Nicolas Chopin

Professor of data sciences

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Experience

Sept. 2006–to date **Professor of data sciences**, *ENSAE, IPP*, Palaiseau, France

2003–2006 **Lecturer in Statistics**, *Bristol University*, UK

2002–2003 **Statistical methodologist**, *UMS-INSEE*, Paris, France

1999–2002 **Junior Lecturer in Statistics**, *ENSAE*, Malakoff, France

Education

2010 **Habilitation à Diriger des recherches**, *Université Paris Dauphine*
(French habilitation to supervise Ph.D. students, Viva 1st Dec. 2010)

1999–2003 **Ph.D. thesis in Statistics**, *Université Paris VI*, supervisor: Pr C.P. Robert
Sequential Monte Carlo methods and their applications to Bayesian inference.

1997–1999 **Msc. in Economics and Statistics**, *ENSAE*

1994–1997 **Msc. in Engineering**, *Ecole Polytechnique*

Research Interests

I am interested in Bayesian computation in a general sense, that is, the development of numerical methods to perform Bayesian learning and inference. I am particularly interested in:

- Monte Carlo methods, especially Sequential Monte Carlo (particle filtering): theory (convergence properties, etc), methodology, and applications; Importance sampling, Markov chain Monte Carlo (MCMC), and recently quasi-Monte Carlo.
- Deterministic approximations: Laplace, Variational Bayes and Expectation Propagation.

I am also interested in Bayesian modelling and practical applications: I am collaborating or have collaborated with scientists from different areas of Science, such as cosmology, neuro-sciences, and (very recently) public health.

Awards, distinctions and grants

- **Keynote speaker:** MCM 2025 (Chicago), ISBA 2018 (Edinburgh), MCQMC 2016 (Stanford)
- Fellow of the IMS (Institute of Mathematical Statistics), 2020
- ANR grant B3DCMB, 2017-2021, 145 KE; (Big Bang à partir de Big Data (du fond diffus cosmologique)
- CREST coordinator of 'SP Bayes' (Statistique Bayésienne semi-paramétrique) ANR Project led by J. Rousseau (2008-10)

- EPSRC first grant EP/C015886/1, Oct 2005 - Oct 2008, £74.000 ; 'Novel Applications of Sequential Monte Carlo'. (Grant awarded on a competitive basis.)
- 2002 Leonard J. Savage Award for an outstanding doctoral dissertation in Bayesian econometrics and statistics ('Theory and Methods' section), International Society for Bayesian Analysis.

Teaching

- **ENSAE**: "Introduction to Stochastic processes" (2nd year, 20 hrs), "Statistique 1" (2nd year, 20 hrs, 2006-2018), "Monte Carlo and simulation" (2nd year, 16 hrs), "State-space models and sequential Monte Carlo (3rd year, 18 hrs)
- **Master M2 MVA**: "Probabilistic Graphical models" (M2, half of the 24h course)
- **Université Paris Dauphine**: "Hidden-Markov models and Particle methods" (M2, 18 hours, 2007 to 2015); "Time Series" (M1, 20 hours, 2008-09)
- **HEC Paris**: "Statistique" (L3, 50 hrs, 2011-2017)
- **HEC Lausanne**: "Introduction to Time series" (Msc, 28 hours, 2009-2014)
- **Bristol University**: Bayesian Analysis (18 hours, lvl 3, 2003-06), Introduction to Statistics (18 hours, lvl 2, 2003-06)
- **Ecole Polytechnique**: "chargé de cours incomplet" (60 hours, 2007-08)
- **Universita dell'Insubria**: Bayesian Analysis (18 hours, 2005)

Academic Responsibilities

- **Editor:** J. Roy. Stat. Soc. B (2026-2028).
- **Associate Editor:** Annals of Statistics (2019 to date); Biometrika (2018 to date); J. Roy. Stat. Soc. B (2012-2020); Stats & Comp. (2013-2017); Stat. Methods and Appl. (2012-2015); member (2013-14) and secretary (2015-16) of the research section of the RSS.
- **Membership:** American Statistical Association (ASA), Inst. of Mathematical Statistics (IMS), Royal Statistical Society (RSS), International Society for Bayesian Analysis (ISBA).
- **Post-doc supervision:** Andrea Pandolfi (2025-27), Francesca Crucinio (2023).
- **Ph.D. supervision:** Aleksei Arzhantsev (2026-29), Yuedan Huo (2025-28), Yvann Le Fay (2024-27), Sylvain Procope-Mamert (2023-26), Otmane Sakhi (2020-23, Criteo), Younès Youssfi (2020-23), Hai-Dang Dau (2019-22), Gabriel Ducrocq (2019-22), Lionel Riou-Durand (2016-19, post-doc at Warwick U), Alexander Buchholz (2015-18, Amazon), Charles Findling (2015-18, co-supervision at ENS), Vincent Cottet (2014-17, French administration), Mathieu Gerber (2012-15, Bristol University), James Ridgway (2012-15, Capital Fund Management), Pierre Jacob (2009-12, co-supervision, assistant prof at Havard U), Christian Schäfer (2009-2012, Dept), Giusi Moffa (Bristol, 2005-06), Elisa Varini (Bristol, 2004-05, co-supervision, CNR)
- **Ph.D. examiner:** Eleonore Blanchard (2026), David Xu (UBC, 2025), Andrea Pandolfi (Bocconi, 2025), Luc de Montella (INRIA Bordeaux, 2025), Jacopo Iollo (INRIA Grenoble, 2025), Antoine Picard (INRIA Lille, 2025), Charly Andral (Dauphine, 2024), Roberta Flenghi (Les Ponts, 2023), Francesca Crucinio (Warwick, 2021), Tobias Schwedes (Imperial, 2019), Jordan Franks (Jyväskylä, 2019), Daniel W. Kennedy (QUT, 2019), Changye Wu (Dauphine, 2018), Jeremy Heng (Oxford, 2016), Van Bien Bui (Nice, 2016), Damien Juery (Montpellier, 2014), Yohan Petetin (Télécom Sud-Paris, 2014), Paul Bui Quang (Rennes, 2013), Sinan Yildirim (Cambridge, 2012), Salima El Kolei (Nice, 2012), Mohamed Sedki (Montpellier, 2012), Anthony Lee (Oxford, 2011), Meïli Baragatti (Marseille, 2011), Nicole White (QUT, 2011), Hugo Hammer (Trondheim, 2008), Zhen Liu (Lancaster, 2008), Adam Johansen (Cambridge, 2006), David Hastie (Bristol, 2004).

- **Conference organisation:** Master class in Bayesian Statistics (CIRM, Oct 2018), SMC 2015 (Paris, 26-28 Aug), NeuroStats 2014 (Warwick, 3-5 Sept)
- **Visits:** Postdam (Aug 2022), Yale (Feb 2019), Oxford (Apr 2017), Pompeu Fabra, Barcelone (May 2013), INRIA Bordeaux (Jul 2011), Cambridge (Oct 2010, Jan 2008, Apr 2007), Lisboa (Nov 2010), Insubria (Nov 2005), Trondheim (March 2013, Sept 2005), Bank of Canada (Sept 2004).

Book

- Chopin, N. and Papaspiliopoulos, O. (2020). An introduction to Sequential Monte Carlo, Springer, doi: 10.1007/978-3-030-47845-2.

Publications

[1] Y. L. Fay, N. Chopin, and S. Barthelmé. Least squares variational inference. **Advances in Neural Information Processing Systems** (2025).

[2] N. Chopin, H. Wang, and M. Gerber. Adaptive stratified Monte Carlo using decision trees. **Stat. Comput.** 35.193 (2025).

[3] M. Xi, Z. Shen, M. Riabiz, N. Chopin, and C. J. Oates. Extrapolation of tempered posteriors. **arxiv 2509.12173** (Sept. 2025).

[4] N. Chopin, F. R. Crucinio, and S. S. Singh. Towards a turnkey approach for unbiased Monte Carlo estimation of smooth functions of expectations. **Biometrika** 112.3 (2025).

[5] T. Voldoire, N. Chopin, G. Rateau, and R. J. Ryder. Saddlepoint Monte Carlo and its application to exact ecological inference. **arxiv 2410.18243** (Oct. 2024).

[6] C. Andrieu, N. Chopin, E. Fincato, and M. Gerber. Gradient-free optimization via integration. **arxiv 2408.00888** (Aug. 2024).

[7] O. Sakhi, I. Aouali, P. Alquier, and N. Chopin. Logarithmic Smoothing for Pessimistic Off-Policy Evaluation, Selection and Learning. **Advances in Neural Information Processing Systems** 37 (2024), 80706–80755.

[8] N. Chopin, F. R. Crucinio, and A. Korba. A connection between tempering and entropic mirror descent. **Forty-first International Conference on Machine Learning**. 2024.

[9] N. Chopin and M. Gerber. Higher-order Monte Carlo through cubic stratification. **SIAM J. Numer. Anal.** 62.1 (2024), 229–247.

[10] Y. Youssfi and N. Chopin. Scalable Bayesian bi-level variable selection in generalized linear models. **Foundations of Data Science** 7.4 (2024), 1020–1033.

[11] R. Jin, S. S. Singh, and N. Chopin. De-biasing particle filtering for a continuous time hidden Markov model with a Cox process observation model. **Statist. Sinica** 34 (2024), 1215–1239.

[12] O. Sakhi, D. Rohde, and N. Chopin. Fast Slate Policy Optimization: Going Beyond Plackett-Luce. **Transactions on Machine Learning Research** (2023).

[13] A. Corenflos, M. Sutton, and N. Chopin. Debiasing piecewise deterministic Markov process samplers using couplings. **Scandinavian Journal of Statistics** (in print) ().

[14] O. Sakhi, P. Alquier, and N. Chopin. PAC-Bayesian Offline Contextual Bandits With Guarantees. **Proceedings of the 40th International Conference on Machine Learning**. Ed. by A. Krause et al. Vol. 202. Proceedings of Machine Learning Research. PMLR, 23–29 Jul 2023, 29777–29799.

[15] H.-D. Dau and N. Chopin. On backward smoothing algorithms. **Ann. Statist.** 51.5 (2023), 2145–2169.

[16] N. Chopin, A. Fulop, J. Heng, and A. H. Thiery. Computational Doob h-transforms for Online Filtering of Discretely Observed Diffusions. **Proceedings of the 40th International Conference on Machine Learning**. Ed. by A. Krause et al. Vol. 202. Proceedings of Machine Learning Research. PMLR, 23–29 Jul 2023, 5904–5923.

[17] N. Chopin, S. S. Singh, T. Soto, and M. Vihola. On resampling schemes for particle filters with weakly informative observations. **Ann. Statist.** 50.6 (2022), 3197–3222.

[18] A. Corenflos, N. Chopin, and S. Särkkä. De-Sequentialized Monte Carlo: a parallel-in-time particle smoother. **Journal of Machine Learning Research** 23.283 (2022), 1–39.

[19] G. Ducrocq, N. Chopin, J. Errard, and R. Stompor. Improved Gibbs samplers for cosmic microwave background power spectrum estimation. **Phys. Rev. D** 105 (10 May 2022), 103501.

[20] H.-D. Dau and N. Chopin. Waste-free sequential Monte Carlo. **J. R. Stat. Soc. Ser. B. Stat. Methodol.** 84.1 (2022), 114–148.

[21] N. Chopin and G. Ducrocq. Fast compression of MCMC output. **Entropy** 23.8 (2021), Paper No. 1017, 16.

[22] A. Buchholz, N. Chopin, and P. E. Jacob. Adaptive tuning of Hamiltonian Monte Carlo within sequential Monte Carlo. **Bayesian Anal.** 16.3 (2021), 745–771.

[23] D. Alvares, C. Armero, A. Forte, and N. Chopin. Sequential Monte Carlo methods in Bayesian joint models for longitudinal and time-to-event data. **Stat. Model.** 21.1-2 (2021), 161–181.

[24] C. Findling, N. Chopin, and E. Koechlin. Imprecise neural computations as a source of adaptive behaviour in volatile environments. **Nature Human Behaviour** (2020), 1–14.

[25] M. Gerber, N. Chopin, and N. Whiteley. Negative association, ordering and convergence of resampling methods. **Ann. Statist.** 47.4 (2019), 2236–2260.

[26] A. Buchholz and N. Chopin. Improving Approximate Bayesian Computation via Quasi-M onte Carlo. **J. Comput. Graph. Statist.** 28.1 (2019), 205–219.

[27] C. Andrieu, A. Doucet, S. Yildirim, and N. Chopin. On the utility of Metropolis-Hastings with asymmetric acceptance ratio. **arXiv e-prints**, arXiv:1803.09527 (Mar. 2018).

[28] L. Riou-Durand and N. Chopin. Noise contrastive estimation: asymptotic properties, formal comparison with MC-MLE. **Electron. J. Stat.** 12.2 (2018), 3473–3518.

[29] N. Chopin and M. Gerber. Sequential quasi–Monte Carlo: introduction for non-experts, dimension reduction, application to partly observed diffusion processes. **Monte Carlo and quasi–Monte Carlo methods**. Vol. 241. Springer Proc. Math. Stat. Springer, Cham, 2018, 99–121.

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[32] S. Vasishth, B. Nicenboim, N. Chopin, and R. Ryder. Bayesian Hierarchical Finite Mixture Models of Reading Times: A Case Study. **PsyArXiv** (July 2017).

[33] C. J. Oates, M. Girolami, and N. Chopin. Control functionals for Monte Carlo integration. **J. R. Stat. Soc. Ser. B. Stat. Methodol.** 79.3 (2017), 695–718.

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[35] N. Chopin and J. Ridgway. Leave Pima Indians alone: binary regression as a benchmark for B ayesian computation. **Statist. Sci.** 32.1 (2017), 64–87.

[36] C. Schretter, Z. He, M. Gerber, N. Chopin, and H. Niederreiter. Van der Corput and golden ratio sequences along the Hilbert space-filling curve. **Monte Carlo and quasi-Monte Carlo methods**. Vol. 163. Springer Proc. Math. Stat. Springer, [Cham], 2016, 531–544.

[37] P. Alquier, J. Ridgway, and N. Chopin. On the properties of variational approximations of Gibbs posteriors. **J. Mach. Learn. Res.** 17.239 (2016), Paper No. 239, 41.

[38] S. Barthelmé, N. Chopin, and V. Cottet. Divide and conquer in ABC: expectation-propagation algorithms for likelihood-free inference. **Handbook of approximate Bayesian computation**. Chapman & Hall/CRC Handb. Mod. Stat. Methods. CRC Press, Boca Raton, FL, 2019, 415–434.

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[57] N. Chopin and C. Robert. Discussion of "Catching up faster by switching sooner: a predictive approach to adaptive estimation with an application to the AIC–BIC dilemma" by Erven, Tim van and Grünwald, Peter and de Rooij, Steven. **Journal of the Royal Statistical Society (series B)** 74.3 (2012), 361–417.

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[59] N. CHOPIN, T. LELIÈVRE, and G. STOLTZ. Free energy methods for Bayesian inference: efficient exploration of univariate Gaussian mixture posteriors. **Stat. Comput.** 22.4 (22 2012), 897–916.

[60] S. BARTHELMÉ et al. Discussions on "Riemann manifold Langevin and Hamiltonian M onte Carlo methods" by M. Girolami and B. Caldherhead. **Journal of the Royal Statistical Society (series B)** 73.2 (2011), 123–214.

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[62] N. CHOPIN and O. PAPASPILIOPOULOS. Comments on "Bayesian variable selection for random intercept modeling of Gaussian and non-Gaussian Data" by Frühwirth-Schnatter, S. and Wagner, H. **Bayesian Statistics 9**. Ed. by J. M. BERNARDO et al. Oxford University Press, 2011, 165–200.

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[65] N. CHOPIN et al. On Particle Learning; comments on "Particle learning for sequential Bayesian computation" by Lopes, Carvalho, Johannes, and Polson. **Bayesian Statistics 9**. Ed. by J. M. BERNARDO et al. Oxford University Press, 2011, 317–360.

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[81] N. Chopin. Inference and model choice for sequentially ordered hidden Markov models. **J. R. Stat. Soc. Ser. B Stat. Methodol.** 69.2 (2007), 269–284.

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