

**Mauro Barni**, was born in PRATO, on 30 June 1965

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### **Education**

- PhD degree, Information and Communication Engineering, University of Florence, Italy, awarded on October 30, 1995. Advisor: Prof. V. Cappellini.
- M.Sc. degree, Electronics Engineering, University of Florence, Italy, 1991.

### **Work Experience**

- 2002 – present: Associate Professor, Dept. of Information Engineering, University of Siena, Italy.
- 1998 – 2002: Assistant Professor (“Ricercatore”), Dept. of Information Engineering, University of Siena, Italy.
- 1996 – 1998: Postdoctoral researcher at Dept. of Electronics, University of Florence, Italy.

In July 2010 he has got the full professorship habilitation in Italy.

### **Teaching**

Since 1998 he has been teaching several graduate and undergraduate courses in: Signal and Systems, Digital communication, Information Theory, Statistics and probability theory; consistently achieving high scores during internal teaching reviews. He has been often appointed member of international PhD evaluation committees.

He has been the advisor of about 60 graduate students, and 9 PhD students. He is currently the advisor of 4 PhD students.

He is the president of the degree course in Electronics and Telecommunication Engineering of the University of Siena.

### **Scientific activity**

Mauro Barni has carried out his research activity for almost 20 years first at the Department of Electronics and Telecommunication of the University of Florence, then at the Department of Information Engineering of the University of Siena. During the last decade, his activity has focused on digital image processing and information security, with particular reference to the application of image processing techniques to copyright protection and authentication of multimedia (digital watermarking). Lately he has been studying the possibility of processing signals that has been previously encrypted without decrypting them (signal processing in the encrypted domain – s.p.e.d.). He is author/co-author of about 230 papers published in international journals and conference proceedings, and holds three patents in the field of digital watermarking. His papers on digital watermarking have significantly contributed to the development of such a theory in the last decade. Lately he contributed to the advancement of a new research field denoted as signal processing in the encrypted domain. The scientific impact of his research is witnessed by his h-number equal to 31 according to Scholar Google search engine. He is co-author of the book “Watermarking Systems Engineering: Enabling Digital Assets Security and other Applications”, published by Dekker Inc. in February 2004. He is editor of the book “Document and Image Compression” published by CRC-Press in 2006. He is currently leading the VIPP (Visual Information Processing and Protection) group of the Telecommunication Laboratory of the Information Engineering Department at the University of Siena (<http://clem.dii.unisi.it/~vippp/>). The group currently consists of 7-10 members including faculty members, graduate and undergraduate students.

Mauro Barni is the chairman of the IEEE Information Forensic and Security Technical

Committee (IFS-TC) of the IEEE Signal Processing Society. He has been a member of the IEEE Multimedia Signal Processing technical committee and of the conference board of the IEEE Signal Processing Society. Mauro Barni is a senior member of the IEEE and EURASIP.

### **Awards**

He was the recipient of the IEEE Signal Processing Society 2009 Best Paper Award (columns and forum section) for the forum: “What is the future for watermarking ? Part I and II”, IEEE Signal Processing Magazine, vol. 20, no.5-6, September-November 2003.

He was the co-author with a graduate student of his of the paper “A structural method for quality evaluation of desynchronization attacks in image watermarking”, that received the best student paper award at the 2008 International Workshop on Multimedia Signal Processing.

### **Conference organization**

He has been the chairman of the IEEE Multimedia Signal Processing Workshop held in Siena in 2004.

He was the chairman of the IV edition of the International Workshop on Digital Watermarking (IWDW 2005, Siena, September 15-17, 2005).

He was the technical program co-chair of the workshops: 7th International Workshop on Information Hiding (IH05), Barcelona, June 2005; International Workshop on Digital Watermarking (IWDW09), Surrey, UK, August 2009; International Workshop on Digital Watermarking (IWDW10), Seoul, Korea, September 2010.

He was in the Technical Program Committee of the following conferences and workshops: ICASSP, ICIP, MMSP, WIFS, ICME, EUSIPCO, IWDW, ACM Multimedia and Security workshop, SPIE Security, Steganography and Watermarking of Multimedia Contents, SPIE Media and Forensics Security.

### **Editorial activity**

He was the founding editor in chief of the EURASIP Journal on Information Security.

He serves as associate editor of the IEEE Trans. on Circuits and System for Video Technology and the IEEE Transactions on Information Forensics and Security.

In the past he served as associate editor of the IEEE Signal Processing Magazine (column and forum section), the IEEE Signal Processing Letters, the IEEE Transactions on Multimedia, the Eurasip Journal of Applied Signal Processing and the IET Proceedings on Information Security.

He was the guest editor of: a special issue on Information Theoretic Issues in Digital Watermarking, Signal Processing, June 2001; a special issue on Emerging Applications of Multimedia Data Hiding, EURASIP Journal of Applied Signal Processing, February 2002; a special issue on Steganography and Digital Watermarking, IET Proceedings of Information Security, September 2006.

### **Coordination of Research Projects**

Mauro Barni coordinated several national and European projects on multimedia security and secure signal processing. The amount of funds gained in the last 5 years is larger than 1MEuro. The most important R&D projects he took part in recently include the following:

- Principal investigator of the research unit of Siena of the EC project: “Living Knowledge: Facts, Opinions and Bias in Time” funded by EC (under FET program) from 2008-2011

(budget 300K);

- Principal investigator of the research unit of Siena of the ESA project “SATSAMP – Next-generation satellite imaging via compressive sampling”; funded by ESA for 2010.
- Coordinator of the project: “Priv-ware: privacy aware processing of encrypted signals for treating sensitive information”; funded by the Italian Ministry of Research and Education from 2008 to 2010. (100 KEuro)
- Coordinator of Project “SPEED: Signal Processing in the EncryptEd Dmain”; funded by EC (under FET program) from 2006 to 2009 1/12/2006-30/11/2009 (budget = 1.6 MEuro).
- Coordinator of the Italy-Israel project “Digital watermarking of still images in the presence of de-synchronization attacks: theoretical analysis and development of practical algorithms”; funded by the Italian ministry from 2006 to 2009 (budget 330Keuro)
- Principal Investigator of the research unit of Siena of the Project ESA-ESTEC 20035/06/NL/LvH, “Distributed image coding for remote sensing applications”; funded under ESA Innovation Triangle Initiative scheme in 2006-2007.
- Principal Investigator of the research unit of Siena of the Project: ESA-ESTEC, “PILL – parallel implementation of lossless hyperspectral image compression”; funded under ESA Innovation Triangle Initiative scheme in 2008.
- Principal Investigator of the research unit of CNIT (Italian Inter-University Consortium for Telecommunications) of the European Network of Excellence: ECRYPT: European Network of Excellence in Cryptology; funded within the Information Societies Technology (IST) Programme of the European Commission's Sixth Framework Program from 2004 to 2008.

## Listo of publications

### A. Thesis

- A.1 M.Barni, "*Il Restauro delle Immagini Numeriche con Applicazioni ai Beni Culturali*"; Master tesi in Electronic Engineering, Firenze 1990.
- A.2 M.Barni, "*Un Sistema Intelligente per l'Ispezione Automatica di Prodotti Alimentari*"; PhD Thesis, in Information and Telecommunication Engineering, Firenze 1994.

### B. Journal papers

- B.1 F.Argenti, M.Barni, V.Cappellini, A.Mecocci: "A vector median deblurring filter for color image restoration"; *Electronic Letters*, Vol.27. No.21, pp. 1899-1900, October 1991.
- B.2 M.Barni, V.Cappellini, A.Mecocci: "Elaborazione numerica delle immagini a colori."; *Alta Frequenza*; vol.IV, n°2, pp. 67-76, Marzo-Aprile 1992.
- B.3 F.Argenti, M.Barni, G.Benelli, V.Cappellini, A.Mecocci, "Broadband network applications in the fine arts world", *Science and Technology for Cultural Heritage, Journal of the "Comitato Nazionale per la Scienza e la Tecnologia dei Beni Culturali"*, CNR, 1, pp. 97-100, 1992.
- B.4 D.Baldini, M.Barni, G.Benelli, A.Foggi, A.Mecocci, "A new star constellation matching algorithm for satellite attitude determination", *ESA Journal*, vol.17, n.2, pp. 185-198, 1993.
- B.5 M.Barni, V.Cappellini, M.Mattioli, A.Mecocci, S.Zipoli, "Scene inspection in complex

- heterogeneous environments by means of knowledge-maps", *Information Services and Use*, vol.13, n.3, pp. 247-277, 1993.
- B.6 M.Barni, V.Cappellini, A.Mecocci: "Fast vector median filter based on euclidean norm approximation", *IEEE Signal Processing Letters*, vol.1, n.6, June 1994.
- B.7 L.Alparone, M.Barni: "Dual-channel iterative even-median filter", *Pattern Recognition Letters*, 15, pp. 949-956, September 1994.
- B.8 D.Baldini, M.Barni, G.Benelli, A.Foggi, A.Mecocci, "Star-configuration searching for satellite attitude computation", *IEEE Transactions on Aerospace and Electronic Systems*, vol.31, n.2, pp. 768-777, April 1995.
- B.9 M.Barni, V.Cappellini, A.Mecocci, «Comments on ‘A possibilistic approach to clustering’», *IEEE Trans. on Fuzzy Systems*, vol.4, no.3, pp.393-396, August 1996.
- B.10 M.Barni, V.Cappellini, A.Mecocci, «Colour-based detection of defects on chicken meat», *Image and Vision Computing*, vol. 15, no. 7, pp. 549-556, July 1997.
- B.11 M.Barni, «A fast algorithm for 1-norm vector median filtering», *IEEE Transactions on Image Processing*, vol. 6, no. 10, pp. 1452-1455, October 1997.
- B.12 M.Barni, F.Bartolini, V.Cappellini, A.Piva, «A DCT-domain system for robust image watermarking », *Signal Processing*, vol. 66, no. 3, pp. 357-372, May 1998.
- B.13 M.Barni, F.Bartolini, V.Cappellini, A.Piva, «Copyright protection of digital images by embedded unperceivable marks», *Image and Vision Computing*, vol. 16, no. 12-13, pp. 897-906, August 1998.
- B.14 M.Barni, V.Cappellini, «On the computational complexity of multivariate median filters"; *Signal Processing*, vol. 71, no. 1, pp. 45-54, November 1998.
- B.15 L.Alparone, M.Barni, F.Bartolini, R.Caldelli, «Regularization of optic flow estimates by means of weighted vector median filtering», *IEEE Transactions on Image Processing*, vol. 8, no. 10, pp. 1462-1467, October 1999.
- B.16 M.Barni, R.Gualtieri, «A new possibilistic clustering algorithm for line detection in real world imagery», *Pattern Recognition*, vol. 32, no. 11, pp. 1897-1909, November 1999.
- B.17 M.Barni, F.Bartolini, V.Cappellini, "Image processing for virtual restoration of artworks", *IEEE Multimedia Magazine*, vol. 7, no. 2, pp. 34-37, April-June 2000 (invited paper).
- B.18 M.Barni, F.Bartolini, A.De Rosa, A.Piva, "Capacity of full frame DCT image watermarks", *IEEE Transactions on Image Processing*, vol. 9, no. 8, pp. 1450-1455, August 2000.
- B.19 M.Barni, F.Bartolini, F.Butì, V.Cappellini, «A quasi-Euclidean norm to speed up vector median filtering», *IEEE Transactions on Image Processing*, vol. 9, no. 10, pp. 1704-1709, October 2000.
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- B.21 M. Barni, F. Bartolini, A. De Rosa, A. Piva, "A new decoder for the optimum recovery of nonadditive watermarks", *IEEE Transactions on Image Processing*, vol. 10, no. 5, pp. 755-766, May 2001.
- B.22 M.Barni, F.Bartolini, A.Piva, "Improved wavelet-based watermarking through pixel-wise masking", *IEEE Transactions on Image Processing*, vol. 10, no. 5, pp. 783-791, May 2001.
- B.23 R.Baitello, M.Barni, F.Bartolini, V.Cappellini, "From watermark detection to watermark decoding: a PPM approach", *Signal Processing*, vol. 81, June 2001, pp. 1261-1271.
- B.24 A.Abrardo, M.Barni, A.Garzelli, D.Marotta, "Error resilient transmission of H.263 video for slow-fading mobile communications", *ETT – European Transactions on*

- Telecommunications*, vol.12, no. 3. May/June 2001, pp. 181-188.
- B.25 M. Barni, C. I. Podilchuk, F. Bartolini, E. J. Delp, "Watermark embedding: hiding a signal within a cover image", *IEEE Communications Magazine*, vol.39, no.8, August 2001, pp. 102-108.
- B.26 F. Bartolini, A. Tefas, M. Barni, I. Pitas, "Image authentication techniques for surveillance applications", *Proceedings of the IEEE* vol. 89, no. 10, October 2001, pp. 1403-1418 (invited paper).
- B.27 A. Abrardo, M. Barni, A. Garzelli, "Improved group-of-block synchronization for robust transmission of H.263 video over slow-fading channels", *Journal of Electronic Imaging*, 10 (4), pp. 1016-1024, October 2001.
- B.28 M. Barni, F. Bartolini, L. Boccardi, A. De Rosa, A. Piva, "Color image watermarking in the Karhunen-Loeve transform domain", *Journal of Electronic Imaging*, Volume 11, no. 1, pp. 87-95, January 2002.
- B.29 M. Barni, F. Bartolini, A. Piva, F. Salucco, "Robust watermarking of cartographic images", *EURASIP Journal on Applied Signal Processing*, vol. 2002, no.2 pp. 197-208, February 2002.
- B.30 M. Barni, F. Bartolini, A. Piva, "Multichannel watermarking of color images", *IEEE Trans. on Circuits and Systems for Video Technology*, vol. 12, no. 3, pp. 142-156, March 2002.
- B.31 A. Piva, M. Barni, F. Bartolini, "Managing Copyright in Open Networks", *IEEE Internet Computing*, Vol. 6, no. 3, May/June 2002, pp. 18-26.
- B.32 M. Barni, F. Bartolini, E. Magli, G. Olmo, "Watermarking techniques for electronic delivery of remote sensing images", *Journal of Optical Engineering*, vol. 41, no. 9, pp. 2111-2119, 2002. (invited paper).
- B.33 M. Barni, F. Bartolini, R. Caldelli, A. Piva, "Object watermarking for MPEG4 video protection", *Telecommunications Review*, vol. 12, no. 5, 2002, pp. 695-710.
- B.34 M. Barni, F. Bartolini, A. De Rosa, A. Piva, "Optimum decoding and detection of multiplicative watermarks", *IEEE Trans. on Signal Processing*, vol. 51, no. 4, April 2003, pp. 1118-1123.
- B.35 V. Cappellini, M. Barni, M. Corsini, A. De Rosa, A. Piva, "ArtShop: an art-oriented image-processing tool for cultural heritage applications", *J. Visual. Comput. Animat.* 2003; 14, pp. 1-10.
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- B.38 F. Bartolini, M. Barni, A. Piva, "Performance analysis of ST-DM watermarking in presence of non-additive attacks", *IEEE Trans. on Signal Processing*, vol. 52, no. 10, October 2004, pp. 2965-2974.
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- B.41 M. Barni, "Effectiveness of exhaustive search and template matching against watermark de-synchronization", *IEEE Signal Processing Letters*, vol. 12, no. 2, February 2005, pp. 158-161.
- B.42 M. Barni, A. Pelagotti, A. Piva, "Image processing for the analysis and conservation of paintings: opportunities and challenges", *IEEE Signal Processing Magazine*, vol. 22,

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- B.43 A. Piva, M. Barni, F. Bartolini, A. De Rosa, "Data hiding technologies for digital radiographies", *IEE Proc. on Vision, Image & Signal Processing*, vol. 152, no. 5, pp. 604-610, October 2005.
- B.44 F. Perez-Gonzalez, C. Mosquera, M. Barni, A. Abrardo, "Rational dither modulation: a high-rate data-hiding method invariant to gain attacks", *IEEE Trans. on Signal Processing*, vol. 53, no. 10, Part 2, pp. 3960-3975, October 2005.
- B.45 A. Abrardo, M. Barni, F. Perez-Gonzalez, C. Mosquera, "Improving the Performance of RDM Watermarking by Means of Trellis Coded Quantization" *IEE Proceedings on Information Security*, vol. 153, no. 3, September 2006, pp. 107-114.
- B.46 R. Caldelli, F. Filippini, M. Barni, "Joint near-lossless compression and watermarking of still images for authentication and tamper localization" *Signal Processing: Image Communication*, Vol. 21, no. 10, November 2006, pp. 890-903
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- B.50 Z. Erkin, A. Piva, S. Katzenbeisser, R. L. Lagendijk, J. Shokrollahi, G. Neven, and M. Barni, "Protection and Retrieval of Encrypted Multimedia Content: When Cryptography Meets Signal Processing," *EURASIP Journal on Information Security*, vol. 2007, Article ID 78943, 20 pages, 2007. doi:10.1155/2007/78943
- B.51 A. Piva and M. Barni, "Design and Analysis of the First BOWS Contest," *EURASIP Journal on Information Security*, vol. 2007, Article ID 98684, 8 pages, 2007. doi:10.1155/2007/98684
- B.52 C. Orlandi, A. Piva, and M. Barni, "Oblivious Neural Network Computing via Homomorphic Encryption," *EURASIP Journal on Information Security*, vol. 2007, Article ID 37343, 11 pages, 2007. doi:10.1155/2007/37343
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- B.55 G. Cancelli, M. Barni, "MPSteg-color: data hiding through redundant basis decomposition", *IEEE Transactions on Information Forensics and Security*, vol. 4 no. 3, September 2009, pp. 346-358.
- B.56 T. Bianchi, A. Piva, M. Barni, "Encrypted Domain DCT based on Homomorphic Cryptosystems", *EURASIP Journal on Information Security*, vol. 2009, Article ID 716357, 12 pages, 2009, doi:10.1155/2009/716357.
- B.57 T. Bianchi, A. Piva, M. Barni, "Composite Signal Representation for Fast and Storage-Efficient Processing of Encrypted Signals", *IEEE Transactions on Information Forensics and Security*, vol. 5, no. 1, March 2010, pp. 180-187.
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- B.61 K. Kim, M. Barni, H. Z. Tan, “Roughness-Adaptive 3D Watermarking Based on Masking Effect of Surface Roughness”, *IEEE Transactions on Information Forensics and Security*, vol. 5, no. 4, December 2010, pp. 721-733.
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### C. Conferences and workshops

- C.1 M.Barni, V.Cappellini, A.Mecocci, «Tele-elaborazione numerica delle immagini», 39° *Convegno Internazionale delle Comunicazioni*, Genova, 3-5 Ottobre 1991.
- C.2 F.Argenti, M.Barni, G.Benelli, V.Cappellini, A.Mecocci: "Art dedicated pictorial information systems"; *COST 229, Workshop on "Intelligent Terminals"*, L'Aquila, 22-24 Aprile 1992.
- C.3 M.Barni, V.Cappellini, A.Mecocci: "The use of different metrics in vector median filtering: application to fine arts and paintings"; *Proceedings of EUSIPCO-92, Sixth European Signal Processing Conference*, pp. 1485-1488, Brussels, 5-28 August 1992,
- C.4 M.Barni, V.Cappellini, A.Mecocci, "New techniques of colour image restoration for works of art"; *Conferenza Internazionale sulle Prove non Distruttive ....*, Viterbo, 4-8 Ottobre 1992.
- C.5 M.Barni, V.Cappellini, M.Mattioli, A.Mecocci, S.Zipoli, "Knowledge-map based automatic inspection and change detection in complex heterogeneous environments"; in *"Image Processing: Theory and Applications"*, G.Vernazza, A.N.Venetsanopoulos, C.Braccini (Editors), *Proceedings of IPTA '93*, Sanremo, Italy, 14-16 June, 1993.
- C.6 M.Barni, V.Cappellini, M.Mattioli, A.Mecocci, S.Zipoli, "Inspection of non-structured environments by means of knowledge-maps", *International Conference on Digital Signal Processing*, pp. 541-546, Nicosia-Cyprus, 14-16 July 1993.
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- C.8 L.Alparone, M.Barni, V.Cappellini, "Even-median filters for noisy image restoration"; in *Time-Varying Image Processing and Moving Object Recognition*, 3 V.Cappellini (Ed.), *Proceedings of the 4th International Workshop*, pp.87-94, Florence; Elsevier Science 1994.
- C.9 M.Barni, F.Bartolini, V.Cappellini, "Fast approximation of the euclidean norm: application to vector median filtering", *Proc. of EUSIPCO-94, Seventh European Signal Processing Conference*, Edinburgh, 13-16 September 1994.
- C.10 A.Barducci, M.Barni, V.Cappellini, S.Livi, A.Mecocci, "ALINSPEC Project: an intelligent vision system for automatic inspection of alimentary products", in *E.A.Yfantis (ed.), Intelligent Systems*, pp. 705-701, 1995, Kluwer, *Proceedings of the Third Golden West International Conference on Intelligent Systems*, Las Vegas, 6-8 June 1994.
- C.11 M.Barni, A.Mecocci, R.Rovati, «Una tecnica fuzzy per la classificazione di immagini da telerilevamento», *Atti del Convegno «Il Telerilevamento ed i Sistemi Informativi*

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- C.13 M.Barni, M.Betti, A.Mecocci, "Fuzzy segmentation of SAR images for oil spills recognition", *Proceedings of IPA '95, 5th International Conference on Image Processing and its Applications*, Edinburgh, 4-6 July 1995.
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- C.22 A.Ade-Hall, K.Jewell, M.Barni, A.Mecocci, «Machine vision for assessing the quality of natural objects», *Proceedings of CAD/CAM Robotics and Factories of the future, 12th International Conference*, pp.835-842, 14-16 August 1996.
- C.23 M.Barni, A.Mecocci, S.Rossi, «A fuzzy expert system for low level image segmentation», *Signal Processing VIII, Theories and Applications, Proceedings of EUSIPCO-96, Eight European Signal processing Conference*, pp.1752-1728, Trieste, Italy, 10-13 September 1996.
- C.24 M.Barni, V.Cappellini, A.Mecocci, A.Paoli, «Unsupervised detection of straight lines through possibilistic clustering», *Proceedings of ICIP-96, IEEE International Conference on Image Processing*, vol.2, pp.963-966, Lausanne, Switzerland, 16-19 September 1996.
- C.25 M.Barni, V.Cappellini, «A computationally efficient implementation of the  $L_1$  vector median filter», *Proceedings of DSP'97, International Conference on Digital Signal Processing*, pp.283-286, Santorini, Greece, 2-4 July 1997.
- C.26 M.Barni, F.Bartolini, V.Cappellini, A.Piva, «Robust watermarking of still images for copyright protection», *Proceedings of DSP'97, International Conference on Digital*



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