

Elsa Dupraz

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RESEARCH INTERESTS Channel coding, Source coding, Information theory, Signal processing, Energy-efficient LDPC codes, Reliable computation on unreliable hardware, Distributed learning over compressed data, Source coding for massive random access.

TEACHING ACTIVITIES Probability, Statistics, Channel coding, Source coding, Information Theory, Machine Learning, Signal Processing, Optimization

EDUCATION **Doctor of Philosophy** *December 2013*

- Laboratoire des Signaux et Systèmes (CNRS, Supélec, University Paris-Sud)
- Thesis title: Source coding with uncertain side information at the decoder

Master of Advanced Systems of Radiocommunications *August 2010*

- ENS Cachan (joint degree with Supélec and University Paris-Sud)
- Thesis title: Source coding with side information and Markovian correlation noise

Bachelor degree in Electrical Engineering *August 2009*

- Department of Electrical Engineering of ENS Cachan
- Internship: realization of a fingerprint audio algorithm robust to pitch changes

EXPERIENCE **Assistant Professor** *October 2015 – present*
IMT Atlantique (ex-Telecom Bretagne), Brest, France

Post-doctoral researcher (FP7 FET Open project iRisc) *Sept. 2014 – Sept. 2015*
ETIS laboratory, ENSEA, Cergy-Pontoise, France

Post-doctoral researcher *Sept. 2014 – August 2014*
University of Arizona, Tucson, USA

PhD student *Sept. 2010 – December 2013*
University Paris-Sud, Orsay, France

Teaching assistant *January 2011 – June 2013*
Ecole Polytechnique, Palaiseau, France

RESEARCH PROJECTS **Manager of IoTAD-CEO, International Cominlabs Chair** *January 2021 – December 2024*
IoT Network Analysis and Design based on CEO Problem, International Chair for Tadashi Matsumoto

Participation to ULERIM, IVADO project *September 2020 – August 2022*
Ultra-Low-Energy Reliable DNN Inference Using Memristive Circuits for Biomedical Applications, in collaboration with Polytechnique Montreal

Participation to dnarXiv, Labex Cominlabs project *September 2020 – August 2022*
Storing information on DNA molecules, in collaboration with INRIA Rennes, LaTim, Institute of Genetics & Development, DNA Script company

Coordinator of REFinEd, Program Samuel de Champlain *April 2020 – December 2021*
Energy-reliability tradeoff for low energy consumption artificial intelligence, in collaboration with Polytechnique Montreal (Canada)

Coordinator of EF-FEctive, ANR JCJC project *January 2018 – June 2021*
Design of Energy-Efficient LDPC codes and decoders, in collaboration with Polytechnique Montreal (Canada)

Principal investigator of InterCom, Labex Cominlabs project *Nov. 2016 – Dec. 2020*
Interactive communications and massive random access to data, in collaboration with INRIA Rennes and University Paris-Sud (France)

French coordinator of AI-EF, Thomas Jefferson fund *August 2018 – July 2020*
Reliable artificial intelligence on energy-efficient hardware, in collaboration with University of Illinois at Urbana-Champaign (USA)

French coordinator of SEED, PHC Pavle Savic *Jan. 2018 – Dec. 2019*
Secure and energy efficient distributed source coding for sensor networks, in collaboration with MISANU, Belgrade (Serbia)

Participation to COLA, Research contract *February. 2016 – January. 2017*
Non-binary LDPC codes for short-packet communications, in collaboration with Huawei, Paris (France)

SUPERVISION

Post-Docs

Alireza Tasdighi, Post-doctoral researcher, May 2020 - April 2021

Khaled Alhaj Ali, Post-doctoral researcher, April 2020 - December 2020

Mai Quyen Pham, Post-doctoral researcher, April 2019 - October 2019

Zeina Mheich, Post-doctoral researcher, February 2016 - August 2017

PhD Students

Belaid Hamoum, PhD Student, October 2019 - September 2022

Jonathan Kern, PhD Student, October 2019 - September 2022

Mohamed Yaoumi, PhD Student, November 2017 - November 2020

Fangping Ye, PhD Student, November 2016 - October 2019

Interns

Marc-André Lavoie, Research Intern, June 2020 - August 2020

Elodie Derringer, Research Intern, June 2019 - August 2019

Sarah El Beji, Research intern, June 2018 - July 2018

Salma El Ghourbal, Research intern, June 2018 - July 2018

Fangping Ye, Research intern, April 2016 - September 2016

Guillaume Muret, Research intern, June 2016 - July 2016

Ji Wei, Research intern, February 2013 - August 2013

Zheng Chen, Research intern, June 2012 - August 2012

EVENT

Information Theory Workshop, Kanazawa, Japan, September 2021

ORGANIZATION

Special Session on the Design of Energy-Efficient Error-Correction Codes, conference ISTC, Montreal, March 2021

Symposium Turbo Codes and Iterative Information Processing, Montreal, March 2021
Workshop on Energy-Efficient design of Error-Correction codes, Paris, April 2020
Symposium Turbo Codes and Iterative Information Processing, Brest, September 2016
GdR ISIS workshop on Energy-efficient LDPC decoders, Paris, June 2016

PUBLICATIONS

JOURNAL PAPERS

- J1 Fangping Ye, Navid Mahmoudian Bidgoli, Elsa Dupraz, Aline Roumy, Karine Amis, Thomas Maugey, Bit-Plane Coding in Extractable Source Coding: optimality, modeling, and application to 360° data, accepted at *IEEE Communication Letters*, January 2021
- J2 **Elsa Dupraz**, François Leduc-Primeau, Noisy Density Evolution With Asymmetric Deviation Models, accepted at *IEEE Transactions on Communications*, November 2020
- J3 Mohamed Yaoumi, **Elsa Dupraz**, François Leduc-Primeau, Frederic Guilloud, Energy optimization of quantized Min-Sum decoders for protograph-based LDPC codes, *Annals of Telecommunications*, vol. 75, no 11, p. 615-621, 2020
- J4 Mai Quyen Pham, Aline Roumy, Thomas Maugey, **Elsa Dupraz**, Michel Kieffer, Optimal reference selection for random access in predictive coding schemes, *IEEE Transactions on Communications*, vol. 68, no 9, p. 5819-5833., 2020
- J5 Thomas Maugey, Aline Roumy, **Elsa Dupraz**, Michel Kieffer, Incremental coding for extractable compression in the context of Massive Random Access, *IEEE Transactions on Signal and Information Processing over Networks*, vol. 6, pp. 251-260, March 2020
- J6 Marwa Ben Abdessalem, Amin Zribi, Tadashi Matsumoto, **Elsa Dupraz**, Ammar Bouallegue, LDPC-based Joint Source Channel Coding and Decoding Strategies for single relay cooperative communications, *Elsevier Physical Communications*, vol. 38, February 2020
- J7 **Elsa Dupraz**, Aline Roumy, Thomas Maugey, Michel Kieffer, Rate-Storage Regions for Extractable Source Coding with Side Information, *Elsevier Physical Communications*, vol. 37, December 2019
- J8 Fangping Ye, **Elsa Dupraz**, Zeina Mheich, Karine Amis, Optimized Rate-Adaptive Protograph-Based LDPC Codes for Source Coding with Side Information, *IEEE Transactions on Communications*, vol. 67, no. 6, pp. 3879-3889, June 2019
- J9 **Elsa Dupraz**, David Declercq, Bane Vasic, Asymptotic Error Probability of the Gallager B Decoder under Timing Errors, *IEEE Communication Letters*, vol. 21, no 4, p. 698-701. January 2017
- J10 **Elsa Dupraz**, David Declercq, Bane Vasic, Valentin Savin, Analysis and Design of Finite Alphabet Iterative Decoders Robust to Faulty Hardware, *IEEE Transactions on Communications*, vol.63, no 8, pp.2797 - 2809 June 2015
- J11 Christiane L. Kameni Ngassa, Valentin Savin, **Elsa Dupraz**, David Declercq, Density Evolution and Functional Threshold for the Noisy Min-Sum Decoder, *IEEE Transactions on Communications*, vol.63, no 5, pp.1497 - 1509, May 2015
- J12 **Elsa Dupraz**, Valentin Savin, Michel Kieffer, Density Evolution for the Design of Non-Binary Low Density Parity Check Codes for Slepian-Wolf Coding, *IEEE Transactions on Communications*, vol.63, no 1, pp.25–36, January 2015
- J13 Francesca Bassi, Aurelia Fraysse, **Elsa Dupraz**, Michel Kieffer, *Rate-distortion bounds for Wyner-Ziv coding with Gaussian scale mixture correlation noise*, *IEEE Transactions on Information Theory*, vol. 30, no 12, pp. 7540–7546, October 2014

J14 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Source coding with side information at the decoder and uncertain knowledge of the correlation, *IEEE Transactions on Communications*, vol. 62, no 1, pp. 269–279, January 2014

INTERNATIONAL
CONFERENCES

- C1 Jonathan Kern, **Elsa Dupraz**, Abdeldjalil Aïssa-El-Bey, François Leduc-Primeau, Improving the Energy-Efficiency of a Kalman Filter using Unreliable Memories, accepted at International Conference on Acoustic, Speech, and Signal Processing (ICASSP), 2021
- C2 Jeremy Nadal, Mickael Fiorentino, **Elsa Dupraz**, Francois Leduc-Primeau, A Deeply Pipelined, Highly Parallel and Flexible LDPC Decoder, *IEEE International Newcas conference*, Montreal, Canada, 2020
- C3 **Elsa Dupraz**, Lav R. Varshney, Noisy In-Memory Recursive Computation with Memristor Crossbars, *International Symposium on Information Theory (ISIT)*, Los Angeles, USA, 2020
- C4 **Elsa Dupraz**, Lav R. Varshney, Energy-Efficient Machine Learning Algorithms, *Conference on Information Theory and Complex Systems (TINKOS)*, Belgrade, Serbia, October 2019
- C5 Mohamed Yaoumi, **Elsa Dupraz**, Francois Leduc-Primeau, Frederic Guilloud, Energy-Efficient Protograph-Based LDPC codes, *Conference on Information Theory and Complex Systems (TINKOS)*, Belgrade, Serbia, October 2019
- C6 Mohamed Yaoumi, François Leduc-Primeau, **Elsa Dupraz**, Frederic Guilloud, Optimization of Protograph LDPC Codes based on High-Level Energy Models, accepted at *16th International Symposium on Wireless Communication Systems (ISWCS)*, Oulu, Finland, August 2019
- C7 **Elsa Dupraz**, Lav R. Varshney, Binary Recursive Estimation on Noisy Hardware, accepted at *International Symposium on Information Theory (ISIT)*, Paris, France, July 2019
- C8 **Elsa Dupraz**, François Leduc-Primeau, François Gagnon, High-Throughput LDPC Decoding Achieved by Code and Architecture Co-Design, *International Symposium on Turbo Codes and Iterative Information Processing (ISTC)*, Hong Kong, December 2018, Invited Paper
- C9 Nicolas Grelier, Carlos Eduardo Rosar Kos Lassance, **Elsa Dupraz**, Vincent Gripon, Graph-Projected Signal Processing, *IEEE International Conference on Signal and Information Processing (GlobalSIP)*, Anaheim, USA, November 2018
- C10 Fangping Ye, Zeina Mheich, **Elsa Dupraz**, Karine Amis, Optimized Short-Length Rate-Adaptive LDPC Codes for Slepian-Wolf Source Coding, *International Conference on Telecommunication (ICT)*, Saint-Malo, France, June 2018
- C11 Mael Bompais, Hamza Ameer, Dominique Pastor, **Elsa Dupraz**, The p-value as a New Similarity Function for Spectral Clustering in Sensor Networks, *Statistical Signal Processing Workshop (SSP)*, Freiburg, Germany, June 2018
- C12 Nicolas Grelier, Carlos Eduardo Rosar Kos Lassance, **Elsa Dupraz**, Vincent Gripon, Graph-Projected Signal Processing, *Graph Signal Processing Workshop (GSP)*, Lausanne, Switzerland, June 2018
- C13 **Elsa Dupraz**, Dominique Pastor, Decentralized clustering algorithm over compressed data, *Conference on Information Theory and Complex Systems (TINKOS)*, Belgrade, Serbia, June 2018

- C14 Fangping Ye, **Elsa Dupraz**, Karine Amis, Rate-adaptive LDPC code construction for Free-Viewpoint Television, *Conference on Information Theory and Complex Systems (TINKOS)*, Belgrade, Serbia, June 2018
- C15 **Elsa Dupraz**, Dominique Pastor, François-Xavier Socheleau, A Statistical Signal Processing Approach to Clustering over Compressed Data, *International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Calgary, Canada, April 2018
- C16 Zeina Mheich, **Elsa Dupraz**, Short Length Non-binary Rate-Adaptive LDPC Codes for Slepian-Wolf Source Coding, *Wireless Communications and Networking Conference (WCNC)*, Barcelona, Spain, April 2018
- C17 **Elsa Dupraz**, K-means Algorithm over Compressed Binary Data, *Data Compression Conference (DCC)*, Utah, United States, March 2018
- C18 **Elsa Dupraz**, Thomas Maugey, Aline Roumy, Michel Kieffer, Rate-Distortion Performance of Sequential Massive Random Access to Gaussian Sources with Memory, *Data Compression Conference (DCC)*, Utah, United States, March 2018
- C19 Velimir Ilić, **Elsa Dupraz**, Bane Vasic, Generic Architectures for Uniformly Reweighted APP Decoders, *International Conference on Advanced Technologies, Systems, and Services in Telecommunications (TELSIKS)*, Nis, Serbia, October 2017, Invited Paper
- C20 **Elsa Dupraz**, Bane Vasic, David Declercq, Performance of Taylor-Kuznetsov memories under timing errors, *International Conference on Communications (ICC)*, Paris, France, May 2017
- C21 **Elsa Dupraz**, Distributed K-means over Compressed Binary Data, *National Conference on Information Theory and Complex Systems (TINKOS)*, Belgrade, Serbia, October 2016
- C22 Satish Kumar Grandhi, **Elsa Dupraz**, Christian Spagnol, Valentin Savin, Emanuel Popovici, CPE: Codeword Prediction Encoder, *European Test Symposium*, Amsterdam, Netherlands, May 2016
- C23 **Elsa Dupraz**, Valentin Savin, Satish Kumar Grandhi, Emanuel Popovici, David Declercq, Practical LDPC Encoders Robust to Hardware Noise, *International Conference on Communications (ICC)*, Kuala Lumpur, Malaysia, May 2016
- C24 **Elsa Dupraz**, David Declercq, Evaluation of the Robustness of LDPC Encoders to Hardware Noise, *BlackSeaCom*, pp 87-91, 2015, Invited Paper
- C25 **Elsa Dupraz**, D. Declercq, B. Vasic, Analysis of Taylor-Kuznetsov Memory using One-Step Majority Logic Decoder, *Information Theory and Applications Workshop (ITA)*, 2015, Invited paper
- C26 Velimir Ilic, **Elsa Dupraz**, David Declercq, Bane Vasic, Uniformly reweighted APP Decoder for memory efficient decoding of LDPC Codes, *Allerton*, pp 1228 - 1232, 2014
- C27 **Elsa Dupraz**, David Declercq, Bane Vasic, Valentin Savin, Finite Alphabet Iterative Decoders Robust to Faulty Hardware: Analysis and Selection, *International Symposium on Turbo Codes and Iterative Information Processing*, pp 107 - 111, 2014
- C28 Velimir Ilic, **Elsa Dupraz**, David Declercq, Bane Vasic, On the Memory Complexity of APP Decoders for LDPC Codes, *ICT Forum 2014*, Serbia, Invited Paper
- C29 Velimir Ilic, **Elsa Dupraz**, David Declercq, Bane Vasic, Memory Efficient APP Decoding of LDPC Codes, *National Conference on Information Theory and Complex Systems 2014*, Serbia
- C30 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Universal Wyner-Ziv coding for Gaussian sources, *International Conference on Acoustic, Speech, and Signal Processing (ICASSP)*, pp. 5132-5135, 2013

- C31 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Practical coding scheme for universal source coding with side information at the decoder, *Data Compression Conference (DCC)*, pp. 401-410, 2013
- C32 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Source coding with side information at the decoder: Models with uncertainty, performance bounds, and practical coding schemes., *International Symposium on Information Theory and its Applications (ISITA)*, pp. 170-174, 2012
- C33 **Elsa Dupraz**, Francesca Bassi, Thomas Rodet, Michel Kieffer, Distributed coding of sources with bursty correlation., International Conference on Acoustic, Speech, and Signal Processing (ICASSP), pp. 2973-2976, 2012
- C34 **Elsa Dupraz**, Gael Richard, Robust frequency-based audio fingerprinting., *International Conference on Acoustic, Speech, and Signal Processing (ICASSP)*, pp. 281-284, 2010

NATIONAL
CONFERENCES

- N1 Fangping Ye, **Elsa Dupraz**, Zeina Mheich, Karine Amis, Construction de Codes LDPC Compatibles en Rendement pour le Codage de Sources avec Information Adjacente, accepted at *Colloque GRETSI*, September 2019
- N2 Mohamed Yaoumi, **Elsa Dupraz**, François Leduc-Primeau, Frederic Guilloud, Optimisation de la Consommation d’Energie pour des Codes LDPC Construits à Partir de Protographes, accepted at *Colloque GRETSI*, September 2019
- N3 **Elsa Dupraz**, David Declercq, Bane Vasic, Stabilité des Mémoires de Taylor-Kuznetsov construites à partir d’un Décodeur LDPC de type Gallager B, *Actes du GRETSI 2015*
- N4 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Codage distribué dans des réseaux de capteurs avec connaissance incertaine des corrélations, *Actes du GRETSI 2013*
- N5 **Elsa Dupraz**, Aline Roumy, Michel Kieffer, Codage de sources avec information adjacente et connaissance imparfaite de la corrélation : le problème des cadrans., *Actes du GRETSI 2013*