promote the use of techniques of Neural Networks. The purpose is to increase the use of neural networks technology by enterprises, leaving transparent to the end user, without specific details about the area.

Keywords: Artificial Neural Networks, Web Application, Javascript.

1 Introduction

Artificial neural networks are composed of distributed parallel systems and simple processing units (nodes) that compute certain functions Mathematical (typically nonlinear). Such units are arranged in one or more layers and interconnected by a large number of connections, usually unidirectional. For most models these connections are associated with weights, which store knowledge represented in the model and serve to weigh input received by each neuron network. The operation of these networks is inspired by a physical structure designed by nature : the human brain [4].

In this last decade there has been a tremendous growth in interest in the study Artificial Neural Networks for the international community. This resumption of interest in the area was provided mainly by the advance of technology, especially microelectronics, which is allowing the physical implementation of models of nodes and their connection modes and also the previously unthinkable fact the Symbolist school not having achieved significant progress on tasks simple for a human , even with their success in other areas problems.

The main objective of this work is to bring users nonspecialists (mainly for businesses environment) applications that used the techniques of Networks Artificial Neural that were both easy to use and they needed a minimum of specific knowledge to the part of end users.

A deeper understanding of how existing models work also provide more information for researchers who are developing new models of neural networks Artificial . A more comprehensive knowledge since the beginning of their studies available to the researcher more precise information on which areas or aspects models must be improved and that can be maintained for the new network to be more efficient.

With these goals in mind we developed a prototype of a web application easy access and use .

2 Related Work

The technology of artificial neural networks has been widely used in recent years in several areas of application. The use of this technology is already widespread in many areas, where the great performance objectives, monitoring and systems integration activities are targeted and increasingly arise solutions that use neural networks in new areas that exceed the solutions obtained by conventional [9].

Examples of some areas where the use of artificial neural networks have achieved great success:

- Water Flow Forecasting [10]

- Prediction of Electricity demand [8]

- Character Recognition [11]

- Stock Market Predictor [6]

- Signature Validation [12]

- Characterizing and Evaluating Fraud in Electronic Transactions [5]

- Medical Image Diagnosis [7]

For access to neural networks help a larger group of people, this work suggested the development of a web application that provides the user with an interesting solution to their problems.

It is apparent that a neural network has its computational power primarily related to its structure highly distributed and parallel and also their ability to learn and therefore generalize (ability of the neural network has to produce reasonable outputs for inputs not shown in phase learning/training). These two information-processing capabilities make it possible to solve complex problems through the use of techniques of Artificial Neural Networks. In practice, however, artificial neural networks can not by itself generate solutions. Should rather be integrated into a consistent approach to Systems Engineering. More specifically, one should take the complex problem which we wish to arrive at a solution, break it down into a number of relatively simple tasks and assign certain of these tasks (pattern recognition, associative memory, control, etc.). Techniques Artificial Neural Networks to solve them.

The use of Artificial Neural Networks offers the following useful properties and capabilities [4]:

I Non-Linearity.

II Input-output Mapping.

III Adaptation.

IV Contextual Information.

V Failure tolerance.

3 NeuroGrubi

Applications hosted on the Internet, or software as a service is an important issue nowadays. The main reasons to consider migrating your application to cloud projects are associated with reduced costs and increased output. Another important advantage is the ease of updating the software, requiring only update the application on the server and so all users can access the updates.

However, to be able to provide a service in which you must use technologies work on the Internet. The NeuroGrubi was built using the language Javascript programming, the NodeJS [1] as language interpreter on the server and MongoDB [2], one NoSQL database, used to store data for neural network training.

The library Brain.js [3] is a library with the Back-propagation algorithm that is used to carry out the training of the neural network. At the end of that library generates a function in javascript with the network already trained.

3.1 Javascript e NodeJs

The choice of programming language such as Javascript support NeuroGrubi is based facility that Javascript has to walk through objects. The objects in javascript behave like lists, thereby simplifying the training algorithm of the neural network. The algorithm rather than iterate over matrices, it iterate over objects list.

Another advantage in the choice of Javascript is its simple syntax of a loosely typed scripting language and dynamic typing. This facilitated the implementation of NeuroGrubi.

The NodeJS is a platform for developing applications in javascript. It provides an easy way to create scalable programs. As the user base grows NeuroGrubi, it is necessary to support more users and therefore will need to add more servers. The NodeJS allows this expansion simply.

3.2 MongoDB

MongoDB is a database document-oriented high-performance, open source, and schema-free, written in C++. He is a mix between repositories based scalable key / value and wealth of traditional features of relational databases.

These features help design NeuroGrubi. As the databases for training the neural network can be great, it makes the task of uploading the database arduous work.

A solution is to upload only once in the database and use it in training as often as necessary.

The problem is that the training data is not of a generalization making the use of relational databases a complicated task. MongoDB makes the task of storing data in varying formats a simple task. MongoDB stores the entire line-shaped object, where each column represents an attribute.
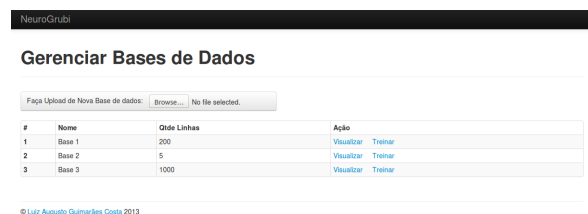
3.3 The Application

First, as the NeuroGrubi works with private data the user, then must provide a username and password. Thus the system can only provide information the user entered in the system. The login screen is NeuroGrubi shown in figure 1.

Figure 1: Login Screen

The second screen is to view the databases that are already contained in NeuroGrubi. It also is possible upload others databases, as well as see the databases are already in NeuroGrubi. Another possible action on this screen is going to screen training Neural Network.
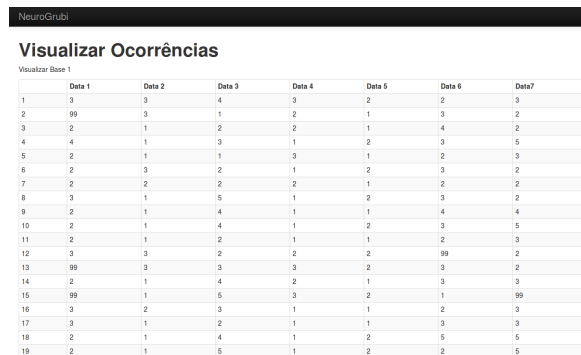
Figure 2: Train Data Screen

Third figure 3 shows how the data screen viewer appearance.

If you choose the train button, the screen directs you to NeuroGrubi training. On screen training the user has access configuration variables Backpropagation neural network used by the library Brais.JS. In this screen the User can configure the following parameters of the network.
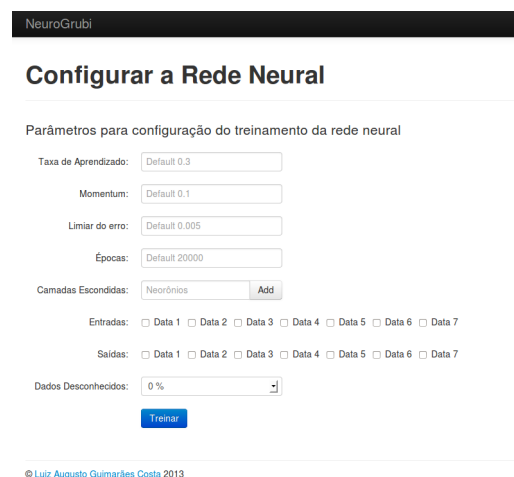

Figure 3: Data Screen Viewer Appearance

- Learning Rate
- Momentum
- Error Threshold
- Iteration
- Hidden Layers
- Node in each Hidden Layer
- Inputs and Output
- Data for Test

Figure 4 represents the configuration screen of the neural network training parameters.

Figure 4: Configuration Training Screen

After training the NeuroGrubi shows a screen with the result of training as shown on figure 5

Figure 5: Train Result Screen

4 Conclusion and Future Work

The NeuroGrubi was the first step towards to develop a web tool for neural networks. It certainly proved to be feasible by enabling people and organizations to have access a simple and free neural networks tool.

The research also shows that the technology of artificial neural networks can easily reach users not experts, since the developers have in mind what kind of user applications are intended to facilitate the use, leaving the fewest accessible possible to the configuration parameters. The NeuroGrubi was implemented with the goal of being easy to non-experts users.

It is known that the arise of a new idea, as well as research on its feasibility and first steps for its implementation are quite difficult and complicated. It is believed that this step was completed this work, however, there is no doubt that there is much more to be done: starting with the implementation and analysis of other models of Artificial Neural Networks. Perhaps the development of a script specifying the steps to be carried out was of vital importance . Another possible work is changing the server-side technology, because *nodejs and* javascript are easy handling but are shown not to have a good performance when the script to train was running. Changing the programming language to *C++ or* Java can improve the use of computer resources .

It is also essential to develop other applications more elaborate and refined. Could be carried out a research on various companies to find out which areas of Artificial Neural Networks techniques could be applied to improve performance and/or lower costs. Thus, the study could generate, with low cost, easily accepted tools and understanding to those potentially interested

in a future purchase.

It is true that in one way or another, most applications and all the attention will be focused here on to the Internet. Offering these prototypes as web application will not only facilitate the exchange of idea on the part of developers, researchers and students as well. The internet makes the NeuroGrubi easier to access for people interested in using and learning Artificial Neural Network.

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