

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte NIKZAD TOOMARIAN and JACOB BARHEN

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Appeal No. 96-0065  
Application No. 07/969,868<sup>1</sup>

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ON BRIEF

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Before KRASS, MARTIN, and CARMICHAEL, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1 through 20, all of the claims in the application.

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<sup>1</sup> Application for patent filed October 27, 1992.

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The invention is directed to a method and apparatus for neural network training.

Representative independent claim 1 is reproduced as follows:

1. A method of training a neural network so that a neuron output state vector thereof obeys a set of forward sensitivity equations over a finite learning period, said method comprising:

defining first and auxiliary adjoint systems of equations governing an adjoint function and an auxiliary adjoint function, respectively, of said neural network;

setting said adjoint function to zero at the beginning of said learning period and integrating said adjoint system of equations forward in time over said learning period to produce a first term of an indirect effect of a sensitivity gradient of said neural network;

setting said auxiliary adjoint function to zero at the end of said learning period and integrating said auxiliary adjoint system of equations forward in time over said learning period to produce a remaining term of said indirect effect;

computing a sum of said first and remaining terms, and multiplying said sum by a learning rate; and

subtracting the product thereof from a current neuron parameter vector to produce an updated neuron parameter vector.

No references are relied on by the examiner.

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Claims 1 through 20 stand rejected under 35 U.S.C. § 101 as being directed to nonstatutory subject matter.

Reference is made to the brief and answer for the respective positions of appellants and the examiner.

#### OPINION

We reverse.

On its face, the instant claimed invention is directed to an operation of an algorithm for producing an updated, or revised version of, a neuron parameter vector which is useful for training a neural network. The instant claimed subject matter therefore has practical utility. Even if the mathematical algorithm by which the final result is reached may be considered an abstract idea, that abstract idea is clearly employed in a useful way. The transformation of data through a series of mathematical calculations to produce the updated version of the neuron parameter vector for training a neural network constitutes a practical application of the abstract idea or mathematical algorithm because it produces a

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useful, concrete and tangible result - the updated version of the neuron parameter vector. See State Street Bank & Trust Co., v. Signature Financial Group, Inc., 149 F.3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998).

The examiner even admits [answer, paper no. 15, paragraph (9)] that the "invention is a neural network training technique for solving problems to save computational time. It has a practical application." Clearly, the saving of computational time is a useful, concrete and tangible result and there is a practical application of the subject matter recited in the instant claims. Thus, the claimed subject matter constitutes patentable subject matter within the meaning of 35 U.S.C. § 101.

The examiner appears to disregard the practical application of the claimed subject matter because "all the activity takes place inside the computer. The computer merely provides an 'indication' when it has finished its computation" [answer, paper no. 15, paragraph (9)]. Merely because the claimed subject matter is practiced via a computer is not an adequate basis for holding the subject matter to be

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nonstatutory under 35 U.S.C. § 101. Further, the "indication" provided by the computer is the updated version of the neuron parameter vector to be used for training the neural network, a practical application. Thus, it is more than merely an indication that the computation has been completed.

The examiner's decision is reversed.

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REVERSED

ERROL A. KRASS	)	
Administrative Patent Judge	)	
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	)	
	)	BOARD OF PATENT
JOHN C. MARTIN	)	APPEALS
Administrative Patent Judge	)	AND
	)	INTERFERENCES
	)	
	)	
	)	
JAMES T. CARMICHAEL	)	
Administrative Patent Judge	)	

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APJ CARMICHAEL

APJ MARTIN

REVERSED

Prepared: August 13, 1999