

6

Referências Bibliográficas

- 1 LJUNG L.: **System identification** – Theory for the User. Prentice-Hall, 1999.
- 2 LUIS ANTONIO AGUIRRE: **Introdução À Identificação de Sistemas-Técnicas Lineares e Não-Lineares Aplicadas a Sistemas Reais**, 2a Edição, Laboratório de Modelagem, Análise e Controle de Sistemas Não Lineares Departamento de Engenharia Eletrônica, Universidade Federal de Minas Gerais.
- 3 VÍTOR H. NASCIMENTO, **Decomposição em Valores Singulares (SVD)**, PEE-5794 - Maio de 2000, http://www.lps.usp.br/~vitor/cursos/matrizes/aula_svd.pdf.
- 4 LEONTARITIS, I. J. E BILLINGS, S. A. (1985a). **Input-output parametric models for non-linear systems part I: deterministic non-linear systems**. International Journal of Control, 41(2):303-328
- 5 CHEN, S. E BILLINGS, S. A. (1989). **Representation of non-linear systems: the NARMAX model**. International Journal of Control, 49(3):1013-1032.
- 6 CASDAGLI (1989), **An analytic approach to practical state space reconstruction**, Physica D57, p. 1.
- 7 HABER, R. E UNBEHAUEN, H. (1990). **Structure identification of nonlinear dynamic systems - A survey on input/output approaches**. Automatica, 26(4):651-677.
- 8 AGUIRRE, L. A. (1994b). **Some remarks on structure selection for nonlinear models**. International Journal of Bifurcation and Chaos, 4(6):1707-1714.
- 9 AGUIRRE, L. A. E BILLINGS, S. A. (1995a). **Dynamical effects of overparametrization in nonlinear models**. Physica D, 80:26-40.
- 10 www.anc.ed.ac.uk/~mjo/rbf.html.

- 11 www.dainf.cefetpr.br/~myriam/papers/DemoEAnfis.pdf.
- 12 Toolbox Fuzzy-Matlab.
- 13 BRUNO COSENZA DE CARVALHO E JACQUES SZCZUPAK, **A Fast Algorithm for Signal Subspace Tracking, Based on the Jacobi Method**, ITS 2002, Natal, Brasil.
- 14 R. O. SCHMIDT, **Multiple Emitter Location and Signal Parameter estimation**, IEEE Trans. Antennas Propagation, vol. 34, pp. 276-280, Mar 1986.
- 15 L.PINTO, J. SZCZUPAK, L.H.MACEDO, T. AMBRIZZI, E. MOLINA, D.S.RAMOS, D.SILVA FO., **Previsão de Cenários Hidrológicos: Quebrando o Paradigma da Incerteza**, IX SEPOPE 2004.
- 16 N. SUNDARARAJAN & P. SARATCHANDRAN & LU YING WEI, **Radial Basis Function Neural Networks with Sequential Learning - MRAN and Its Application**, World Scientific Publishing, 1988.
- 17 E. VONK & L. C. JAIN & R. P. JOHNSON, **Automatic Generation of Neural Network Architecture Using Evolutionary Computation**, World Scientific Publishing, 1982.
- 18 G.E. GOLDBERG, **Genetic Algorithms in Search, Optimization and Machine Learning**, Addison Wesley 1989.
- 19 DARRELL WHITLEY, **A Genetic Algorithm Tutorial, Technical Report CS-93-103**, Colorado State University.
- 20 T. K. MOON AND W. C. STIRLING, **Mathematical Methods and Algorithms for Signal Processing**, Prentice Hall, Upper Side River, NJ, 2000.
- 21 S. HAYKIN, **Adaptive Filter Theory**, Prentice hall, Upper Side River, NJ, terceira edição, 1996.
- 22 MOHAMAD H. HASSOUN, **Fundamentals of Artificial Neural Networks**, The MIT Press, 1995.
- 23 YANGDONG PAN, SU W. SUNG, AND JAY H. LEE 1, **Nonlinear Dynamic Trend Modeling Using Feedback Neural Networks And Prediction Error Minimization**, School of Chemical Engineering, Purdue University, West Lafayette, IN 47907.

- 24 RICCARDO PARENTIY ANSALDO, **Neural Modeling of Non-Linear Processes: Relevance of the Takens-Mañé Theorem** Francesco Masulli Instituto Nazionale per la Fisica della Materia & DISI-Dipartimento di Informatica e Scienze dell'Informazione Università di Genova, Italy, 15 June 1998.
- 25 S. DREISEITL. **Modeling of Discrete Dynamical Systems by Neural Networks and Genetic Algorithms**. In Proceedings of the 13th European Meeting on Cybernetics and Systems Research (EMCSR'96), Vienna, Austria, pages 89-94, 1996.
- 26 S. DREISEITL. **Discrete Dynamical Systems Modeling by Evolved Neural Networks**. In Proceedings of the 11th International Conference on Systems Engineering (ICSE'96), Las Vegas, USA, pages 19-24, 1996.
- 27 S. DREISEITL, **Nonlinear System and Structure Identification by Neural Networks and Genetic Algorithms**, PhD Thesis, RISC-Linz, Johannes Kepler University Linz, Austria, 1997.
- 28 W. DUCH, P. IWINSKI (PhD project), **Neural networks and genetic algorithms in time series analysis, compare neural models and genetic optimization with standard statistical methods used in econometrics**, 1995-1998.
- 29 LEIGH JR, **Genetic Algorithms in Engineering Systems**, Computing and Control Engineering Journal, February 1998.
- 30 M. IBNKAHLA AND B. POCHON, **Natural Gradient Learning Neural Networks For Modeling and Identification of Nonlinear Systems With Memory**, Proc. IEEE ICASSP'2002, Orlando, FL, May 2002.
- 31 WELSTEAD, S., **Neural Network and Fuzzy Logic Applications in C/C++**, John Wiley & Sons, Inc., 1994.
- 32 ZYGMUNT HASIEWICZ, **Modular Neural Networks for Non-Linearity Recovering by the Haar Approximation**, Institute of Engineering Cybernetics, University of Technology Janiszewskiego 11/17, 50-372 Wrocław, Poland.
- 33 I.O. HABIBALLAH, AND V.H. QUINTANA, **Eigenvector Approach for Partitioning Power System State Estimation Networks**,

- International Journal of Energy Systems, Vol. 13, No. 2, 1993, pp. 56-60.
- 34 I.O. HABIBALLAH, AND V.H. QUINTANA, **Integer-Linear-Programming Eigenvector Based Approach for Multipartitioning Power System State Estimation Networks**, IEE Proceedings, Part C, Vol. 141, No. 1, January, 1994, pp. 11-18.
- 35 MAUREEN MCGLYNN AND DEBOPAM CHAKRABORTY, **Interpreting Complex Nonlinear Models**, SUGI, vol.19,1994, pages1185-1189.
- 36 EKLUND, KLAWONN/NAUCK, **Distributing Errors in Neural Fuzzy Control**. Paper of IIZUKA 92, Japan, 1992.
- 37 NAUCK, KLAWONN/KRUSE, **Fuzzy Sets, Fuzzy Controllers and Neural Networks**. Presented at a workshop in Potsdam/Germany, 1992.
- 38 NAUCK, KLAWONN/KRUSE, **Combining Neural Networks and Fuzzy Controllers**. Paper of EUFIT'94 1994 in Aachen, Germany
- 39 NAUCK, KRUSE, **Choosing Appropriate Neuro-Fuzzy Models**. Paper of EUFIT'94 1994 in Aachen, Germany.
- 40 NAUCK, KRUSE/STELLMACH, **New Learning Algorithms for the Neuro-Fuzzy Environment NEFCON-I**. Paper for the Third German GI-Workshop "Fuzzy-Neuro-Systeme'95", Darmstadt, Germany, November 15 - 17, 1995.
- 41 A. V. KNYAZEVA AND J. E. PASCIAK, **A subspace preconditioning algorithm for eigenvalue/eigenvector computation**. Advances in Comp. Math. 6 (1996) pp.159-189.
- 42 LIU, SPRINGER, **Nonlinear Identification and Control: A Neural Network Approach by G.P.**, New York, 2001, 210 pp., Euro 79.95, ISBN 1-85233-342-1. Reviewed by Victor M. Becerra, University of Reading, U.K.
- 43 BILLINGS, S. A. (1980). **Identification of nonlinear systems – A survey**. IEE Proceedings, Part D, 127(6):272-285.
- 44 A. HOMAIFAR, E. MCCORMICK, **Simultaneous design of membership functions and rule sets for fuzzy controllers using genetic algorithms**, USA, vol. 3, no. 2, pp. 129-39, May 1995.

- 45 J. A. JOHNSON, H. B. SMARTT, **Advantages of an alternative form of fuzzy logic**, vol. 3, no. 2, pp. 149-57, May 1995.
- 46 LIN YINGHUA, G. A. CUNNINGHAM III, **A new approach to fuzzy-neural system modeling**, vol. 3, no. 2, pp. 190-8, May 1995.
- 47 DUNYAK, J.; GUVEN, M.; WUNSCH, D., **Training fuzzy number neural networks using constrained backpropagation**, Fuzzy Systems Proceedings, 1998. IEEE World Congress on Computational, Intelligence, The 1998 IEEE International Conference on, Volume 2, Page(s): 1142 -1146 , 1998.
- 48 LEI XU, **RBF nets, mixture experts, and Bayesian Ying-Yang learning**, Department of Computer Science and Engineering, The Chinese University of Hong Kong, Shatin, NT, Hong Kong, People's Republic of China.
- 49 ROBERT A. JACOBS, MICHAEL I. JORDAN, STEVEN J. NOWLAN, GEOFFREY E. HILTON, **Adaptive Mixtures of local Experts**, Department of Brains and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139 USA.
- 50 BARTO, A.G. 1985. **Learning by statistical cooperation of self-interested neuron-like computing elements**. Human Neurobiol. 4,2229-256.
- 51 HAMPSHIRE, J., AND WAIBEL, A. 1989. **The meta-pi network: Building distributed knowledge representations for robust pattern recognition**. Tech. Rep. CMU-CS-89-166, Carnegie Mellon University, Pittsburgh, PA.
- 52 JACOBS, R. A. AND JORDAN, M. 1991. **Learning piecewise control strategies in a modular connectionist architecture**, . IEE Proceedings, Part B, 117(2):272-285.
- 53 JACOBS, R. A. AND JORDAN, M., AND BARTO, A. G. 1991. **Task decomposition through competition in a modular connectionist architecture: The what and where vision tasks**. Cog. Sci., in press, IEE Proceedings, Part B, 117(6):172-185.
- 54 MCLACHLAN, G. J., AND BASFORD, K. E. 1988. **Mixture Models: Inference and applications to Clustering**. Marcel Dekker, New York.

- 55 MOODY, J., AND DARKEN, C. 1989. **Fast learning in networks of locally tuned processing units**. Neural comp. 1(2), 281-294.
- 56 NOWLAN, S. J. 1990a. **Maximum likelihood competitive learning**. In Advances in Neural Information Processing System 2. D. S. Touretzky, ed., pp. 574-582. Morgan Kaufmann, San Mateo, C.A.
- 57 NOWLAN, S. J. 1990b. **Competing experts: An experimental investigation of associative mixture models**. Tech. Rep. CRG-TR-90-5, University of Toronto, Toronto, Canada.
- 58 PETERSON, G. E., AND BARNEY, H.L. 1952. **Control methods used in a study of the vowels**. Acoust. Soc. Am. 24, 175-184.
- 59 STEINBRUCH, WINTERLE. **Álgebra Linear**. MAKRON Books, 1987.

7

Apêndice: Cooperação das técnicas nas modelagens das partições para o caso do exemplo 1

A Tabela seguinte mostra que os autovetores resultantes da combinação linear dos autovetores das técnicas estão formados por uma fração (determinada pelos pesos) dos autovetores das técnicas, indicando a validade em empregar o Algoritmo de Cooperação.

Partição	Número de autovetores	Somatória de pesos autovetores RBF(%)	Somatória de pesos autovetores Neuro-fuzzy(%)
1	25	92.6858	7.3142
2	10	73.5272	26.4728
3	15	59.5602	40.4398
4	23	64.4315	35.5685
5	19	59.2863	40.7137
6	51	71.0839	28.9161
7	15	89.7931	10.2069
8	22	87.6772	12.3228
9	36	84.2193	15.7807
10	23	75.1474	24.8526
11	13	66.2247	33.7753
12	40	79.3067	20.6933
13	12	80	20
14	25	64.0744	35.9256
15	27	72.9896	27.0104
16	36	61.3242	38.6758
17	30	61.8568	38.1432
18	34	70.5803	29.4197
19	26	49,78964	50,21036
20	10	78,33722	21,66278
21	22	34,71628	65,28372
22	8	28,72873	71,27127
23	12	37,4123	62,5877
24	21	23,9785	76,0215
25	14	37,56408	62,43592
26	46	35,94932	64,05068
27	10	58,80921	41,19079
28	18	72,70553	27,29447

29	23	53,65972	46,34028
30	17	61,20415	38,79585
31	9	64,17448	35,82552
32	37	86,35029	13,64971
33	8	12,88873	87,11127
34	22	86,03024	13,96976
35	21	90,69303	9,306974
36	30	61,92017	38,07983
37	23	71,86035	28,13965
38	29	53,15961	46,84039
39	24	61,40308	38,59692
40	8	69,92612	30,07388
41	18	74,05456	25,94544
42	8	0,11252	99,88748
43	10	62,56828	37,43172
44	17	57,50185	42,49815
45	11	62,52844	37,47156
46	38	93,38051	6,619488
47	10	65,79441	34,20559
48	14	85,5417	14,4583
49	20	59,62002	40,37998
50	13	64,34979	35,65021
51	9	71,96782	28,03218
52	29	68,8158	31,1842
53	8	70,40427	29,59573
54	17	96,21299	3,787008
55	15	85,09573	14,90427
56	26	72,45442	27,54558
57	18	85,10649	14,89351
58	20	58,41995	41,58005
59	21	61,12207	38,87793
60	8	68,01633	31,98367
61	5	87,88789	12,11211
62	6	81,50712	18,49288
63	4	96,85321	3,146791
64	4	61,57173	38,42827
65	8	81,16141	18,83859
66	10	90,99172	9,008283
67	7	84,75909	15,24091

Tabela Somatória dos módulos dos pesos para cada técnica

Conclui-se da Tabela, que as técnicas (RBF e Neuro-fuzzy) mostraram cooperação através dos pesos de sua combinação linear.