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Research interests

Profile

The research project I pursued during my Ph.D. training focused on distributed source coding of continuous sources. The correlation between the sources, in the literature, is usually modeled using a Gaussian additive noise channel, which is ill suited to correctly describe the signals involved in practical applications. In this context, I focused on the investigation of alternative statistical models for the correlation channel. This involved both the characterization of the information theoretic performance of the system, and the conception of original coding strategies, specifically tailored to overcome practical design limitations (*e.g.* the requirement of feed-back channel between the source and the destination). I acquired a solid background in information theory and Bayesian signal processing, and developed a strong interest in the mathematical theory underlying the compression of signals (dimension reduction).

Later, during my post-doc, I investigated the problem of correlation detection in large data sets, where the number of variates greatly exceeds the number of samples available. In this context the standard theory of large deviations (*e.g.* the central limit theorem, the Chernoff bounds) no longer apply, and new theoretical tools are needed to solve the inference problem. I developed competences and a strong interest in the aspects of information theory more intimately related to statistics.

Current research interests

My current research interests lie mainly in the areas of information theory and statistical signal processing related to communication theory. In the context of wireless network communication, I am currently investigating statistical inference algorithms to achieve joint compression and network coding of correlated sources.

Research experiences

2011 - 2012
(12 months)

Post-doctoral researcher

EECS Department, University of Michigan
Ann Arbor, MI

Supervisor: Prof. Alfred Hero

Research project: *Correlation detection in high dimensional datasets.*

- 2006 - 2010
(4 years) **Ph.D. student**
Laboratoire des Signaux et des Systèmes (LSS), Gif-sur-Yvette, France
Supervisor: Prof. Michel Kieffer
Research project: *Theory and practice in Wyner-Ziv coding with uncertain side information quality.*
- 2009
(5 months) **Visiting Ph.D. student**
DEIS, Università di Bologna, Cesena (Italy)
Supervisor: Prof. Marco Chiani
- 2007
(6 months) **Visiting Ph.D. student**
DEIS, Università di Bologna, Bologna (Italy)
Supervisor: Prof. Marco Chiani
- 2005
(6 months) **Visiting Master's student**
Laboratoire des Signaux et des Systèmes (LSS), Gif-sur-Yvette, France
Supervisor: Prof. Michel Kieffer
Research project: *Lattice-based distributed asymmetric source coding.*

Education

- December 2010 **Ph.D. in Physics**
Université Paris XI (France)
Ph.D. in Electronics, Computer Science and Telecommunications
Università di Bologna (Italy)
Research project: *Wyner-Ziv coding with uncertain side information quality*
Supervisors: Prof. Michel Kieffer, Prof. Marco Chiani
- July 2006 **Master's degree (Laurea magistrale) in Telecommunications Engineering**
Università di Bologna (Italy)
Research project: *Low-dimensional lattice-based source coding with side information at the decoder*
Supervisors: Prof. Michel Kieffer, Prof. Marco Chiani
Final grade: 110/110, *summa cum laude*
- March 2003 **Bachelor's degree (Laurea) in Telecommunications Engineering**
Università di Bologna (Italy)
Final grade: 109/110
- July 1999 **High school diploma (Maturità Classica)**
Liceo Classico Daniele Manin, Cremona (Italy)
Final grade: 100/100

Publications

Submitted

F. Bassi, A. Hero, "Large scale correlation detection", *submitted to IEEE Information Theory Symposium, ISIT 2012, Boston, MA, August 2012.*

Published

E. Dupraz, F. Bassi, T. Rodet and M. Kieffer, "Distributed coding of sources with bursty correlation", *Proc. IEEE Int. Conference on Acoustics, Speech and Signal Processing, ICASSP 2012, Kyoto, Japan, March 2012.*

F. Bassi, M. Kieffer and C. Weidmann, "Wyner-Ziv coding with uncertain side information quality", *Proc. European Conference on Signal Processing, EUSIPCO 2010, Aalborg, Denmark, August 2010. Invited paper.*

F. Bassi, M. Kieffer and C. Dikici, "Multiterminal source coding for Bernoulli-Gaussian correlated sources", *Proc. IEEE Int. Conference on Acoustics, Speech and Signal Processing, ICASSP 2009, Taipei, Taiwan, April 2009.*

F. Bassi, M. Kieffer and C. Weidmann, "Source coding with time-varying quality of the decoder side information", *Newcom++ - ACoRN Joint Workshop, Barcelona, Spain, March 2009.*

C. Weidmann, F. Bassi and M. Kieffer, "Practical distributed source coding with impulse-noise degraded side information at the decoder", *Proc. European Conference on Signal Processing, EUSIPCO 2008, Lausanne, Switzerland, August 2008.*

F. Bassi, M. Kieffer and C. Weidmann, "Source coding with intermittent and degraded side information at the decoder", *Proc. IEEE Int. Conference on Acoustics, Speech and Signal Processing, ICASSP 2008, Las Vegas, Nevada, April 2008. Best paper award.*

Dissertations

Wyner-Ziv coding with uncertain side information quality, Doctoral dissertation, December 2010.

Low-dimensional lattice-based source coding with side information at the decoder, Masters dissertation, July 2006.

Grants and awards

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| 2006-2009 | Doctoral research fellowship (3 years), <i>French Ministry for Education, Research and Technology</i> |
| 2005 | Visiting studentship (6 months), <i>Università di Bologna, Italy (spent at Laboratoire des Signaux et des Systèmes, Gif-sur-Yvette, France)</i> |
| 1999 - 2005 | Undergraduate studentship (5 years), <i>Collegio Superiore, Università di Bologna, Italy</i> |
| 1999 | Admission to <i>Collegio Superiore, Università di Bologna, Italy</i> |

Teaching

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| 2012 (12 hours) | Teaching assistant Course: <i>Modélisation Électrique</i> (SAPH-245) Ecole Normale Supérieure de Cachan |
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Student supervision

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| 2011 (2 months) | Chao Liu, Master's project (with Prof. Michel Kieffer) Laboratoire des Signaux et des Systèmes (LSS), Gif-sur-Yvette, France Research Project: <i>Joint source and network coding</i> |
| 2010 (6 months) | Elsa Dupraz, Master's training period (with Prof. Michel Kieffer) Laboratoire des Signaux et des Systèmes (LSS), Gif-sur-Yvette, France Research project: <i>Wyner-Ziv coding with uncertain side information and Markovian correlation noise</i> |
| 2010 (2 months) | Elsa Dupraz, Master's project (with Prof. Michel Kieffer) Laboratoire des Signaux et des Systèmes (LSS), Gif-sur-Yvette, France Research project: <i>Wyner-Ziv coding with Markov model for the side information</i> |

General skills

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| Spoken languages | Italian (native speaker), English (fluent), French (fluent), Spanish (intermediate) |
| Programming | GNU Octave, Matlab, Python, C/C++ and IT++, \LaTeX , PHP/MySQL |
| Operating systems | GNU/Linux (Debian), Windows XP, OSX |