MATHIEU LEONARDON

Associate Professor

Algorithm-Architecture Adequation
Deep Learning Compression

MEE Department
IMT Atlantique
born March 18th, 1987, French
℘ *(+33) 229001384*
✉ *mathieu.leonardon@imt-atlantique.fr*
⌂ *My Webpage*
 Github   in Linkedin

Education

2015–2018 **PhD, Electrical Engineering**, *Polytechnique Montréal and Université de Bordeaux*, codirec, Polar Decoding on programmable architectures, *defended on 2018-12-13*.
Forward Error Correction, Polar Codes, Software Implementations, Hardware Implementations, ASIP

2012–2015 : **Master of Engineering, Embedded Electronics**, *Bordeaux INP, ENSEIRB-Matmeca*, Bordeaux.

Publications

Journal Articles

2022 Hugo Tessier, Vincent Gripon, **Léonardon, Mathieu**, Matthieu Arzel, Thomas Hannagan, and David Bertrand. Rethinking Weight Decay for Efficient Neural Network Pruning. *Journal of Imaging*, volume 8, page 64. MDPI, March 2022.

2022 Khaled Alhaj Ali, Amer Baghdadi, Elsa Dupraz, **Léonardon, Mathieu**, Mostafa Rizk, and Jean-Philippe Diguet. MOL-based In-Memory Computing of Binary Neural Networks. *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, volume 30. IEEE, July 2022.

2019 **Léonardon, Mathieu**, Adrien Cassagne, Camille Leroux, Christophe Jego, Louis-Philippe Hamelin, and Yvon Savaria. Fast and Flexible Software Polar List Decoders. *Journal of Signal Processing Systems*. Springer, January 2019.

2019 Alireza Ghaffari, **Léonardon, Mathieu**, Adrien Cassagne, Camille Leroux, and Yvon Savaria. Toward High-Performance Implementation of 5G SCMA Algorithms. *IEEE Access*, volume 7, pages 10402–10414. IEEE, January 2019.

2019 Adrien Cassagne, Olivier Hartmann, **Léonardon, Mathieu**, Kun He, Camille Leroux, Romain Tajan, Olivier Aumage, Denis Barthou, Thibaud Tonnellier, Vincent Pignoly, Bertrand Le Gal, and Christophe Jego. AFF3CT: A Fast Forward Error Correction Toolbox! *SoftwareX*, volume 10, page 100345. Elsevier, July 2019.

In Conference Proceedings

2023 Hugo Le Blevec, **Léonardon, Mathieu**, Hugo Tessier, and Matthieu Arzel. Pipelined Architecture for a Semantic Segmentation Neural Network on FPGA. In *IEEE 30th International Conference on Electronics, Circuits and Systems (ICECS)*, Istanbul, Turkey, December 2023.

2023 Lucas Grativol Ribeiro, **Léonardon, Mathieu**, Guillaume Muller, Fresse Virginie, and Matthieu Arzel. Federated learning compression designed for lightweight communications. In *IEEE 30th International Conference on Electronics, Circuits and Systems*, Istanbul, Turkey, December 2023.

2023 Lucas Grativol, **Léonardon, Mathieu**, Guillaume Muller, Virginie Fresse, and Matthieu Arzel. Compression de réseaux de neurones pour l'apprentissage fédéré. In *XXIXème Colloque GRETSI*, Grenoble, France, August 2023.

2023   Darshan C Ganji, Saad Ashfaq, Ehsan Saaboori, Sudhakar Sah, Saptarshi Mitra, Mohammad-hossein Askarihemmat, Alexander Hoffmann, Ahmed Hassanien, and **Léonardon, Mathieu**. DeepGEMM: Accelerated Ultra Low-Precision Inference on CPU Architectures using Lookup Tables. In *CVPRW 2023: IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops*, Vancouver, Canada, June 2023.

2022   Hamoud Younes, Hugo Le Blevec, **Léonardon, Mathieu**, and Vincent Gripon. Inter-Operability of Compression Techniques for Efficient Deployment of CNNs on Microcontrollers. In *SYSINT 2022: International Conference on System-Integrated Intelligence*, volume 546 of *Lecture Notes in Networks and Systems book series (LNNS)*, pages 543–552, Genova, Italy, September 2022. Springer International Publishing.

2022   Hugo Tessier, Vincent Gripon, **Léonardon, Mathieu**, Matthieu Arzel, Thomas Hannagan, and David Bertrand. Élagage de réseaux profond de neurones par dégradation sélective des pondérations. In *GRETSI 2022 : 28ème colloque du Groupement de Recherche en Traitement du Signal et des Images*, Nancy, France, September 2022.

2022   Hugo Tessier, Vincent Gripon, **Léonardon, Mathieu**, Matthieu Arzel, David Bertrand, and Thomas Hannagan. Leveraging Structured Pruning of Convolutional Neural Networks. In *SiPS 2022: IEEE Workshop on Signal Processing Systems*, pages 1–6, Rennes, France, November 2022.

2022   Hugo Tessier, Vincent Gripon, **Léonardon, Mathieu**, Matthieu Arzel, David Bertrand, and Thomas Hannagan. Investigating the Not-So-Obvious Effects of Structured Pruning. In *ICML 2022 - Hardware-aware efficient training (HAET)*, Baltimore, United States, July 2022.

2022   Hugo Tessier, Vincent Gripon, **Léonardon, Mathieu**, Matthieu Arzel, David Bertrand, and Thomas Hannagan. Energy Consumption Analysis of pruned Semantic Segmentation Networks on an Embedded GPU. In *SYSINT 2022: International Conference on System-Integrated Intelligence*, volume 546 of *International Conference on System-Integrated Intelligence*, pages 553–563, Genova, Italy, September 2022. Springer.

2021   **Léonardon, Mathieu** and Vincent Gripon. Using Deep Neural Networks to Predict and Improve the Performance of Polar Codes. In *ISTC 2021: 11th IEEE International Symposium on Topics in Coding*, Montréal, Canada, August 2021.

2021   Adrien Cassagne, **Léonardon, Mathieu**, Romain Tajan, Camille Leroux, Christophe Jégo, Olivier Aumage, and Denis Barthou. A Flexible and Portable Real-time DVB-S2 Transceiver using Multicore and SIMD CPUs. In *The 11th IEEE International Symposium on Topics in Coding (ISTC 2021)*, Montréal, Canada, August 2021.

2018   **Léonardon, Mathieu**, Camille Leroux, Pekka Jaaskelainen, Christophe Jego, and Yvon Savaria. Transport Triggered Polar Decoders. In *2018 IEEE 10th International Symposium on Turbo Codes & Iterative Information Processing (ISTC)*, pages 1–5, Hong Kong, Hong Kong SAR China, December 2018. IEEE.

2018   **Léonardon, Mathieu**, Camille Leroux, David Binet, J. M Pierre Langlois, Christophe Jego, and Yvon Savaria. Custom Low Power Processor for Polar Decoding. In *IEEE International Symposium on Circuits & Systems (ISCAS)*, 2018 IEEE International Symposium on Circuits and Systems (ISCAS), Florence, Italy, May 2018.

2017   Alireza Ghaffari, **Léonardon, Mathieu**, Yvon Savaria, Christophe Jego, and Camille Leroux. Improving performance of SCMA MPA decoders using estimation of conditional probabilities. In *2017 15th IEEE International New Circuits and Systems Conference (NEWCAS)*, pages 21–24, Strasbourg, France, June 2017. IEEE.

2017   Adrien Cassagne, Olivier Hartmann, **Léonardon, Mathieu**, Thibaud Tonnellier, Guillaume Delbergue, Camille Leroux, Romain Tajan, Bertrand Le Gal, Christophe Jego, Olivier Aumage, and Denis Barthou. Fast Simulation and Prototyping with AFF3CT. In *The 20th International Workshop on Signal Processing Systems (SiPS 2017)*, Lorient, France, October 2017.

Work Experience

ENSEIRB-Matmeca, France

Sep,2018 – **A Flexible and Portable Real-time DVB-S2 Transceiver using Multicore and SIMD CPUs**.
Dec, 2019 Developing a full Software Defined Radio communication chain for real-time processing for satellite communications with Airbus Defense & Space.

Advisor : **Pr. Christophe Jégo**, *Full Professor, Electrical Engineering Department*, Bordeaux INP (*LinkedIn*)

Worldcast Systems, France

Sep,2012 – **Design and Test of FM transmitters**.
Aug,2015 Participated in the design of Ecreso FM transmitters, created a Human-Machine Interface for production and customers.

Advisor : **Hervé Garat**, *R&D Engineer*,(*LinkedIn*)

Reviewer

IEEE SIPS, IEEE ISTC, GRETSI, IEEE NEWCAS, IEEE SysInt, MDPI Entropy

Computer skills

Programming C, C++, Python, PyTorch
Languages

HDL VHDL, Vivado HLS

Software Git, Gitlab CI, Linux, Inkscape

Research Supervising

Ph.D. students

2020-2023 **Hugo Tessier**, IMT Atlantique, Stellantis.

2021-present **Hugo Le Blevec**, IMT Atlantique.

2021-present **Lucas Grativol**, IMT Atlantique, Telecom Saint Etienne.

2022-present **Timotée Ly-Manson**, IMT Atlantique.

2022-present **Karl La Grassa**, IMT Atlantique, Polytechnique Montréal.

2022-present **Ismail Amessegher**, IMT Atlantique, University of Adelaide.

Post-doctoral researchers

2022-2023 **Hamoud Younes**, IMT Atlantique, GoodFloow.

2023-present **Hugo Tessier**, IMT Atlantique.

Teaching

2018-2019 **EN112: Digital Electronics Design**, ENSEIRB-Matmeca.

2018-2019 **EN102: Combinatorial and Sequential Logic**, ENSEIRB-Matmeca.

2018-2019 **EN103: Micro-controller project**, ENSEIRB-Matmeca.

2018-2019 **EN114: Computer Architecture**, ENSEIRB-Matmeca.

2018-2019 **MI202: Micro-controller project**, ENSEIRB-Matmeca.

2018-2019 **PG208: Object-Oriented Programmation with C++**, ENSEIRB-Matmeca.

2020-present **EFFDL: Efficient Deep Learning**, IMT Atlantique.

2020-present **SEIML: Embedded Systems - Software Hardware Interaction**, IMT Atlantique.

2020-present **ParPIng: Parallel Computing for Engineers**, IMT Atlantique.

Fundings Obtained

2023-2026	**ANR JCJC**, *250k€*, ProPruNN: Profitable Pruning of Neural Networks, Project Lead. ANR
2022-2024	**Labex CominLabs**, *325k€*, Leasard: Low Energy deep neural networks for Autonomous Search-And-Rescue Drones, Member.
2022-2024	**AI@IMT**, *120k€*, Leasard: Low Energy deep neural networks for Autonomous Search-And-Rescue Drones, Member. IMT
2022-2024	**GDR ISIS**, *7k€*, Furnitures. CNRS
2022	**Maupertuis visit program**, *1k€*. Institut Français Finland
2021-2024	**Futur et Ruptures**, *120k€*, FLCNNFPGA: Towards an efficient and privacy-protecting IoT through the use of federated learning and FPGA technologies, Member. IMT Atlantique

Visiting Researcher

As Guest

2022	**Tampere University**, *Finland*.