BreakingCaptcha Reference Manual

0.1

Generated by Doxygen 1.5.1

Tue Oct 2 03:16:27 2007

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2.1 BreakingCaptcha File List

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Chapter 3

BreakingCaptcha Class Documentation

3.1 GenericLayer Class Reference

`#include <GenericLayer.h>`

Public Member Functions

- GenericLayer (int numNeurons, GenericLayer *parent, GenericLayer *child)
- virtual ~GenericLayer ()
- void initWeights ()
- void initNeurons ()

Public Attributes

- GenericLayer * parentLayer
- GenericLayer * childLayer
- Neuron * neurons
- int numNeurons
- double ** weights

3.1.1 Detailed Description

Provides a generic implementation of a neural network layer. In general, the network is defined as loosely coupled neurons in a feed forward three layered design. The neurons are all each connected to adjacent layer neurons, and those connections have weights associated with them. In this implementation, those neurons with a child layer will be associated with the weights between them and their children. Also included are bias factors, which are stored in the neurons themselves since there is only one bias per neuron. The neurons will be initialized with values of 0 except for the bias value which will be 1. The error factor is also included on the neuron itself.

3.1.2 Constructor & Destructor Documentation

3.1.2.1 GenericLayer::GenericLayer (int *numNeurons*, GenericLayer * *parent*, GenericLayer * *child*)

Defines the constructor for the generic neural layer.

Parameters:

numNeurons The number of neurons to create in this layer.

parent A pointer to the parent layer of this current layer. NULL if this layer is the inputer layer.

child A pointer to the child layer of this current layer. NULL if this layer is the output layer.

```
GenericLayer input, hidden, output;
input =  new GenericLayer(50, NULL, &hidden);
hidden = new GenericLayer(50, &input, &output);
output = new GenericLayer(50, &hidden, NULL);
```

Exceptions:

integer Throws an integer exception when the bounds of the GenericLayer::MAX_NEURONS or GenericLayer::MIN_NEURONS number of neurons in this layer has been broken.

Postcondition:

All the default values have been assigned and all arrays have been allocated.

3.1.2.2 GenericLayer::~GenericLayer () [virtual]

Deallocates the memory from the neuron and weight arrays.

3.1.3 Member Function Documentation

3.1.3.1 void GenericLayer::initWeights ()

Initialize the weights array, but only if we are in a layer with a child because they are responsible for keeping track of the weights. The number of total entries should number GenericLayer.numNeurons*GenericLayer.childLayer.numNeurons. The weights are all initialized to zero before training.

Postcondition:

The array containing the weights for each neuron is allocated and has been filled with zeros. It is ready to be trained.

3.1.3.2 void GenericLayer::initNeurons ()

Precondition:

The neuron array is undefined.

Postcondition:

The neuron array has been allocated and intelligent defaults have been set. There is now GenericLayer::numNeurons neurons in this layer. It is ready to be trained.

3.1.4 Member Data Documentation

3.1.4.1 GenericLayer* GenericLayer::parentLayer

Pointer to the parent layer of this layer.

3.1.4.2 GenericLayer* GenericLayer::childLayer

Pointer to the child layer of this layer.

3.1.4.3 Neuron* GenericLayer::neurons

The array of neurons that populate this layer of the network.

3.1.4.4 int GenericLayer::numNeurons

The number of neurons to create in this layer.

3.1.4.5 double** GenericLayer::weights

The 2D array of weights with dimensions of this layer's numNeurons by the child layer's numNeruons. If there is no child layer then it remains NULL.

The documentation for this class was generated from the following files:

- src/GenericLayer.h
- src/GenericLayer.cpp

3.2 Neuron Class Reference

`#include <Neuron.h>`

Public Member Functions

- Neuron (double value, double bias, double biasWeight)
- virtual ~Neuron ()

Public Attributes

- double value
- double bias
- double biasWeight
- double error

3.2.1 Detailed Description

Provides the structure of the neuron. The Neuron class has details about the neuron's value, which is the value stored by the neruon. The neuron's bias, which is used and adjusted when training and computing new values for the network. The neuron bias' weight which is used similarly to the bias. And also the error, which is used primarily in training for computing how far off the network's output is from the desired output. All of this is used generically and in conjuction with the GenericLayer class to implement any sort of nerual network layout.

3.2.2 Constructor & Destructor Documentation

3.2.2.1 Neuron::Neuron (double *value* = `0.0`, double *bias* = `1.0`, double *biasWeight* = `0.0`)

Defines the constructor for the Neuron class.

Parameters:

value A double representing the value of the neuron.

bias A double representing the bias of the neuron.

biasWeight A double representing the weight of the bias on the given neuron.

3.2.2.2 Neuron::~Neuron () `[virtual]`

Neuron class desctructor.

3.2.3 Member Data Documentation

3.2.3.1 double Neuron::value

The value of the neuron.

3.2.3.2 double Neuron::bias

The bias of the neuron.

3.2.3.3 double Neuron::biasWeight

The weight of the bias on the neuron.

3.2.3.4 double Neuron::error

The error associated with the computation of the network versus the desired output.

The documentation for this class was generated from the following files:

- src/Neuron.h
- src/Neuron.cpp

Chapter 4

BreakingCaptcha File Documentation

4.1 src/GenericLayer.cpp File Reference

```
#include "GenericLayer.h"
#include "omp.h"
```

4.1.1 Detailed Description

Author:

Ben Snider

Version:

0.1

Defines the GenericLayer class for the implementation of the network.

4.2 src/GenericLayer.h File Reference

Classes

- class GenericLayer

4.2.1 Detailed Description

Author:

Ben Snider

Version:

0.1

Header file for the GenericLayer class.

4.3 src/Neuron.cpp File Reference

```
#include "Neuron.h"
```

4.3.1 Detailed Description

Author:

Ben Snider

Version:

0.1

Implements the Neuron class.

4.4 src/Neuron.h File Reference

Classes

- class Neuron

4.4.1 Detailed Description

Author:

Ben Snider

Version:

0.1

Defines the Neuron class.

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