

FRANCESCO LEPORATI SHORT BIO

Francesco Leporati was born in Parma (Italy) on November 9th, 1963.

Laurea degree in Electronics Engineering at the Computer Science Dept. of the University of Pavia achieved on 1988. The title of the thesis was “Digital to analog converters for ECGs maps”.

PhD degree in Electronics and Computer Engineering, at the Computer Science Dept. of the University of Pavia achieved on 1993. The title of the thesis was “Parallel architectures for intensive computations”.

1993-1998, **consultant** for Beta 80 Holding Group, CiSE Italian Research center, Eltag Bailey, Pirelli.

1998-2004, **assistant professor** at the Computer Science Department of the University of Pavia.

2004-now, **associate professor** at the Computer Science Dept. of the University of Pavia where he teaches the courses of Digital System Design, Industrial Electronics and Industrial Informatics and Embedded Systems.



Skills and technical competences:

- Design and development of accelerating custom units for high performance computing
- Software development environments for parallel systems
- Computational Physics simulations
- Parallel architectures for machine learning
- Impact analysis on enterprises management
- Standard industrial communications protocols (with particular focus on numeric control machines for shoes-wearable machines)
- Custom Computing based on programmable logic devices (FPGA)
- Embedded systems for image processing in motorsport
- Data acquisition and processing from IR sensors in biomedical instrumentations
- Hyperspectral image processing on GPUs and cluster
- Image super-resolution processing
- Fetal ECG signal processing on DSP
- International Projects Evaluation

The **research activity** of Francesco Leporati concerns the design and the implementation of architectures for **high performance computing**, in particular exploiting FPGA technology, applied to the following main fields:

Parallel computing and special purpose computers: design of special purpose parallel computers and FPGA based accelerators devoted to scientific heavy computing problems. Several problems in the fields of the Physics of the Matter, Fluid Dynamics, Image Processing and Neural Networks have been faced showing the effectiveness of the proposed hardware approaches based on the design and implementation of parallel systems, multicore computational units, application specific processors.

Signal and image processing: digital systems controlled by microprocessors or DSPs for acquiring and processing biomedical data from sensors in the fields of rehabilitation, blood velocity profile evaluation, in vivo measurements of local changes in haemodynamics and oxygenation of human tissues and extract of the fetal heart rate from the mother's ECG.

Automotive applications: designing and developing electronic systems for image processing on competition cars. In particular he developed embedded acquisition systems for the remote monitoring of tire status through thermal images and for video de-interlacing. These activities were awarded with the Altran Engineering Academy prize 2008 and the Innovate Italy Altera Contest Prize 2009.

Biomedical instrumentation: Francesco Leporati recently began a collaboration with the ISPRC European Commission's Joint Research Centre aimed at design and developing an embedded low cost system based on **IR sensors** for multi-parametric biomedical analysis and on ARM processor for the elaboration of the acquired signals. A patent request for this activity has been conceived.

Collaboration with the following institutions/industries: Italian Institute for Nuclear Physics, Polytechnic of Milan, Ispra European Joint Research Centre, Neuricam inc., Ferrari inc., Marelli Motorsport, ST Microelectronics, ASSOMAC (Association of Italian developers of footwear machines).

He is **reviewer** of ACM/IEEE journals (IEEE Micro, IEEE Trans. On Instrumentation and Systems, IEEE Transactions on Systems, Man, and Cybernetics--Part C: Applications and Reviews, IEEE Transactions on Industrial Informatics, ACM Transactions on Design Automation of Electronic Systems, Elsevier Journal of System Architecture and Microprocessors and Microsystems), member of Program Committee and reviewer for Euromicro PDP (Parallel and Distributed Processing) and DSD (Digital System Design) Conferences.

Since 2012 Francesco Loporati is **Handling Subject Area Editor** in the field "FPGA -based Systems and Applications" for the Microprocessors and Microsystems journal edited by Elsevier.

Francesco Loporati was **Chair** of the XI IEEE/Euromicro Conference on Parallel and Distributed Processing (Mantova february 2001) and of the IEEE/Euromicro Conference on Software Engineering and Advanced Applications and on Digital System Design (SEEA/DSD) held in Parma on September 2008.

Francesco Loporati was **Program Chair** of the IEEE/Euromicro Conference on Digital System Design (SEEA/DSD) held in Verona on August 2014.

He is **member of IEEE** Computer Society and of the **Euromicro** Society (Director of Italian correspondents and member of the DSD Conference Steering Committee).

He represents Italy in the European Community **Cost Action IC1204 "Trustworthy Manufacturing and Utilization of Secure Devices"**. This COST action aims at creating a European network of competence and experts on all aspects of hardware security including design, manufacturing, testing, reliability, validation and utilization. The network will play a key role in developing solutions responding to the hardware security challenges, hence strengthening the position of Europe in the field.

Awards :

Altran Engineering Academy prize 2008: design and development of an embedded system for the remote monitoring of tire status through thermal images

Innovate Italy Altera Contest Prize 2008: design and development of an embedded system for people identification based on fingerprints recognition

Innovate Italy Altera Contest Prize 2009: design and development of an embedded system for video de-interlacing on F1 competition cars

Innovate Italy Altera Contest Prize 2010: design and development of an embedded system for the extraction of the fetal heart rate from the mother's ECG

Best paper award at the 6th Mediterranean Conf. on Embedded Computing (MECO) including ECYPS'2017 - the 5th EUROMICRO/IEEE Workshop on Embedded and Cyber-Physical Systems, Bar Montenegro, June 2017

Francesco Loporati is author of nearly 80 publications. In the following, some of the most significant (ISI Indexed) ones :

1. G. Danese, I. De Lotto, D. Dotti, F. Loporati, "*A parallel Special Purpose Computer dedicated to the simulation of interacting particle systems*", IEEE Computing in Science and Engineering vol. 11, n° 6, nov/dic. 1997, pp. 630-640, Am Inst. of Physics ed., New York.
2. G. Danese, F. Loporati, R. Lombardi, M. Roveda, "*A correlator for light-scattering experiments*" IEEE Transactions on Instrumentation and Measurement, August 1998, Vol. 47, N. 4, pp. 935-940, New York.
3. R. Lombardi, G. Danese, F. Loporati, "*FRP – An instrument to measure blood velocity profiles*", Ultrasonics, Elsevier Science B.V., Amsterdam, The Netherlands, Ultrasonics, Elsevier Science, Amsterdam, The Netherlands, vol. 39/2, pp. 143-150, February 2001.
4. G. Danese, I. De Lotto, A. De Marchi, F. Loporati, T. Bellini, M. Buscaglia, F. Mantegazza, "*Monte Carlo - Metropolis simulation of interacting anisotropic polarizable spins on a lattice*", Computer Phys. Communications, vol. 134/1, pp. 47-57, February 2001, Elsev. Sc. B. V.
5. G. Danese, F. Loporati, S. Ramat, "*A parallel neural processor for real time processing applications*", IEEE Micro – Special Issue on Unorthodox Computer Archit. –pp. 20-31 – May-June 2002.

6. R. Lombardi, G. Coldani, G. Danese, R. Gandolfi, F. Loporati, "Data acquisition system for Measurements in Free Moving Subjects and its Applications", IEEE Trans. on Instr. and Measurement, vol. 52, n° 3, June 2003, pp. 878-884.
7. G. Danese, F. Loporati, M. Bera, M. Giachero, N. Nazzicari, A. Spelgatti, "An Accelerator for Physics Simulations", IEEE Computing in Science & Engineering, Vol. 9, Issue 5, Sept.-Oct. 2007, pp. 16 - 25
8. G. Danese, M. Giachero, F. Loporati, A. Majani, N. D. Nazzicari, and Carlo Virgili, "A Video Elaboration System for Image Deinterlacing and Processing in Race Cars", IEEE Embedded Systems Letters, 2(2), pp. 27-30, June 2010
9. G. Danese, F. Loporati, M. Giachero, N. Nazzicari, "An Embedded Multi Core Identification System", Microprocessors and Microsystems, 2011, Elsevier ed. DOI: 10.1016/j.micpro.2011.03.003.
10. G. Danese, F. Loporati, M. Giachero, N. Nazzicari, "A Novel Standard for Footwear Industry Machinerics", IEEE Transactions on Industrial Informatics, November 2011, vol. 7, n° 4, ISSN 1551-3203, pp. 713-722. IEEE Computer Society Press ed.
11. G. Danese, F. Loporati, A. Majani, G. Matrone, E. Merlino, "A Wearable Intelligent System for The Health of Expectant Mom's and of Their Children", Proc. of DSD 2011, 14th IEEE-Euromicro Conference on Digital System Design, Oulu, September 2011, pp. 757-763, Comp. Society Press ed., Los Alamitos (CA-USA). ISBN 978-0-7695-4494-6
12. A. Majani, M. C. Lorena, F. Loporati, G. Danese, "A hardware accelerator for real time simulation of complex neuronal models", Proc. of DSD 2012, 15th IEEE-Euromicro Conference on Digital System Design, Cesme, September 2012, pp. 931-937, Comp. Society Press ed., Los Alamitos (CA-USA). ISBN-13: 978-0-7695-4798-5, DOI 10.1109/DSD.2012.5
13. A. Barberis, G. Danese, F. Loporati, A. Plaza, E. Torti, "Real-Time Implementation of the Vertex Component Analysis Algorithm on GPUs", IEEE Geoscience and Remote Sensing Letters. IEEE Computer Society Press ed. , March 2013, vol. 10, n° 2, pp. 251-255, 10.1109/LGRS.2013.2247517.
14. E. Marenzi, G. M. Bertolotti, A. Cristiani, F. De Donno, F. Loporati, G. Danese, M. Bejor., "Identification and evaluation of parameters for the prevention of pressure ulcers in hospitalized patients", Proc. of IEEE EUROCON 2013, Zagreb (Croatia), July 2013, pp. 1598-160, Comp. Society Press ed., ISBN-13: 9781467322317.
15. S. Rampazzi, G. Danese, F. Loporati, F. Marabelli, "A Localized Surface Plasmon Resonance-Based Portable Instrument for Quick On-Site Biomolecular Detection", IEEE Transactions on Instrumentation and Measurements. IEEE Computer Society Press ed., September 2015, 10.1109/TIM.2015.2465691.
16. E. Torti, G. Danese, F. Loporati, A. Plaza, "A Hybrid CPU-GPU Real-Time Hyperspectral Unmixing Chain", IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Computer Society Press ed., September 2015. 10.1109/JSTARS.2015.2485399
17. Giordana Florimbi, Emanuele Torti, Stefano Masoli, Egidio D'Angelo, Giovanni Danese and Francesco Loporati, "The Human Brain Project: Parallel Technologies for Biologically Accurate Simulation of Granule Cells", Microprocessors and Microsystems, 2016 Elsevier ed., 47: 303-313, [doi:10.1016/j.micpro.2016.05.015](https://doi.org/10.1016/j.micpro.2016.05.015), <http://www.sciencedirect.com/science/article/pii/S0141933116300515>
18. Emanuele Torti, Dimitris Koliopoulos, Mirko Matraxia, Giovanni Danese, Francesco Loporati; "Custom FPGA Processing for Real-Time Fetal ECG Extraction and Identification", Computers in Biology and Medicine, 2016 Elsevier ed. DOI 10.1016/j.combiomed.2016.11.006
19. Giordana Florimbi, Emanuele Torti, Giovanni Danese and Francesco Loporati, "High performant simulations of cerebellar Golgi cells activity" Proc. of IEEE Euromicro Conference on Parallel and Distributed Computing, St. Petersburg, March 2017, Comp. Society Press ed., Los Alamitos (CA-USA), pp. 527-534.. ISBN 978-1-5090-6058-0 .DOI [10.1109/PDP.2017.91](https://doi.org/10.1109/PDP.2017.91)
20. Elisa Marenzi, Andrea Carrus, Giovanni Danese, Gustavo Marrero Callicò and Francesco Loporati, "Efficient Parallelization of Motion Estimation for Super-Resolution", Proc. of IEEE Euromicro Conference on Parallel and Distributed Computing, St. Petersburg, March 2017, Comp. Society Press ed., Los Alamitos (CA-USA). pp. 274-277. DOI 10.1109/PDP.2017.64. ISBN 2377-5750
21. Canale Pietro, [Fontanella Alessandro](#), [Torti Emanuele](#), [Danese Giovanni](#), [Loporati Francesco](#), "Development of a Real-Time Heart Rate Estimation Algorithm on a Low-Power Device", Proc. of 6th Mediterranean Conf. on Embedded Computing (MECO) including ECYPS'2017 - the 5th EUROMICRO/IEEE Workshop on Embedded and Cyber-Physical Systems, Bar Montenegro, June 2017, IEEE Xplore Print ed., Los Alamitos (CA-USA). pp. 25-28. 978-1-5090-6741-1