

Lecture Notes in Computer Science

Edited by G. Goos, J. Hartmanis, and J. van Leeuwen

2486

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Tokyo

Maria Marinaro Roberto Tagliaferri (Eds.)

Neural Nets

13th Italian Workshop on Neural Nets, WIRN VIETRI 2002
Vietri sul Mare, Italy, May 30 – June 1, 2002
Revised Papers



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Maria Marinaro
Dipartimento di Fisica, "E.R. Caianiello"
Via S. Allende, Baronissi (Salerno), Italy
and
International Institute for Advanced Scientific Studies
"E.R. Caianiello", IIASS
Via G. Pellegrino, 19, 84019 Vietri Sul Mare (Salerno), Italy
E-mail: iiass.vietri@tin.it
Roberto Tagliaferri
Dipartimento di Matematica ed Informatica
Via S. Allende, Baronissi (Salerno), Italy
E-mail: robttag@unisa.it

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Neural nets : revised papers / 13th Italian Workshop on Neural Nets, WIRN
VIETRI 2002, Vietri sul Mare, Italy, May 30 - June 1, 2002. Maria Marinaro ;
Roberto Tagliaferri (ed.). - Berlin ; Heidelberg ; New York ; Hong Kong ;
London ; Milan ; Paris ; Tokyo : Springer, 2002
(Lecture notes in computer science ; Vol. 2486)
ISBN 3-540-44265-0

CR Subject Classification (1998): F.1.1, I.2.6, B.6.1., C.1, J.3

ISSN 0302-9743

ISBN 3-540-44265-0 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York,
a member of BertelsmannSpringer Science+Business Media GmbH

<http://www.springer.de>

© Springer-Verlag Berlin Heidelberg 2002
Printed in Germany

Typesetting: Camera-ready by author, data conversion by DA-TeX Gerd Blumenstein
Printed on acid-free paper SPIN: 10870619 06/3142 5 4 3 2 1 0

Preface

This volume contains the proceedings of the 13th Italian Workshop on Neural Nets WIRN VIETRI 2002, jointly organized by the International Institute for Advanced Scientific Studies “Eduardo R. Caianiello” (IIASS), the Società Italiana Reti Neuroniche (SIREN), the IEEE NNC Italian RIG, and the Italian SIG of the INNS.

In this book a review talk, dealing with a very up-to-date topic “Ensembles of Learning Machines”, and original contributions, approved by the referee committee as oral or poster presentations, have been collected. The contributions have been assembled, for reading convenience, into sections.

The last section, devoted to “Learning in Neural Networks: Limitations and Future Trends”, was organized by Prof. M. Gori and also contains the invited lecture “Mathematical Modeling of Generalization” given by Dr. Martin Anthony. The first and second sections are dedicated, respectively, to the memory of two scientists who were friends in life, Professors Francesco Lauria and Eduardo R. Caianiello.

The editors thank all the participants for their qualified contributions, while special thanks go to Prof. M. Gori for his help in the organization, and to the referees for their accurate work.

July 2002

*Maria Marinaro
Roberto Tagliaferri*

Organizing – Scientific Committee

B. Apolloni (Univ. Milano), A. Bertoni (Univ. Milano), N. A. Borghese (Univ. Milano), D. D. Caviglia (Univ. Genova), P. Campadelli (Univ. Milano), A. Chella (Univ. Palermo), A. Colla (ELSAG Genova), A. Esposito (I.I.A.S.S.), C. Furlanello (ITC-IRST Trento), G. M. Guazzo (I.I.A.S.S.), M. Gori (Univ. Siena), F. Lauria (Univ. Napoli), M. Marinaro (Univ. Salerno), F. Masulli (Univ. Pisa), C. Morabito (Univ. Reggio Calabria), P. Morasso (Univ. Genova), G. Orlandi (Univ. Roma), T. Parisini (Univ. Trieste), E. Pasero (Politecnico Torino), A. Petrosino (CNR Napoli), V. Piuri (Politecnico Milano), R. Serra (CRA Montecatini Ravenna), F. Sorbello (Univ. Palermo), A. Sperduti (Univ. Pisa), R. Tagliaferri (Univ. Salerno)

Referees

Apolloni B., Bertoni A., Borghese N.A., Burattini E., Burrascano P., Campadeli P., Caviglia D.D., Chella A., Colla A.M., Di Claudio E., Frattale Mascioli F., Furlanello C., Gori M., Lauria F., Marinaro M., Masulli F., Morabito F.C., Palmieri F., Parisi R., Parisini T., Pasero E., Raiconi G., Sessa S., Sperduti A., Tagliaferri R..

Sponsors

International Institute for Advanced Scientific Studies (IIASS) “E.R. Caianiello”
Dip. di Fisica “E.R. Caianiello”, Univ. of Salerno
Dip. di Matematica ed Informatica, Univ. of Salerno
Dip. di Scienze dell’Informazione, Univ. of Milano
Società Italiana Reti Neuroniche (SIREN)
IEEE Neural Network Council INNS/SIG Italy
Istituto Italiano per gli Studi Filosofici, Napoli
Provincia di Salerno

Acknowledgments

Special thanks go to Angelo Ciarabella, Maria Funaro, and Alfredo Volpicelli for their contribution in editing and collecting the papers. Furthermore, thanks go to Tina M. Nappi and Ornella De Pasquale for their secretarial work and to Michele Donnarumma for his technical work.

Table of Contents

Review Papers

Ensembles of Learning Machines	3
<i>Giorgio Valentini and Francesco Masulli</i>	

Eduardo R. Caianiello Lecture

Learning Preference Relations from Data	23
<i>Theodoros Evgniou and Massimiliano Pontil</i>	

Francesco E. Lauria Lecture

Increasing the Biological Inspiration of Neural Networks	35
<i>Francesco E. Lauria</i>	

Architectures and Algorithms

Hybrid Automatic Trading Systems: Technical Analysis & Group Method of Data Handling	47
<i>Marco Corazza, Paolo Vanni, and Umberto Loschi</i>	
Interval TOPSIS for Multicriteria Decision Making	56
<i>Silvio Giove</i>	
A Distributed Algorithm for Max Independent Set Problem Based on Hopfield Networks	64
<i>Giuliano Grossi and Roberto Posenato</i>	
Extended Random Neural Networks	75
<i>G. Martinelli, F. M. Frattale Mascioli, M. Panella, and A. Rizzi</i>	
Generalized Independent Component Analysis as Density Estimation	83
<i>Francesco Palmieri and Alessandra Budillon</i>	
Spline Recurrent Neural Networks for Quad-Tree Video Coding	90
<i>Lorenzo Topi, Raffaele Parisi, and Aurelio Uncini</i>	
MLP Neural Network Implementation on a SIMD Architecture	99
<i>Salvatore Vitabile, Antonio Gentile, G. B. Dammone, and Filippo Sorbello</i>	

Image and Signal Processing

A New Approach to Detection of Muscle Activation by Independent Component Analysis and Wavelet Transform	109
<i>Bruno Azzerboni, Giovanni Finocchio, Maurizio Ipsale, Fabio La Foresta, and Francesco Carlo Morabito</i>	
Learning to Balance Upright Posture: What can be Learnt Using Adaptive NN Models?	117
<i>N. Alberto Borghese</i>	
Detection of Facial Features	124
<i>Paola Campadelli, Elena Casiraghi, and Raffaella Lanzarotti</i>	
A Two Stage Neural Architecture for Segmentation and Superquadrics Recovery from Range Data	132
<i>Antonio Chella and Roberto Pirrone</i>	
Automatic Discrimination of Earthquakes and False Events in Seismological Recording for Volcanic Monitoring	140
<i>E. C. Ezin, Flora Giudicepietro, Simona Petrosino, S. Scarpetta, and A. Vanacore</i>	
A Comparison of Signal Compression Methods by Sparse Solution of Linear Systems	146
<i>Davide Mattera, Francesco Palmieri, and Michele Di Monte</i>	
Fuzzy Time Series for Forecasting Pollutants Concentration in the Air	152
<i>Francesco Carlo Morabito and Mario Versaci</i>	
Real-Time Perceptual Coding of Wideband Speech by Competitive Neural Networks	160
<i>Eros Pasero and Alfonso Montuori</i>	
Sound Synthesis by Flexible Activation Function Recurrent Neural Networks	168
<i>Aurelio Uncini</i>	

**Special Session on “Learning in Neural Networks:
Limitations and Future Trends” Chaired by Marco Gori**

Mathematical Modelling of Generalization	181
<i>Martin Anthony</i>	
Structural Complexity and Neural Networks	190
<i>Alberto Bertoni and Beatrice Palano</i>	
Bayesian Learning Techniques: Application to Neural Networks with Constraints on Weight Space	216
<i>A. Eleuteri, R. Tagliaferri, L. Milano, F. Acernese, and M. De Laurentiis</i>	

A Short Review of Statistical Learning Theory	233
<i>Massimiliano Pontil</i>	
Increasing the Biological Inspiration of Neural Networks	243
<i>Domenico Parisi</i>	
Author Index	253