ITK Neural Network IO Classes

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Abstract

This document describes the itk Neural network IO classes. The code of the algorithm is written following the ITK Coding Style as described in the directory `Insight/Documentation/Style.pdf`

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1. ITK Neural Network IO

These classes enable users to load Neural Networks and define topology, weights, etc from a text file and save a trained neural network to a text file. This also lets users to change network topology without having to recompile as they can do this by editing the network configuration file.

Neural Network file format:

ObjectType = MultilayerNeuralNetworkBase

NLayers = 3

NWeightSets = 2

WeightValuesType = 1

Layer_Id = 0

NumNodes = 2

LayerType = BackPropagationLayer

TransferFunction = IdentityTransferFunction

InputFunction = SumInputFunction

Layer_Id = 1

NumNodes = 2

LayerType = BackPropagationLayer

TransferFunction = TanSigmoidTransferFunction

InputFunction = SumInputFunction

Layer_Id = 2

NumNodes = 1

LayerType = BackPropagationLayer

TransferFunction = TanSigmoidTransferFunction

InputFunction = SumInputFunction

WeightSet_Id = 0

WeightSetType = CompletelyConnectedWeightSet

SRC_Layer = 0

DEST_Layer = 1

WeightSet_Id = 1

WeightSetType = CompletelyConnectedWeightSet

SRC_Layer = 1

DEST_Layer = 2

WeightValues = -1.55069 -1.55531 1.41818 -1.10289 -1.10465 -0.816426

WeightValues = 1.97489 -2.03274 -1.65122

The above example defines a simple 2-2-1 network. Most of the fields are self explanatory.

WeightValuesType: defines how weights are defined.

0: weights are randomly initialized

1: weights are in the same file following the network definition in ASCII format

2: weights are in the same file following the network definition in binary format.

Each weightset connects two layers, and hence has a source and a destination layer; these are indicated by the respective ids of the layers.

In the above example, we are specifying a 2-2-1 network, hence we have

NLayers =3

NWeightsets = 2

Each layer is further defined in terms of type, input function, and transfer function.

Each weightset is again defined in terms of type, and the source and destination layers it connects.

The itk Neuralnetwork IO classes include itkNNEtFileReader and itkNNETFileWriter.

The NNETFileWriter would allow users to save a trained network and generate a similar file as described above. Users also have the option of saving weights in ASCII or binary format.

1 Software Requirements

You need to have the following software installed:

- Insight Toolkit