Performance Analysis of Artificial Neural Network Using Gray Related Analysis (GRA) Method

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Abstract

Neural Network in GRA (Gray-related analysis). These types of gene regulatory networks. Of gene expression in this paper Artificial neural networks as a model of dynamics Networks we use networks. Other of the system Expression of genes by means of a gene Product the importance matrix of regulatory effect is defined. Positive and/or negative the model considers mutational regulation including feedback. Research significance: on the expression of a particular gene Regulatory effect as a neural network Based on the assumption that can be expressed a new model has been developed. Methology: Neural Network in GRA (Gray-related analysis) method Alternative: Neural Network, Training time, Execution time, Information content. Evaluation Preference: Back-scattering, counter scattering, Boltzmann Machine, Hopfield Network, BAM. Result: shows that from the result it is seen that BAM and is got the first rank whereas is the counter propagation got is having the lowest rank. Conclusion: The value of the dataset for Neural Network in GRA (Gray-related analysis) method shows that it results in BAM and top ranking.
Keywords: Artificial Neural Networks, Recursive Neural networks, Convolution Neural Networks, MCDM method.

I. Introduction

In this article, we will communicate approximately neural networks. The purposeful unit of deep studying, because of this a neural network accepts enter and produces output. Deep mastering makes use human brain to resolve complicated facts troubles. These technologies consist of image popularity, speech reputation, pattern recognition and natural language processing (NLP) to call a few. In this article, you'll research the basics of Artificial Neural Networks or ANN. It will also give you an in-depth clarification of ways neural networks work. Artificial Neural Networks (ANN) is algorithms based totally on brain activity and used to version complicated styles and predictive issues. A synthetic A Neural Network (ANN) is the brainchild of the human mind one that arose from the concept of neural networks Deep learning method. The development An ANN can mimic the functioning of the human brain the end result of the effort. Capabilities of ANN much like the ones of organic neural networks, even though they're now not equal. ANN set of rules accepts only numerical and structured records. Convolution Neural Networks (CNN) and Recursive Neural networks (RNNs) are unstructured and to accept non-numeric data are used. Formats including picture, Text and speech. This article is synthetic Special focus on neural networks pays.

II. Neural Network

In Application of Artificial Neural Community, BP Network And most of its varied model Neuroscientists are accepted in social cultures; However, this does not suggest that the BP community is better, However there are inevitable flaws in its methodology There are, for example, nearby in the way of training falls within the minimum area of the area, an alternative Fees are sluggish. Network Addition Redundancy and newly presented models are learned models or May affect others. To address those deficiencies the researcher developed several methods the researcher developed several methods recommended. Proceed accordingly Techniques can generally be classified into three categories: One is the pace of neurosocial schooling to improve; the second is the accuracy of the exercise to improve; Third, the minimum of neighboring elements Avoiding losing on point. Among those techniques, an alternative to conventional, additional momentum mode and charge the technique is known variable. [1] First, an outline of the neural community method is supplied. This is followed through a few sensible tips for implementing lower back-propagation neural networks. Two practical examples in geotechnical engineering are then offered to demonstrate the capability of this approach for taking pictures nonlinear potential of this technique for shooting nonlinear capability of this technique for shooting nonlinear interactions between variables in complex engineering structures. The first instance includes the evaluation of facts obtained from massive scale laboratory assessments on sand. The different example pertains to the prediction of the closing load ability of pushed piles from real area statistics [2]. This paper is an emerging practical neurosociology Form and organization to the organization of applications represents an attempt to propagate again. Pack- Essay with quick explanation of fractional mathematics begins. To overcome back diffusion problems some heuristics used by researchers and techniques, potentially for example Identify and outline areas of improvement are shown. Identified heuristics and application development methodology using strategies proposed [3]. The very green second-order (LM) set of rules become followed Hagan et al. for neural network education later turned into carried out inside the MATLAB Neurosocial Toolbox LM Algorithm uses drastically extra number of parameters describing the error surface than

simply gradient factors as inside the EBP rapid however it is able to also educate neural networks for which the EBP [4]. In this paper, a hybrid prediction we recommend version referred to Wavelet T-Blood-primarily pack Propagation (WDBP) Neurology community. In this type of version, the authentic the data are first two by wavelet reshaping is decomposed into layers. For each layer Low frequency and high frequency signal means has Back Propagation (BB) Neural Network Version Lower of each layer to predict future value the frequency is connected through the signal. our To the best of our knowledge, inventory costs of principal-based rules for forecasting Set WDBP neural network This is the first attempt to use it.[5]. The category time is linearly proportional to the scale of the photograph and every pixel is calculated independently of its friends. Therefore, route-grain multiprocessor machines could pace the category by splitting the huge photo into smaller units. The network generalizes pretty nicely from image to picture, but the community can also learn thru time. The retraining must be less complicated than the initial schooling because the Although they have a look at of neural network strategies for classifying multispectral and multisource satellite records continues to be in its infancy, a again-propagation community appears to be a viable classifier for extremely large multichannel pix [6]. The book starts off evolved and with an introductory chapter by Hwang. This chapter is well written and e-book other parts are built on simple principles Introduces the reader. This chapter is Neuroscience Social Structures and McCulloch and Pitts Neuron, Multi-Layer Perception, Radial Basis Neuron, Multi-Layer Perception, Radial Basis Networks, Competitive Learning Networks, Committee Machines and Support Vector Machines It starts with an inclusive idea. For MATLAB Written code, with different types of neural community to allow readers to examine Downloading from the publisher and In order to have a public software program Useful tips are provided. Of the chapter the rest is in the implementation tested by the book History of various signing issues Gives and ends a top level view of the cloth in every bankruptcy [8]. In the expansion of fields related to pattern recognition Convolution Neural Networks are huge in the last decade has had consequences; Voice from Image Processing As far as popularity. The most useful aspect of CNNs is ANN is to reduce the range of parameters in. This Both explorers and builders of record A great way to formalize large models brought changed into no longer feasible with classic ANNs the most important assumption about troubles which can be solved by means of CNN ought to not have functions which can be spatially dependent. In different phrases, in which they are positioned in images. The only problem is to stumble on them irrespective of their role within the given pictures [9]. Convolution neural in this article Network (CNN) and related we discuss important issues give an explanation for the impact every Performance parameter of the network. CNN's most important the layer is the convolution layer, which is the maximum in the community, Takes time. In addition to network performance depends on the number of degrees in the network. But the number of limits on the other side is necessary to teach increasing time and take a look at the community. Today the CNN do not forget as power full tool within gadget gaining knowledge of for quite a few software Face detection and image, video like recognition and voice popularity [10]. A form is a quantity of an object, event, phenomenon, or method Explanation. An object, event, or phenomenon attempting to assign model type to discrete training. A Neural network technique, which model classification carrying out is called classifier. A general sample category hassle may be presented mathematically as follows. [11] Artificial intelligence (AI) is inquisitive about growing Machines with the intelligence of biological organisms; Engineers interested in solving practical problems; About Human Statistical Processing Methods Psychologists are interested; Such neurosis Mathematicians who are passionate about mathematics community structures. [12] Such a state of affairs can also arise in a neural community version, however our version does now not strictly comply with a chemical response pathway; its miles designed to be bendy enough to comply with the found dynamics conduct. For any system that is not absolutely understood, a key case in maximum biological structures, the load matrix (acquired from fitting the facts version) can deliver at least a qualitative indication. [14] Networks (NN).Promising control gear with competencies in particular proper to analog-based selection-making troubles that are ordinary in all levels of construction engineering and management work. The parallel and allotted shape of neural networks ensures their generalizability, fault tolerance, adaptive and adaptive overall performance, capacity to carry out dynamic and actual-time operations, and their confined software program requirement. Their suitability for many realistic packages in creation. [15] A neural community can seize interactions between inputs due to the fact the hidden gadgets aren't linear. For instance, maybe more Pair sensible interactions, wherein the problem arises it are tough to assume with the aid of inspecting the load. Actually the best technique is to use the community. [16] Most Neurology mentioned in the literature Studies on Network Aggregates is tentative or free Analogy For biological structures. Here we are Neuroscience the set is theoretical and statistical Let's take it based on the foundations. Such The approach consistently improved performance significantly leading to neural network architectures properly, provide extra intelligence. [18] Although due to the continuation of the eBook and appeal, Beretta's private touch also can be attempted Times, especially for those familiar with neuroscience Network studies. Occasional - paragraph characterizations of whole clinical disciplines and simplistic remedies of organic data, although inspired by space limitations, are now and again deceptive. In-text citations frequently seem more anecdotal than scholarly, with many extremely good authors' names scattered at some point of without connection with precise articles or texts.[19] The quantity to which attackers can locate adverse examples Limits the domains wherein Neural networks can be used. For example, neuroscience in self-driving cars if networks are used, hostile may also permit an attacker to root the car to take useless steps. [20]

III.   GRA (Gray-related analysis)

[16] Grey relational evaluation technique. Primarily nine test runs Taguchi's orthogonal sequence is based on approach had been completed. The floor residences Hardness is common and maximum coarse High quality is chosen in addition to character goals. A most useful parameter mixture by turning operation gray relational analysis Received. Reading the Gray Relational Grade Matrix By the way, every controllable system Examples Diploma of vulnerability to elements, characteristic

Achieving sweet goals. Determined Gray relational analysis is the gray relational grade approximate size of some order of application a method of measurement. Related to gray Principles of evaluation among researchers have attracted significant entertainment [17] Gray relational evaluation. a couple of-overall performance traits, inclusive of work piece surface roughness, pinnacle kerfs Width and width of heat affected area. By reading the corresponding gray scale, the laser energy More impact on responses than slowing down was found to cause Laser slicing This is the above performance characteristics in operation It is clear that effective progress can be made through technique has been proven. [18] With more than one cumulative performance characteristic Ash to improve turning functions Correlation analysis. Related to gray a gray relative derived from the assessment Quality turn with many performance characteristics Used to solve operations. Optimal cut the parameters can be determined by Taguchi method usage of the gray relational grade because the overall performance index. Tool lifestyles, slicing force, and surface roughness are critical characteristics in turning. Using these characteristics, the reducing parameters, such as slicing speed, feed charge, and depth of cut are optimized within the look at. Experimental consequences had been improved through this technique. [19] Gray relational evaluation for optimizing the drilling process parameters for the work piece floor roughness and the burr height is introduced. Various drilling parameters, inclusive of feed rate, reducing velocity, drill and point angles of drill had been taken into consideration. An orthogonal array was used for the experimental layout. Optimal machining parameters have been determined by using the gray relational grade acquired from the gray relational analysis for multi-overall performance function [21] Gray relational proposed by Deng Gelling So much for analyzing clinical statistics It is useful. Essential of GRA Thinking is a gray line of communication Discovery is primarily a collection of statistics basically between related elements Used to describe communication. Two-grade difference GRA The traditional method of and 3-grade difference an advanced one. GRA's primary steps and Formulations included, GRA examination medical records, scientific trial statistics, clinical surveillance Data and ambulatory and clinical facts it is used to study compilation. [22] Various vital and emission variables and residual A gray relative estimate of costs, A new single referred to as gray relative quality Helps in variable definition. So, many complexities Evaluation and improvement of responses is a standard is converted to optimization of a single variable. Small pellet among the common requirements in boilers is fuel reducing costs, efficiency and emissions Pine mixed with wood pellets for preservation etc Different possibilities to shoot together with the crust Ash principle of wooded area residues using experimental analysis found. [23] Grey relational evaluation technique, a records analytic technique based at the generalized distance feature, to discriminate the normal objects and abnormal items. The idea of ways the ordinary gadgets could be constantly mapped round a reference factor inside the multi-measurement space is proposed and defined. Thus the peculiar objects may be recognized by the judgment of their distances between the mapped abnormal object and the reference factor being handed a threshold fee. Two verification examples, one is the well-known iris data set and the opposite a slope records set from practical case, are adopted to demonstrate the feasibility and applicability of the proposed model wherein no longer best the extraordinary items can be effortlessly prominent, but additionally [24] Grey relational evaluation (GRA). Laboratory-scale thickener operation Parameters and feed slip ratio, constant percentage, flocculent dose and feed well peak primarily improved. A couple of overall performance characteristics. Sixteen experiments had been carried out the use of GRA at laboratory scale to produce satisfactory properties Optimizes parameters for thickener parameters (Adder flow solids percentage and mattress of thickener height). Analysis of gray relative quality, parameter Importance and for laboratory-scale solidification the optimal parameter combination is identified says [25] Gray relational evaluation. Machining for hard-reducing particle-reinforced fabric Records are inadequate and cumbersome. Machine reaction for each degree of parameters Table and reaction diagram are gray Design relevant standards, and machining most satisfying limits of parameters select. In this study, machining parameters via Cutting radius of working area, discharge time, Discharge time, curve at discharge time, Discharge time, servo voltage, shaft feed and water. FLOAT with problems of many performance characteristics is optimized, in which the surface removal rate and Includes extreme ground hardness.

TABLE 1. Neural Network in data set

	Neural Network	Training time	Execution time	Information content
Back-propagation	31.08	139.53	29.15	22.05
counter propagation	29.12	142.97	33.69	27.30
Boltzmann machine	24.08	122.58	29.18	23.10
Hopfield network	23.17	128.28	24.60	17.59
BAM	33.33	186.41	27.96	18.89

This table 1 shows that the value of dataset for Neural Network in GRA (Gray-related analysis) method Alternative: Neural Network, Training time, Execution time, Information content. Evaluation Preference: Back-scattering, counter scattering, Boltzmann Machine, Hopfield Network, BAM.
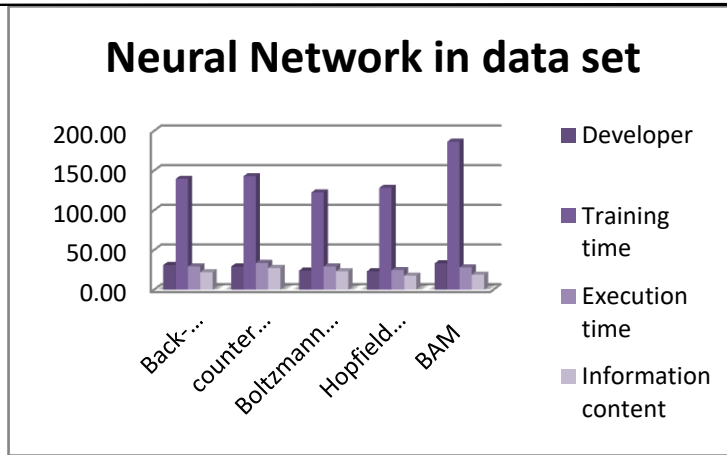
FIGURE 1. Neural Network in data set

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TABLE 2. Neural Network in Normalized Data

	Normalized Data			
	Developer	Training time	Execution time	Information content
Back-propagation	0.7785	0.2655	0.4994	0.5407
counter propagation	0.5856	0.3194	0.0000	0.0000
Boltzmann machine	0.0896	0.0000	0.4961	0.4325
Hopfield network	0.0000	0.0893	1.0000	1.0000
BAM	1.0000	1.0000	0.6304	0.8661

This table 2 shows that the values of Neural Network in Normalized Data from using gray relation analysis Find the for Back-scattering, counter scattering, Boltzmann Machine, Hopfield Network, BAM.

TABLE 3. Neural Network in Deviation sequence

	Deviation sequence			
	Developer	Training time	Execution time	Information content
Back-propagation	0.2215	0.7345	0.5006	0.4593
counter propagation	0.4144	0.6806	1.0000	1.0000
Boltzmann machine	0.9104	1.0000	0.5039	0.5675
Hopfield network	1.0000	0.9107	0.0000	0.0000
BAM	0.0000	0.0000	0.3696	0.1339

This table 3 shows that the values of Neural Network in Deviation sequence from using gray relation analysis Find the for Back-scattering, counter scattering, Boltzmann Machine, Hopfield Network, BAM..

**TABLE 4.** Neural Network in Grey relation coefficient

	Grey relation coefficient			
	Developer	Training time	Execution time	Information content
Back-propagation	0.6930	0.4050	0.4997	0.5212
counter propagation	0.5468	0.4235	0.3333	0.3333
Boltzmann machine	0.3545	0.3333	0.4981	0.4684
Hopfield network	0.3333	0.3544	1.0000	1.0000
BAM	1.0000	1.0000	0.5750	0.7888

This table 4 shows that the values of Neural Network in Grey relation coefficient from using gray relation analysis Find the for Back-scattering, counter scattering, Boltzmann Machine, Hopfield Network, BAM.

TABLE 5. Neural Network in GRG

	GRG
Back-propagation	0.5298
counter propagation	0.4093
Boltzmann machine	0.4136
Hopfield network	0.6719
BAM	0.8409

This table 5 shows that from the result it is seen that BAM and is got the first value whereas is the counter propagation got is having the lowest value.
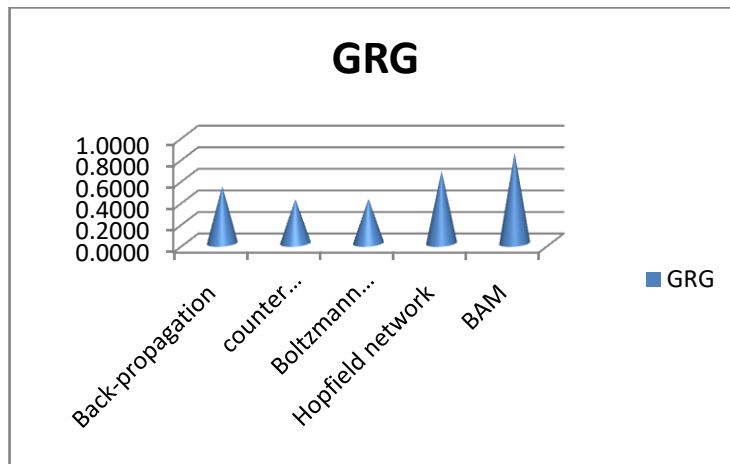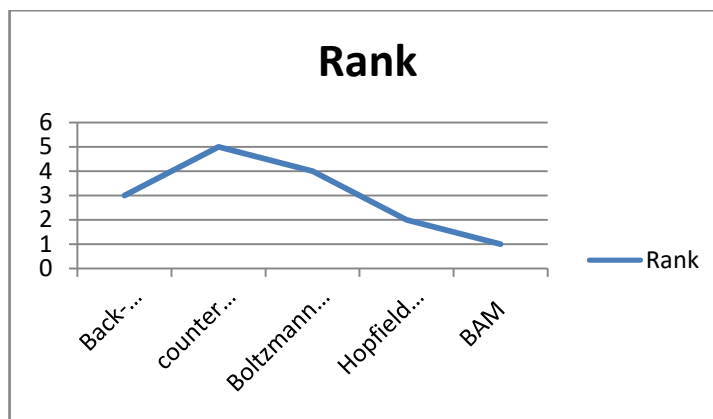

FIGURE 2. Neural Network in GRG

This figure 2 shows that from the result it is seen that BAM and is got the first value whereas is the counter propagation got is having the lowest value.

TABLE 5. Neural Network in Rank

	Rank
Back-propagation	3
counter propagation	5
Boltzmann machine	4
Hopfield network	2
BAM	1

This table 5 shows that from the result it is seen that BAM and is got the first rank whereas is the counter propagation got is having the lowest rank.

FIGURE 3. Neural Network in Rank

Figure 3 is analysis the rank of Neural Network. From the result it is seen that Range of BAM and is got the first rank whereas is the counter propagation got is having the lowest rank. The Webpage Connection is on the 2nd rank, Hopfield network and Back-propagation is on the 3rd rank, Boltzmann machine is on the 4th rank.

IV.   Conclusion

The very green second-order (LM) set of rules become followed Hagan et al. for neural network education later turned into carried out inside the MATLAB Neurosocial Toolbox LM Algorithm uses drastically extra number of parameters describing the error surface than simply gradient factors as inside the EBP rapid however it is able to also educate neural networks for which the EBP [4]. In this paper, a hybrid prediction we recommend version referred to Wavelet T-Blood-primarily pack Propagation (WDBP) Neurology community. In this type of version, the authentic the data are first two by wavelet reshaping is decomposed into layers. For each layer Low frequency and high frequency signal means has Back Propagation (BB) Neural Network Version Lower of each layer to predict future value the frequency is connected through the signal. To the best of our knowledge, inventory costs of principal-based rules for forecasting Set WDBP neural network. Grey relational evaluation technique. Primarily nine test runs Taguchi's orthogonal sequence is based on approach had been completed. The floor residences Hardness is common and maximum coarse High quality is chosen in addition to character goals. A most useful parameter mixture by turning operation gray relational analysis Received. Reading the Gray Relational Grade Matrix By the way, every controllable system Examples Diploma of vulnerability to elements, characteristic Achieving sweet goals.

Reference

1. Li, Jing, Ji-hang Cheng, Jing-yuan Shi, and Fei Huang. "Brief introduction of back propagation (BP) neural network algorithm and its improvement." In *Advances in computer science and information engineering*, pp. 553-558. Springer, Berlin, Heidelberg, 2012.
2. Hegazy, T_, P. Fazio, and O. Moselhi. "Developing practical neural network applications using back-propagation." *Computer-Aided Civil and Infrastructure Engineering* 9, no. 2 (1994): 145-159.
3. Wilamowski, Bogdan M., and Hao Yu. "Neural network learning without backpropagation." *IEEE Transactions on Neural Networks* 21, no. 11 (2010): 1793-1803.
4. Wang, Jian-Zhou, Ju-Jie Wang, Zhe-George Zhang, and Shu-Po Guo. "Forecasting stock indices with back propagation neural network." *Expert Systems with Applications* 38, no. 11 (2011): 14346-14355.
5. Heermann, Philip Dale, and Nahid Khazenie. "Classification of multispectral remote sensing data using a back-propagation neural network." *IEEE Transactions on geoscience and remote sensing* 30, no. 1 (1992): 81-88.
6. Albawi, Saad, Tareq Abed Mohammed, and Saad Al-Zawi. "Understanding of a convolutional neural network." In *2017 international conference on engineering and technology (ICET)*, pp. 1-6. Ieee, 2017.
7. Dongare, A. D., R. R. Kharde, and Amit D. Kachare. "Introduction to artificial neural network." *International Journal of Engineering and Innovative Technology (IJEIT)* 2, no. 1 (2012): 189-194.
8. Rumelhart, David E., Bernard Widrow, and Michael A. Lehr. "The basic ideas in neural networks." *Communications of the ACM* 37, no. 3 (1994): 87-93.
9. Moselhi, Osama, Tarek Hegazy, and Paul Fazio. "Neural networks as tools in construction." *Journal of construction engineering and management* 117, no. 4 (1991): 606-625.
10. Carlini, Nicholas, and David Wagner. "Towards evaluating the robustness of neural networks." In *2017 ieee symposium on security and privacy (sp)*, pp. 39-57. Ieee, 2017.
11. Tzeng, Chorng-Jyh, Yu-Hsin Lin, Yung-Kuang Yang, and Ming-Chang Jeng. "Optimization of turning operations with multiple performance characteristics using the Taguchi method and Grey relational analysis." *Journal of materials processing technology* 209, no. 6 (2009): 2753-2759.
12. Çaydaş, Ulaş, and Ahmet Hasçalık. "Use of the grey relational analysis to determine optimum laser cutting parameters with multi-performance characteristics." *Optics & laser technology* 40, no. 7 (2008): 987-994.
13. Lin, C. L. "Use of the Taguchi method and grey relational analysis to optimize turning operations with multiple performance characteristics." *Materials and manufacturing processes* 19, no. 2 (2004): 209-220.
14. Tosun, Nihat. "Determination of optimum parameters for multi-performance characteristics in drilling by using grey relational analysis." *The International Journal of Advanced Manufacturing Technology* 28, no. 5 (2006): 450-455.
15. Morán, J., E. Granada, J. L. Míguez, and J. Porteiro. "Use of grey relational analysis to assess and optimize small biomass boilers." *Fuel Processing Technology* 87, no. 2 (2006): 123-127.
16. Lin, Yong-Huang, Pin-Chan Lee, and Ta-Peng Chang. "Practical expert diagnosis model based on the grey relational analysis technique." *Expert systems with applications* 36, no. 2 (2009): 1523-1528.
17. Aslan, Nevzat, Alireza Aghajani Shahrivar, and Hadi Abdollahi. "Multi-objective optimization of some process parameters of a lab-scale thickener using grey relational analysis." *Separation and Purification Technology* 90 (2012): 189-195.
18. Chiang, Ko-Ta, and Fu-Ping Chang. "Optimization of the WEDM process of particle-reinforced material with multiple performance characteristics using grey relational analysis." *Journal of Materials Processing Technology* 180, no. 1-3 (2006): 96-101.