Maxime Vono

Ph.D. in Statistics

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▬▬ Research interests

My research interests lie in Bayesian modelling, the development of efficient computational methods for inferring unknown objects in complex problems and their applications to signal/image processing and machine learning.

My recent works focused on deriving a broad approximate statistical framework and associated Monte Carlo sampling approaches by taking inspiration from the variable splitting method in optimisation, e.g., used by quadratic penalty approaches and the alternating direction method of multipliers (ADMM).

Keywords: Bayesian inference, computational statistics, optimisation, Monte Carlo methods, signal and image processing, statistical machine learning.

▬▬ Education

2017-2020   **Ph.D. in Statistics**, ***University of Toulouse***, Toulouse.

Asymptotically exact data augmentation - Models and Monte Carlo sampling with applications to Bayesian inference, under the supervision of Nicolas Dobigeon and Pierre Chainais.

Defended on October 7, 2020. Ph.D. committee: Pierre Chainais (advisor), Emilie Chouzenoux (examiner), Nicolas Dobigeon (advisor), Jalal Fadili (referee), Florence Forbes (referee), Jean-Michel Marin (examiner) and Eric Moulines (president). Do not hesitate to contact Jalal Fadili and Florence Forbes if you need their reports.

I was awarded a competitive scholarship from CIMI Excellence Laboratory. *Rank: 1/50+*.

In spring 2019, I was a visiting research scholar at the **University of Oxford** in Arnaud Doucet's research group.

I was also a member of the ORION-B project which brings together observatorial astronomers, theoretical astrophysicists, data scientists and statisticians in order to analyse galactic and extra-galactic molecular line observations.

2016-2017   **M.Sc. in Applied Mathematics**, ***University of Lille***, Lille.

Major in **Probability & Statistics**: Itô calculus, statistics, stochastic processes. *Honours*.

Clearance pricing policy optimisation with an application to Leroy Merlin France pricing strategy, under the supervision of Azzouz Dermoune.

2013-2017   **M.Sc. in Engineering**, ***École Centrale de Lille***, Lille.

Major in **Data Analysis & Decision making (DAD):** optimisation, statistical estimation and learning. *Rank: 1/24. Top 2% (250 students)*.

▬▬ Work experience

apr. 2017 -
sep. 2017   **Data Scientist intern**, *Vekia*, Lille.

Machine learning techniques (random forests, sparse representations, time series, ...) applied to sales forecasting issues and supply chain management.
Led 4 major projects in different sectors: clothing, home improvement, food and health/beauty.

mar. 2016 -
sep. 2016   **Data Scientist intern**, *Leroy Merlin France*, Lille.

Daily revenue forecasting (time series). The derived revenue forecasting algorithm is currently used to anticipate potential losses with respect to initial objectives.

sep. 2015 -
feb. 2016   **Financial Auditor intern**, *EY*, Paris.

Financial statements analyses.

Industrial partnerships

2018 - 2019 **Intermarché**, *Strategy, Commercial Performance and Data direction*, Paris.
Consultancy missions in data strategy and sales/revenue forecasting (32 days).

2016 - 2017 **Leroy Merlin France**, *Pricing direction*, Lille.
Dynamic pricing in clearance and promotional events (stochastic processes, robust control, Itô calculus). The derived pricing strategy was tested on real sales transactions and has been proposed to some French brick-and-mortar stores.

Editorial activities

Refereeing for conferences

IEEE ICASSP Conferences, IEEE MLSP Workshops.

Refereeing for journals

Digital Signal Processing.

Seminars and invited talks

2020/09 **Seminar**, *Laplace's Demon Seminar*, Online.
"Efficient MCMC sampling using ADMM-type splitting"

2020/02 **Seminar**, *Actuarial Mathematics & Statistics Seminar*, School of Mathematics of Heriot Watt University, Edinburgh, United Kingdom.
"Asymptotically exact data augmentation: models, properties and algorithms"

2019/12 **Invited talk**, *Toulouse Inderdisciplinary group on Deep Learning*, Quai des Savoirs, Toulouse, France.
"Asymptotically exact data augmentation: models, properties and algorithms"

2019/12 **Invited talk**, *Workshop on optimization, probability and simulation*, Shenzhen Institute of Artificial Intelligence and Robotics for Society, University of Hong-Kong, Shenzhen, China.
"Asymptotically exact data augmentation: models, properties and algorithms"

2019/04 **Invited talk**, *Mews Digital Day*, Mews Partners, Toulouse, France.
"On artificial intelligence dedicated to supply chain and business strategy"

2019/03 **Seminar**, *OxCSML Seminar*, Department of Statistics, University of Oxford, Oxford, United Kingdom.
"Asymptotically exact data augmentation: models, properties and algorithms"

2018/05 **Seminar**, *CRIStAL Seminar*, Ecole Centrale de Lille, Lille, France.
"Split-and-augmented Gibbs sampler - A divide & conquer approach to solve large-scale inference problems"

Computer skills

Programming	MATLAB, Python, R
Documents	LaTeX, Microsoft Office

Languages

French	Mother tongue
English	Fluent
Spanish	Fluent

Publications

Synthetic summary of the scientific production (submitted as gray subscripts)

	total		2020	2019	2018
international journal	4^{+3}	$=$	3	1	
international conference	4	$=$		3	1
national conference	2	$=$		2	

Bibliometric indicators (source: Google Scholar, October 2020)

Citations : 46

H-index : 4

Full list of publications

Submitted papers

[S1] **M. Vono**, N. Dobigeon, and P. Chainais, *High-dimensional Gaussian sampling: A review and a unifying approach based on a stochastic proximal point algorithm*. arXiv: 2010.01510.

[S2] P. Gratier, J. Pety, E. Bron, A. Roueff, J. H. Orkisz, M. Gerin, V. de Souza Magalhaes, M. Gaudel, **M. Vono**, S. Bardeau, J. Chanussot, P. Chainais, J. R. Goicoechea, V. V. Guzmán, A. Hughes, J. Kainulainen, D. Languignon, J. Le Bourlot, F. Le Petit, F. Levrier, H. Liszt, N. Peretto, E. Roueff, and A. Sievers, *Quantitative inference of the H_2 column densities from 3 mm molecular emission: A case study towards Orion B*. arXiv: 2008.13417.

[S3] **M. Vono**, D. Paulin, and A. Doucet, *Efficient MCMC sampling with dimension-free convergence rate using ADMM-type splitting*. arXiv: 1905.11937.

International journal papers

[JI1] **M. Vono**, N. Dobigeon, and P. Chainais (2020), *Asymptotically exact data augmentation: models, properties and algorithms*, Journal of Computational and Graphical Statistics (in press).

[JI2] E. Bron, E. Roueff, M. Gerin, J. Pety, P. Gratier, F. Le Petit, V. Guzmán, J. H. Orkisz, V. de Souza Magalhaes, M. Gaudel, **M. Vono**, S. Bardeau, P. Chainais, J. R. Goicoechea, A. Hughes, J. Kainulainen, D. Languignon, J. Le Bourlot, F. Levrier, H. Liszt, K. Oberg, N. Peretto, A. Roueff, and A. Sievers (2020), *Tracers of the ionization fraction in dense and translucent gas. I. Automated exploitation of massive astrochemical model grids*, Astronomy & Astrophysics (in press).

[JI3] A. Roueff, M. Gerin, P. Gratier, F. Levrier, J. Pety, M. Gaudel, J. R. Goicoechea, J. H. Orkisz, V. de Souza Magalhaes, **M. Vono**, S. Bardeau, E. Bron, J. Chanussot, P. Chainais, V. V. Guzman, A. Hugues, J. Kainulainen, D. Languignon, J. Le Bourlot, F. Le Petit, H. S. Liszt, A. Marchal, M.-A. Miville-Deschenes, N. Peretto, E. Roueff, and A. Sievers (2020), *C18O, 13CO, and 12CO abundances and excitation temperatures in the Orion B molecular cloud* , Astronomy & Astrophysics (in press).

[JI4] **M. Vono**, N. Dobigeon, and P. Chainais (2019). *Split-and-augmented Gibbs sampler - Application to large-scale inference problems*, IEEE Transactions on Signal Processing, vol. 67, no. 6, pp. 1648-1661.

International conference papers

[CI1] **M. Vono**, E. Bron, P. Chainais, F. L. Petit, S. Bardeau, S. Bourguignon, J. Chanussot, M. Gaudel, M. Gerin, J. R. Goicoechea, P. Gratier, V. V. Guzmán, A. Hughes, J. Kainulainen, D. Languignon, J. L. Bourlot, F. Levrier, H. S. Listz, K. I. Oberg, J. H. Orkisz, N. Peretto, J. Pety, A. Roueff, E. Roueff, A. Sievers, V. de Souza Magalhaes, and P. Tremblin (2019), *A fully Bayesian approach for inferring physical properties with credibility intervals from noisy astronomical data*, in Proc. Workshop on Hyperspectral Imaging and Signal Processing: Evolution in Remote Sensing (WHISPERS), Amsterdam, Netherlands

[CI2] **M. Vono**, N. Dobigeon, and P. Chainais (2019), *Image restoration under Poisson noise and log-concave prior*, in Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Brighton, U.K.

[CI3] **M. Vono**, N. Dobigeon, and P. Chainais (2019), *Efficient sampling through variable splitting-inspired Bayesian hierarchical models*, in Proc. International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Brighton, U.K.

[CI4] **M. Vono**, N. Dobigeon, and P. Chainais (2018), *Sparse Bayesian binary logistic regression using the split-and-augmented Gibbs sampler*. In Proc. IEEE International Workshop on Machine Learning for Signal Processing (MLSP), Aalborg, Denmark. *Finalist for the Best Student Paper Awards*.

National conference papers

[CN1] **M. Vono**, N. Dobigeon, and P. Chainais (2019), *Modèles augmentés asymptotiquement exacts*, in Proc. GRETSI, Lille, France

[CN2] **M. Vono**, N. Dobigeon, and P. Chainais (2019), *Un modèle augmenté asymptotiquement exact pour la restauration bayésienne d'images dégradées par un bruit de Poisson*, in Proc. GRETSI, Lille, France