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- (54) **Title:** TRAINING OF ARTIFICIAL NEURAL NETWORKS

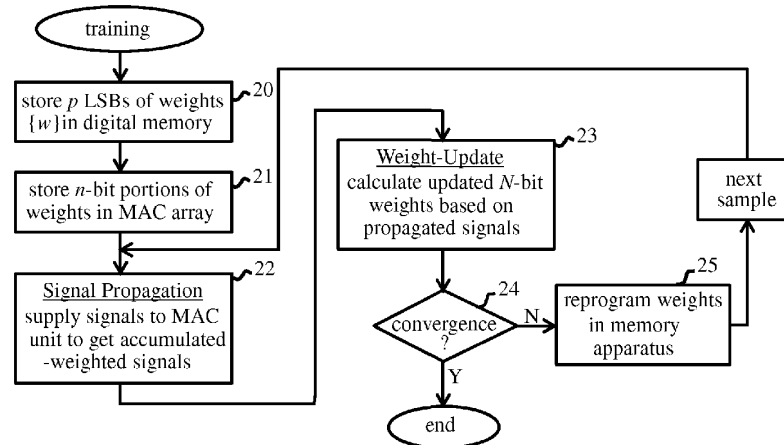


Figure 5

- (57) **Abstract:** Methods and apparatus are provided for training an artificial neural network having a succession of neuron layers with interposed synaptic layers each having a respective set of N -bit fixed-point weights $\{w\}$ for weighting signals propagated between its adjacent neuron layers, via an iterative cycle of signal propagation and weight-update calculation operations. Such a method includes, for each synaptic layer, storing a plurality p of the least-significant bits of each N -bit weight w in digital memory, and storing the next n -bit portion of each weight w in an analog multiply-accumulate unit comprising an array of digital memory elements. Each digital memory element comprises n binary memory cells for storing respective bits of the n -bit portion of a weight, where $n \geq 1$ and $(p + n + m) = N$ where $m \geq 0$ corresponds to a defined number of most-significant zero bits in weights of the synaptic layer.

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