

# STEFANO FERRARI

## Curriculum Vitæ

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# 1 Personal informations

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## 1.1 Current position

Associate Professor in Computer Science at the Department of Computer Science, Università degli Studi di Milano, Milano, Italy.

## 1.2 Education and Positions

- Jan. 2016 – present: Associate Professor in Computer Science, Department of Computer Science, Università degli Studi di Milano, Crema, Italy.
- Dec. 2002 – Jan. 2016: Assistant professor, Department of Information Technology (since 2012 flowed into the Department of Computer Science), Università degli Studi di Milano, Crema, Italy.
- Nov. 2001 – Dec. 2002: Research associate, Department of Information Technology, Università degli Studi di Milano, Crema, Italy.
- Oct. 1998– Dec. 2000: Ph.D. in Computer and Automation Engineering, Politecnico di Milano, Milano, Italy.
- Oct. 1995: Laurea degree in Computer Science (109/110), Università degli Studi di Milano, Milano, Italy.

# 2 Research activity and publications

## 2.1 Research activity

The research activity covered several theoretical and applicative aspects of computational intelligence paradigms and signal processing. In particular, the developed new models and learning algorithms well compare with the models in literature (in terms of both learning speed and robustness) and their efficient implementation have been studied. Several problems on the signal analysis and prediction in the industrial and environmental fields have been studied, and the computational intelligence paradigms have been the main tools used for their solution. In particular, the surface reconstruction problem has been used to challenge the properties of the developed paradigms and to validate their performance with respect to the paradigms in literature.

## 2.2 Editorial activities

- *Co-Guest Editor, IEEE Transactions on Instrumentation and Measurement*, Special Section on Virtual Environments, Human-Computer Interface and Measurement Systems, 2007
- *Co-Guest Editor, IEEE Transactions on Instrumentation and Measurement*, Special Section on Virtual Environments, Human-Computer Interface and Measurement Systems, 2006

## 2.3 Awards

- *Senior Member IEEE* (2014)
- *Best paper runner-up award* of the 2010 IEEE International Joint Conference on Neural Networks (IJCNN 2010), for the paper “Multi-scale support vector regression,” by S. Ferrari, F. Bellocchio, V. Piuri, and N.A. Borghese (July 2010)

## 2.4 Scientific membership

- IEEE, Senior Member (2014–)
- IEEE Computational Intelligence Society, Member (2009–)

## 2.5 Publications

### Books

- [B1] F. Bellocchio, N. A. Borghese, S. Ferrari, V. Piuri, *3D Surface Reconstruction: Multi-Scale Hierarchical Approaches*. Springer-Verlag New York, LLC, 2013.

### Journals papers

- [J1] M. Abukmeil, S. Ferrari, A. Genovese, V. Piuri, F. Scotti, “A survey of unsupervised generative models for exploratory data analysis and representation learning,” *ACM Computing Surveys*, vol. 54, pp. 1–40, 2021.
- [J2] S. Ferrari, M. Lazzaroni, V. Piuri, A. Salman, L. Cristaldi, M. Faifer, S. Toscani, “Solar panel modelling through computational intelligence techniques,” *Measurement*, vol. 93, pp. 572–580, 2016.
- [J3] M. Lazzaroni, S. Ferrari, V. Piuri, A. Salman, L. Cristaldi, M. Faifer, “Models for solar radiation prediction based on different measurement sites,” *Measurement*, vol. 63, pp. 346–363, 2015.
- [J4] F. Bellocchio, S. Ferrari, V. Piuri, N. A. Borghese, “Hierarchical approach for multiscale Support Vector Regression,” *IEEE Trans. on Neural Networks and Learning Systems*, vol. 23, pp. 1448–1460, Sep. 2012.
- [J5] S. Ferrari, F. Bellocchio, V. Piuri, N. A. Borghese, “A hierarchical RBF online learning algorithm for real-time 3-D scanner,” *IEEE Trans. on Neural Networks*, vol. 21, pp. 275–285, Feb. 2010.
- [J6] M. Lazzaroni, S. Ferrari, L. Cristaldi, M. Annoni, “Nozzle and working-condition classifications for water jet systems,” *IEEE Trans. on Instr. and Meas.*, vol. 58, pp. 1546–1554, May 2009.
- [J7] M. Annoni, L. Cristaldi, M. Lazzaroni, S. Ferrari, “Nozzles classification in a high-pressure water jet system,” *IEEE Trans. on Instr. and Meas.*, vol. 58, pp. 3739–3745, Oct. 2009.

- [J8] S. Ferrari, G. Ferrigno, V. Piuri, N. A. Borghese, “Reducing and filtering point clouds with enhanced vector quantization,” *IEEE Trans. on Neural Networks*, vol. 18, pp. 161–177, Jan. 2007.
- [J9] S. Ferrari, I. Frosio, V. Piuri, N. A. Borghese, “Automatic multiscale meshing through HRBF networks,” *IEEE Trans. on Instr. and Meas.*, vol. 54, pp. 1463–1470, Aug. 2005.
- [J10] S. Ferrari, M. Maggioni, N. A. Borghese, “Multi-scale approximation with hierarchical radial basis functions networks,” *IEEE Trans. on Neural Networks*, vol. 15, pp. 178–188, Jan. 2004.
- [J11] D. Perani, F. Fazio, N. A. Borghese, M. Tettamanti, S. Ferrari, J. Decety, M. C. Gilardi, “Different brain correlates for watching real and virtual hand actions,” *NeuroImage*, vol. 14, pp. 749–758, Sep. 2001.
- [J12] S. Ferrari, N. A. Borghese, V. Piuri, “Multiscale models for data processing: an experimental sensitivity analysis,” *IEEE Trans. on Instr. and Meas.*, vol. 50, pp. 995–1002, Aug. 2001.
- [J13] N. A. Borghese, S. Ferrari, “A portable modular system for automatic acquisition of 3-D objects,” *IEEE Trans. on Instr. and Meas.*, vol. 49, pp. 1128–1136, Oct. 2000.
- [J14] C. Alippi, S. Ferrari, V. Piuri, M. Sami, F. Scotti, “New trends in intelligent systems design for embedded and measurement applications,” *IEEE Instr. & Meas. Mag.*, vol. 2, pp. 36–44, Jun. 1999.
- [J15] N. A. Borghese, G. Ferrigno, G. Baroni, A. Pedotti, S. Ferrari, R. Savaré, “Autoscan: a flexible and portable 3D scanner,” *IEEE Computer Graphics and Applications*, vol. 18, pp. 38–41, May 1998.
- [J16] N. A. Borghese, S. Ferrari, “Hierarchical RBF networks and local parameter estimate,” *Neurocomputing*, vol. 19, no. 1–3, pp. 259–283, 1998.

## Conference papers

- [C1] M. Abukmeil, S. Ferrari, A. Genovese, V. Piuri, F. Scotti, “Grad<sub>2</sub>VAE: An explainable variational autoencoder model based on online attentions preserving curvatures of representations,” in *Image Analysis and Processing – ICIAP 2022* (S. Sclaroff, C. Distanto, M. Leo, G. M. Farinella, F. Tombari, eds.), (Cham), pp. 670–681, Springer International Publishing, 2022.
- [C2] M. Abukmeil, S. Ferrari, A. Genovese, V. Piuri, F. Scotti, “On approximating the non-negative rank: Applications to unsupervised image reduction,” in *2020 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA)*, pp. 1–6, 2020.
- [C3] M. Abukmeil, S. Ferrari, A. Genovese, V. Piuri, F. Scotti, “Unsupervised learning from limited available data by  $\beta$ -NMF and dual autoencoder,” in *2020 IEEE International Conference on Image Processing (ICIP)*, pp. 81–85, 2020.
- [C4] S. Ferrari, C. Leani, V. Piuri, “Multi-point solar prediction through feed-forward neural networks,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2014 IEEE Workshop on*, pp. 1–5, Sept 2014.
- [C5] S. Ferrari, M. Lazzaroni, V. Piuri, A. Salman, L. Cristaldi, M. Faifer, S. Toscani, “A computational intelligence approach to solar panel modelling,” in *Instrumentation and Measurement Technology Conference (I2MTC) Proceedings, 2014 IEEE International*, pp. 1261–1266, May 2014.
- [C6] S. Ferrari, G. Pentchev, “An android-based platform for augmented-reality remote inspection systems prototyping,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2013 IEEE Workshop on*, pp. 1–6, Sep. 2013.
- [C7] S. Ferrari, M. Lazzaroni, V. Piuri, A. Salman, L. Cristaldi, M. Faifer, “A data approximation based approach to photovoltaic systems maintenance,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2013 IEEE Workshop on*, pp. 1–6, Sep. 2013.
- [C8] S. Ferrari, M. Lazzaroni, V. Piuri, L. Cristaldi, M. Faifer, “Statistical models approach for solar radiation prediction,” in *Instrumentation and Measurement Technology Conference (I2MTC), 2013 IEEE International*, pp. 1734–1739, May 2013.

- [C9] S. Ferrari, M. Lazzaroni, V. Piuri, A. Salman, L. Cristaldi, M. Faifer, “Computational intelligence models for solar radiation prediction,” in *Instrumentation and Measurement Technology Conference (I2MTC), 2013 IEEE International*, pp. 757–762, May 2013.
- [C10] F. Bellocchio, N. A. Borghese, S. Ferrari, V. Piuri, “Computational intelligence for surface modeling,” in *ICNNAI’2012, Proceedings of the 7th International Conference on Neural Networks and Artificial Intelligence*, pp. 11–16, Oct. 2012.
- [C11] S. Ferrari, A. Fina, M. Lazzaroni, V. Piuri, L. Cristaldi, M. Faifer, T. Poli, “Illuminance prediction through statistical models,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2012 IEEE Workshop on*, pp. 90–96, Sep. 2012.
- [C12] S. Ferrari, M. Lazzaroni, V. Piuri, A. Salman, L. Cristaldi, M. Rossi, T. Poli, “Illuminance prediction through Extreme Learning Machines,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2012 IEEE Workshop on*, pp. 97–103, Sep. 2012.
- [C13] F. Bellocchio, S. Ferrari, M. Lazzaroni, L. Cristaldi, M. Rossi, T. Poli, R. Paolini, “Illuminance prediction through SVM regression,” in *Environmental Energy and Structural Monitoring Systems (EESMS), 2011 IEEE Workshop on*, pp. 1–5, Sep. 2011.
- [C14] S. Ferrari, F. Bellocchio, V. Piuri, N. Borghese, “Multi-scale support vector regression,” in *Proceedings of IJCNN 2010 (IEEE International Joint Conference on Neural Networks)*, pp. 1–7, Jul. 2010. Runner-up Best Paper.
- [C15] F. Bellocchio, N. Borghese, S. Ferrari, V. Piuri, “Kernel regression in HRBF networks for surface reconstruction,” in *Proceedings of HAVE 2008 (IEEE International Workshop on Haptic Audio and Visual Environments and Games)*, pp. 160–165, Oct. 2008.
- [C16] S. Ferrari, V. Piuri, F. Scotti, “Image processing for granulometry analysis via neural networks,” in *Proceedings of CIMSA 2008 (IEEE Conference on Computational Intelligence for Measurement Systems and Applications)*, pp. 28–32, Jul. 2008.
- [C17] S. Ferrari, V. Piuri, F. Scotti, “Virtual environment for granulometry analysis,” in *Proceedings of VECIMS 2008 (IEEE Conference on Virtual Environments, Human-Computer Interfaces and Measurement Systems)*, pp. 156–161, Jul. 2008.
- [C18] M. Lazzaroni, S. Ferrari, M. Annoni, L. Cristaldi, “A tool for working condition and nozzles classification for water jet systems,” in *Proceedings of IMTC 2008 (IEEE Instrumentation and Measurement Technology Conference)*, pp. 1435–1440, May 2008.
- [C19] S. Ferrari, F. Bellocchio, N. Borghese, V. Piuri, “Refining hierarchical radial basis function networks,” in *Proceedings of HAVE 2007 (IEEE International Workshop on Haptic Audio and Visual Environments and Games)*, pp. 166–170, Oct. 2007.
- [C20] F. Bellocchio, S. Ferrari, V. Piuri, N. Borghese, “Online training of hierarchical RBF,” in *Proceedings of IJCNN 2007 (IEEE International Joint Conference on Neural Networks)*, pp. 2159–2164, Aug. 2007.
- [C21] M. Annoni, L. Cristaldi, M. Lazzaroni, S. Ferrari, “Nozzles classification in a high pressure water jet systems,” in *Proceedings of IMTC 2007 (IEEE Instrumentation and Measurement Technology Conference)*, pp. 1–6, May 2007.
- [C22] S. Ferrari, I. Frosio, V. Piuri, N. Borghese, “Enhanced vector quantization for data reduction and filtering,” in *Proceedings of 3DPVT 2004 (2nd International Symposium on 3D Data Processing, Visualization and Transmission)*, pp. 470–477, Sep. 2004.
- [C23] S. Ferrari, I. Frosio, V. Piuri, N. Borghese, “The accuracy of the HRBF networks,” in *Proceedings of IMTC 2004 (21th IEEE Instrumentation and Measurement Technology Conference)*, pp. 482–486, May 2004.
- [C24] N. Borghese, S. Ferrari, V. Piuri, “A methodology for surface reconstruction based on hierarchical models,” in *Proceedings of HAVE 2003 (IEEE International Workshop on Haptic Virtual Environments and Their Applications)*, pp. 119–124, Sep. 2003.
- [C25] N. Borghese, S. Ferrari, V. Piuri, “Real-time surface meshing through HRBF networks,” in *Proceedings of IJCNN 2003 (IEEE-INNS-ENNS International Joint Conference of Neural Networks)*, vol. 2, pp. 1361–1366, Jul. 2003.

- [C26] N. Borghese, S. Ferrari, V. Piuri, “Real-time surface reconstruction through HRBF networks,” in *Proceedings of HAVE 2002 (IEEE International Workshop on Haptic Virtual Environments and Their Applications)*, pp. 19–24, Nov. 2002.
- [C27] C. Alippi, S. Ferrari, V. Piuri, “A methodology for example-based specification and design,” in *Proceedings of IJCNN 2000 (IEEE-INNS-ENNS International Joint Conference of Neural Networks)* (S.-I. Amari, C. L. Giles, M. Gori, V. Piuri, eds.), vol. 3, pp. 535–540, Jul. 2000.
- [C28] N. A. Borghese, S. Ferrari, “Mesh construction with fast soft vector quantization,” in *Proceedings of IJCNN 2000 (IEEE-INNS-ENNS International Joint Conference of Neural Networks)* (S.-I. Amari, C. L. Giles, M. Gori, V. Piuri, eds.), vol. 5, pp. 473–478, Jul. 2000.
- [C29] S. Ferrari, N. A. Borghese, V. Piuri, “Multi-resolution models for data processing: an experimental sensitivity analysis,” in *Proceedings of IMTC 2000 (17th IEEE Instrumentation and Measurement Technology Conference)*, vol. 2, pp. 1056–1060, May 2000.
- [C30] N. A. Borghese, S. Ferrari, V. Piuri, “Local wavelet decomposition and its application to face reconstruction,” in *Neural Nets WIRN Vietri-99, Proc. of the 11th Italian Workshop on Neural Nets* (M. Marinaro, R. Tagliaferri, eds.), pp. 184–189, May 1999.
- [C31] S. Ferrari, N. A. Borghese, “A portable modular system for automatic acquisition of 3D objects,” in *Proceedings of IMTC’99 (16th IEEE Instrumentation and Measurement Technology Conference)* (V. Piuri, M. Savino, eds.), vol. 3, pp. 1823–1827, May 1999.
- [C32] N. A. Borghese, S. Ferrari, “Scanning and reconstruction of human body parts,” in *STAR Proc. of Eurographics 1998*, pp. 3.5.1–3.5.2, 1998.
- [C33] C. Rigotti, N. A. Borghese, S. Ferrari, G. Baroni, G. Ferrigno, “Portable and accurate 3D scanner for breast implants design and reconstructive plastic surgery,” in *Proceedings of SPIE’s International Symposium on Medical Imaging 1998*, vol. 3338, pp. 1558–1567, Feb. 1998.
- [C34] N. A. Borghese, G. Ferrigno, S. Ferrari, “Image reconstruction using a hierarchical RBF network architecture,” in *Proceedings of WIRN ’97, Italian Workshop on Neural Nets*, pp. 177–182, 1997.
- [C35] P. Cerveri, S. Ferrari, N. A. Borghese, “Calibration of TV cameras through RBF networks,” in *Applications of Soft Computing, Proceedings of SPIE ’97* (B. Bosacchi, J. Bezdek, D. Fogel, eds.), vol. 3165, pp. 312–318, 1997.
- [C36] M. Fontana, N. A. Borghese, S. Ferrari, “Image reconstruction using improved “Neural-Gas”,” in *Proceedings of WIRN ’95, Italian Workshop on Neural Nets*, pp. 260–265, 1995.

## Book chapters

- [CH1] S. Ferrari, V. Piuri, *Neural networks for Instrumentation, Measurements, and Related Industrial Applications, NIMIA 2001*, ch. Neural Networks in Intelligent Sensors and Measurement Systems for Industrial Applications, pp. 19–42. IOS Press, 2003.

## PhD dissertation

- [T1] S. Ferrari, *Una Metodologia Gerarchica per Analisi e Sintesi di Immagini Tridimensionali*. PhD thesis, Politecnico di Milano, Jan. 2001.

## 3 Teaching

### 3.1 Undergraduate and graduate programmes

Courses at Computer Science programmes of the Università degli Studi di Milano, Italy:

- AA.YY. 2021/22–current — *Computer programming, Algorithms and Data structures (Module 1)* (6 ECTS, in English)
- AA.YY. 2014/15–current — *Methods for image processing* (6 ECTS, in English)
- AA.YY. 2016/17–2020/21 — *Computer programming (Programmazione - Modulo B)* (6 ECTS)
- AA.YY. 2011/12–2013/14 — *Image processing* (6 ECTS, in English)
- AA.YY. 2009/10–2010/11 — *Image processing (Elaborazione di immagini)* (6 ECTS)
- AA.YY. 2003/04–2008/09 — *Computer science fundamentals (Fondamenti di informatica per la sicurezza)* (6 ECTS)

Courses at Industrial and Environmental Biotechnology programme of the Università degli Studi di Milano, Italy:

- AA.YY. 2004/05 and 2006/07 — *Informatics applied to biological processes (Informatica applicata ai processi biologici)* (3 ECTS)

Courses at Milk Production and Transformation programme of the Università degli Studi di Milano, Italy:

- A.Y. 2005/06 — *Statistical data analysis (Analisi statistica dei dati)* (3 ECTS).

Courses at Graduate School in Medical Physics of the Università degli Studi di Milano, Italy:

- AA.YY. 2017/18–current — *Computation techniques and Operating systems and Informatics (Tecniche di calcolo e Sistemi operativi e informatica)* (1 ECTS).

### 3.2 Ph.D. programmes

Courses at the Ph.D. School of Computer Science of the Università degli Studi di Milano, Italy:

- July 2015 — *Fundamentals of digital image processing* (6 hours)
- January 2012 — *Fundamentals of digital image processing* (6 hours)
- May 2010 — *Fundamentals of digital signal processing* (6 hours)

### 3.3 International programmes

Courses at Master Degree in Computer Science of S. Seifullin Kazakh Agro Technical University, Astana, Kazakhstan:

- October 2014 — *Image processing* (24 hours)

### 3.4 Tutorials

- June 2014 — *Computational intelligence methods for 3D surface reconstruction* at 2014 IEEE International Symposium on INnovations in Intelligent SysTems and Applications (INISTA 2014)

### 3.5 Ph.D. co-supervision

- Francesco Bellocchio, “Online Hierarchical Models for Surface Reconstruction”, Ph.D. Degree Program in Information Technology, Università degli Studi di Milano, 2011

## 4 Organization

### 4.1 International scientific associations

- *Membership Development Committee Coordinator*, IEEE Italy Section (2021–present)
- *Information Management Coordinator*, IEEE Italy Section (2016–2021)
- *Treasurer*, IEEE Italy Section (2014–2016)
- *Chair*, IEEE Systems Council Italy Chapter (2012–2015)
- *Vice-Chair*, IEEE Systems Council Italy Chapter (2010–2011)
- *Secretary*, IEEE Systems Council Italy Chapter (2009)

### 4.2 International conferences

*General co-Chair:*

- 2016 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications, Budapest, Hungary, 27–29 June 2016
- 2016 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems, Bari, Italy, 13–14 June 2016
- 2015 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems, Trento, Italy, 9–10 July 2015
- 2014 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems, Napoli, Italy, 17–18 September 2014
- 2013 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems, Trento, Italy, 11–12 September 2013
- 2012 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems, Perugia, Italy, 28 September 2012
- 2012 IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems, Tianjin, China, 2–4 July 2012
- 2011 IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems, Ottawa, ON, Canada, 19–21 September 2011

*Technical Program co-Chair:*

- 2010 IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems, Taranto, Italy, 6–8 September 2010



- 2009 IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems, Hong Kong, China, 11–13 May 2009
- 2007 IEEE International Workshop on Haptic Audio Visual Environments and Games, Ottawa, ON, Canada, 12–14 October 2007