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**United States Patent [19]**

Deangelis

[11] Patent Number: **5,787,408**[45] Date of Patent: **Jul. 28, 1998****[54] SYSTEM AND METHOD FOR DETERMINING NODE FUNCTIONALITY IN ARTIFICIAL NEURAL NETWORKS**[75] Inventor: **Christopher M. Deangelis**, Cranston, R.I.[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.[21] Appl. No.: **702,300**[22] Filed: **Aug. 23, 1996**[51] Int. Cl.<sup>6</sup> ..... **G06F 15/18**[52] U.S. Cl. ..... **706/25; 706/16; 706/20; 706/27**[58] Field of Search ..... **395/22, 23, 21; 706/25, 16, 20, 27****[56] References Cited****U.S. PATENT DOCUMENTS**

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A system for unwrapping an artificial neural network (ANN) to determine the utilization and functionality of the nodes uses a network generator for generating an initial ANN architecture. Training and pruning processors operate to generate minimal ANN architectures having increasingly lower levels of classification accuracy. A network analyzer uses an analysis controller to receive minimal ANN architectures from the pruning processor. A connection analyzer operates on the minimal ANN architectures to identify the inputs to the minimal ANN architecture and determine the information represented by and contained in the network inputs. A node analyzer, coupled to the connection analyzer, then defines the utilization and functionality of each node in the minimal ANN architecture in terms of known functions.

**13 Claims, 2 Drawing Sheets**