George Deligiannidis

Department of Statistics
24-29 St Giles
OX1 3LB, Oxford

Email: deligian@stats.ox.ac.uk
URL: http://www.stats.ox.ac.uk/~deligian

Summary

I am professor at the Department of statistics of the University of Oxford, specialising in statistical machine learning and computational statistics. At the moment I am interested in generative AI, in particular diffusion models and flow matching. I have worked extensively on sampling methods, including Markov chain Monte Carlo. My research gets regularly published in top statistical journals and peer reviewed conferences.

Current position

2024– **Professor of Statistics**, Department of Statistics, University of Oxford
2017– **Director of MSc in Statistical Science**, Department of Statistics, University of Oxford
2017– **Senior Research Fellow in Statistics**, Jesus College, University of Oxford

Past appointments

2017–24 *Associate Professor of Statistics*, Department of Statistics, University of Oxford
2018–21 *Turing Fellow*, the Alan Turing Institute, London
2016–17 *Lecturer in Statistics*, Department of Mathematics, King's College London
2012–16 *Departmental Lecturer*, Department of Statistics, University of Oxford
2009–12 *Teaching Fellow in Mathematics*, Department of Mathematics, University of Leicester

Education

2006-10 PhD in Statistics, University of Nottingham
Supervisors: S. Utev and H. Le
2005-06 MSc in Financial Mathematics, University of Edinburgh and Heriot-Watt University
2001-05 MMath University of Warwick

Grants and awards

• EPSRC New Investigator Award, EP/Y018273/01, *Theory for Denoising Diffusion Models: generalisation and sample complexity*, £524,406

Research Visits

Jan 2020 *Short Term Visitor*, Institute for Advanced Study, Princeton, US
May 2017 *Short Term Visit*, Harvard University, Cambridge, US
April 2016 *Visiting Researcher*, Nicta, Sydney, AU

Teaching

University of Oxford

2022- Foundations of Statistical Inference (UG/PG)
2020 Statistical Programming (UG)
'16, 18-19 SC5 Advanced Simulation Methods (UG/PG)
2012–16 Actuarial Science (UG/PG)
2012–15 Introduction to Probability and Statistics for Human Scientists (UG)
2019– Modern Statistics, STATML CDT Core module, shared with A. Young (PhD course)
2024– Generative Models, STATML CDT Optional module, shared with D. Akyildiz (PhD course)
College teaching: Probability, Statistics, Analysis, Complex Analysis, Discrete Mathematics, Optimization

King's College London

2016-17 Probability and Statistics II (UG)

University of Leicester

Probability (UG) Applied Statistics (PG) Financial Engineering (PG)

Administration

2017– Director of MSc Statistical Science, Dept. of Statistics, Oxford
2023– Academic Steering Committee, Schmidt AI Futures fellowship
2017– Admissions lead, MSc in Statistical Science, Dept of Statistics, Oxford
2019– General Purpose Committee, Dept. of Statistics, Oxford
2019– Graduate Liaison Group, Dept. of Statistics, Oxford
2015– Teaching Committee, Sept. of Statistics, Oxford
2017 Statistics Seminar Organizer, Dept. of Mathematics, KCL
2016-17 Department Education Committee, Dept. of Mathematics, KCL
2013-15 Career Development working group, Dept. of Statistics, Oxford
2010-12 Learning and Teaching Committee, Dept of Mathematics, University of Leicester

Doctoral (Co-)Supervision

Graduated

1. R. Cornish (Florence Nightingale Fellow, Oxford)
2. S. Schmon (Latent Labs)
3. J. Thornton (Deepmind)
4. E. Clerico (Postdoc, Pompeu Fabra)
5. F. Faizi (BT)
6. L. Middleton (AstraZeneca)
7. J. Benton (Anthropic AI)

Current

1. A. Shidani
2. C. Williams
3. M. Tapia Costa(Imperial, Stat.ML CDT)
4. A. Goyal(Imperial)
5. G. Dhillon
6. P. Potapchik
7. I. Azangulov
8. S. Howard
9. T. Farghly
10. K. Lam

11. T. Schwarz, (Mathematics of Random Systems CDT)
12. M. El Khribch (Essec, Paris)

Visiting students

1. G. Batzolis (Cambridge, MT 23)
2. R. Santet (Paris, MT 23)
3. L. Baker (Copenhage, MT24)

Service to the profession

2024- Chair of the Academic Steering Committee– Schmidt AI in Science, Oxford
2021- Committee of Oxford chapter of the Royal Statistical Society
2023- Associate Editor, ACM Transactions of Probabilistic Machine Learning
2023- Associate Editor, Statistics and Computing

Refereeing

• Annals of Statistics • Annals of Applied Probability • JRSS B • Journal of Uncertainty Quantification • Stochastics • AIHP • Statistics and Computing • Statistics and Probability Letters • Journal of Mathematical Analysis and Applications • JASA • Bernoulli • IMA Journal of Mathematical Control and Information • JUQ • NeurIPS • AISTATS • ICML • UAI • JMLR

Selected Invited Talks

2024 Cambridge, Statslab Seminar, April 2024
2023 Warwick Statistics seminar, June 2023
14th International Conference on Monte Carlo Methods and Applications, Paris, June 2023
2022 Athens Probability Colloquium 2023, March 2023 Prairie Colloquium, December 2022
Second Congress of Greek Mathematicians 2022
IMS Annual Meeting, London, June 2022
ESSEC Statistics Seminar , May 2022
Inference for expensive systems in math. biology, Oxford 2022
Second Congress of Greek Mathematicians, Athens, July 2022
2021 AUEB Statistics Seminar, October 2021
Imperial Statistics Seminar, October 2021
2020 Session on PDMPs and hypo-coercivity, MCQMC, Oxford, 2020
Mathematical Conversations, Institute for Advanced Study, Princeton, 2020
Bayescomp, Florida 2020
2019 European Meeting of Statisticians, Palermo 2019
Probability Seminar, Warwick, February 2019.
SIAM Conference on High Dimensional Inference and Monte Carlo Techniques, Warwick 2019
2018 Statistics Seminar, Bristol, October 2018.
Bayesian Computation for High-Dimensional Statistical Models, IMS, Singapore, September 2018.
Opening talk of Applied Mathematics Session, 3rd UK India Frontiers of Science Meeting, Royal Society, Chicheley Hall, May 2018.
BayesComp, Session on PDMPs, Barcelona, March 2018.
Machine Learning Seminar, Department of Information Technology, Uppsala, January 2018.
2017 Department of Statistics, Warwick, June 2017.
Department of Statistics, Harvard University, May 2017.

Publications

Peer reviewed conference papers

[1] J. Pidstrigach, E. Baker, C. Domingo-Enrich, G. Deligiannidis, and N. Nüsken. "Conditioning Diffusions Using Malliavin Calculus". In: *accepted at ICML 2025* (2025). arXiv: 2504.03461.

[2] P. Potaptchik, I. Azangulov, and G. Deligiannidis. "Linear Convergence of Diffusion Models Under the Manifold Hypothesis". In: *Accepted at **COLT 2025*** (2025). arXiv: 2410.09046.

[3] J. Benton, V. De Bortoli, A. Doucet, and G. Deligiannidis. "Linear Convergence Bounds for Diffusion Models via Stochastic Localization". In: ***ICLR** (**spotlight**)* (2024).

[4] G. S. Dhillon, G. Deligiannidis, and T. Rainforth. "On the expected size of conformal prediction sets". In: *AISTATS*. PMLR. 2024, pp. 1549–1557.

[5] A. Phillips, H.-D. Dau, M. J. Hutchinson, V. De Bortoli, G. Deligiannidis, and A. Doucet. "Particle Denoising Diffusion Sampler". In: *accepted at **ICML** 2024*. 2024. arXiv: 2402.06320.

[6] A. Shidani, G. Deligiannidis, and A. Doucet. "Ranking in Generalized Linear Bandits". In: *Workshop on Recommendation Ecosystems: Modeling, Optimization and Incentive Design*. 2024.

[7] E. Clerico, G. Deligiannidis, and A. Doucet. "Wide stochastic networks: Gaussian limit and PAC-Bayesian training". In: *International Conference on Algorithmic Learning Theory*. PMLR. 2023, pp. 447–470.

[8] B. Dupuis, G. Deligiannidis, and U. Şimşekli. "Generalization Bounds with Data-dependent Fractal Dimensions". In: ***ICML** 2023* (2023).

[9] C. Williams, F. Falck, G. Deligiannidis, C. C. Holmes, A. Doucet, and S. Syed. "A Unified Framework for U-Net Design and Analysis". In: ***NeurIPS*** 36 (2023).

[10] A. Campbell, J. Benton, V. De Bortoli, T. Rainforth, G. Deligiannidis, and A. Doucet. "A Continuous Time Framework for Discrete Denoising Models". In: ***NeurIPS 2022** (oral)* (2022).

[11] E. Clerico, G. Deligiannidis, and A. Doucet. "Conditionally gaussian pac-bayes". In: *International Conference on Artificial Intelligence and Statistics*. PMLR. 2022, pp. 2311–2329.

[12] E. Clerico, A. Shidani, G. Deligiannidis, and A. Doucet. "Chained generalisation bounds". In: *Conference on Learning Theory*. PMLR. 2022, pp. 4212–4257.

[13] O. Clivio, F. Falck, B. Lehmann, G. Deligiannidis, and C. Holmes. "Neural score matching for high-dimensional causal inference". In: *International Conference on Artificial Intelligence and Statistics*. PMLR. 2022, pp. 7076–7110.

[14] F. Falck, C. Williams, D. Danks, G. Deligiannidis, C. Yau, C. Holmes, A. Doucet, and M. Willetts. "A Multi-Resolution Framework for U-Nets with Applications to Hierarchical VAEs". In: ***NeurIPS** 2022 (**Oral**)* (2022).

[15] Y. Shi, V. De Bortoli, G. Deligiannidis, and A. Doucet. "Conditional Simulation Using Diffusion Schrödinger Bridges". In: *UAI 2022*. 2022. arXiv: 2202.13460.

[16] A. Camuto, G. Deligiannidis, M. A. Erdogdu, M. Gurbuzbalaban, U. Simsekli, and L. Zhu. "Fractal structure and generalization properties of stochastic optimization algorithms". In: ***NeurIPS** (**Spotlight**)* 34 (2021).

[17] A. Corenflos, J. Thornton, G. Deligiannidis, and A. Doucet. "Differentiable particle filtering via entropy-regularized optimal transport". In: ***ICML** (**Long Oral**)*. PMLR. 2021, pp. 2100–2111.

[18] S. Hayou, E. Clerico, B. He, G. Deligiannidis, A. Doucet, and J. Rousseau. "Stable resnet". In: *AISTATS (Oral)*. PMLR. 2021, pp. 1324–1332.

[19] R. Cornish, A. Caterini, G. Deligiannidis, and A. Doucet. "Relaxing bijectivity constraints with continuously indexed normalising flows". In: ***ICML***. PMLR. 2020, pp. 2133–2143.

[20] U. Simsekli, O. Sener, G. Deligiannidis, and M. A. Erdogdu. "Hausdorff dimension, heavy tails, and generalization in neural networks". In: ***NeurIPS** (**Spotlight**)* 33 (2020), pp. 5138–5151.

[21] R. Cornish, P. Vanetti, A. Bouchard-Côté, G. Deligiannidis, and A. Doucet. "Scalable Metropolis-Hastings for exact Bayesian inference with large datasets". In: ***ICML** (**Long oral**)*. 2019.

[22] L. Middleton, G. Deligiannidis, A. Doucet, and P. E. Jacob. "Unbiased smoothing using particle independent Metropolis-Hastings". In: *AISTATS 2019, (Oral)*. PMLR. 2019, pp. 2378–2387.

[23] S. M. Schmon, A. Doucet, and G. Deligiannidis. "Bernoulli race particle filters". In: *AISTATS*. PMLR. 2019, pp. 2350–2358.

Journal Papers

[24] J. Benton, G. Deligiannidis, and A. Doucet. "Error Bounds for Flow Matching Methods". In: *Transactions on Machine Learning Research* (2024). ISSN: 2835-8856. URL: https://openreview.net/forum?id=uqQPyWFDhY.

[25] J. Benton, Y. Shi, V. De Bortoli, G. Deligiannidis, and A. Doucet. "From denoising diffusions to denoising Markov models". In: ***Journal of the Royal Statistical Society, Series B(discussion paper)*** 86.2 (2024), pp. 286–301.

[26] G. Deligiannidis, V. de Bortoli, and A. Doucet. "Quantitative uniform stability of the iterative proportional fitting procedure". In: ***Annals of Applied Probability*** 34.1A (2024), pp. 501–516.

[27] B. Dupuis, P. Viallard, G. Deligiannidis, and U. Simsekli. "Uniform Generalization Bounds on Data-Dependent Hypothesis Sets via PAC-Bayesian Theory on Random Sets". In: *Journal of Machine Learning Research* 25.409 (2024), pp. 1–55. URL: http://jmlr.org/papers/v25/24-0605.html.

[28] S. Syed, A. Bouchard-Côté, G. Deligiannidis, and A. Doucet. "Non-reversible parallel tempering: a scalable highly parallel MCMC scheme". In: ***Journal of the Royal Statistical Society, Series B*** 84 (2 2022).

[29] G. Deligiannidis, S. Gouëzel, and Z. Kosloff. "Boundary of the Range of a random walk and the Følner property". In: *Electronic Journal of Probability* 26 (2021), pp. 1–39.

[30] G. Deligiannidis, S. Maurer, and M. V. Tretyakov. "Random walk algorithm for the Dirichlet problem for parabolic integro-differential equation". In: *BIT Numerical Mathematics* 61.4 (2021), pp. 1223–1269.

[31] G. Deligiannidis, D. Paulin, A. Bouchard-Côté, and A. Doucet. "Randomized Hamiltonian Monte Carlo as scaling limit of the bouncy particle sampler and dimension-free convergence rates". In: ***Annals of Applied Probability*** 31 (6 2021), pp. 2612–2662.

[32] F. Faizi, P. J. Buigues, G. Deligiannidis, and E. Rosta. "Simulated tempering with irreversible Gibbs sampling techniques". In: *The Journal of Chemical Physics* 153.21 (2020), p. 214111.

[33] F. Faizi, G. Deligiannidis, and E. Rosta. "Efficient irreversible Monte Carlo samplers". In: *Journal of Chemical Theory and Computation* 16.4 (2020), pp. 2124–2138.

[34] J. Heng, A. N. Bishop, G. Deligiannidis, and A. Doucet. "Controlled sequential monte carlo". In: ***Annals of Statistics*** 48.5 (2020), pp. 2904–2929.

[35] L. Middleton, G. Deligiannidis, A. Doucet, and P. E. Jacob. "Unbiased Markov chain Monte Carlo for intractable target distributions". In: *Electronic Journal of Statistics* 14.2 (2020), pp. 2842–2891.

[36] S. M. Schmon, G. Deligiannidis, A. Doucet, and M. K. Pitt. "Large sample asymptotics of the pseudo-marginal method". In: ***Biometrika*** 108.1 (2020), pp. 37–51.

[37] G. Deligiannidis, A. Bouchard-Côté, and A. Doucet. "Exponential Ergodicity of the Bouncy Particle Sampler". In: ***Annals of Statistics*** 47.3 (2019), pp. 1268–1287.

[38] G. Deligiannidis and A. Lee. "Which ergodic averages have finite asymptotic variance?" In: ***Annals of Applied Probability*** 28.4 (2018), pp. 2309–2334.

[39] G. Deligiannidis and Z. Kosloff. "Relative Complexity of Random Walks in Random Scenery in the absence of a weak invariance principle for the local times". In: ***Annals of Probability*** 45.4 (2017), pp. 2505–2532.

[40] G. Deligiannidis and S. Utev. "Optimal bounds for the variance of self-intersection local times". In: *International Journal of Stochastic Analysis* 2016 (2016).

[41] G. Deligiannidis, A. Doucet, and M. K. Pitt. "The Correlated Pseudo-Marginal Method". In: ***Journal of the Royal Statistical Society, Series B*** 80.5 (2015), pp. 839–870.

[42] A. Doucet, M. K. Pitt, G. Deligiannidis, and R. Kohn. "Efficient implementation of Markov chain Monte Carlo when using an unbiased likelihood estimator". In: ***Biometrika*** 102.2 (2015), pp. 295–313.

[43] G. Deligiannidis, M. Peligrad, and S. Utev. "Asymptotic variance of stationary reversible and normal Markov processes". In: *Electronic Journal of Probability* 20 (2014), pp. 1–26.

[44] G. Deligiannidis and S. Utev. "Variance of partial sums of stationary sequences". In: ***Annals of Probability*** 41.5 (2013), pp. 3606–3616.

[45] G. Deligiannidis and S. A. Utev. "Asymptotic variance of the self-intersections of stable random walks using Darboux-Wiener theory". In: *Siberian mathematical journal* 52.4 (2011), pp. 639–650.

[46] G. Deligiannidis, H. Le, and S. Utev. "Optimal Stopping for processes with independent increments, and applications". In: *Journal of Applied Probability* 46.4 (2009), pp. 1130–1145.

Preprints

[1] B. Dupuis, M. Haddouche, G. Deligiannidis, and U. Simsekli. *Understanding the Generalization Error of Markov algorithms through Poissonization*. 2025. arXiv: 2502.07584 [stat.ML]. URL: https://arxiv.org/abs/2502.07584.

[2] I. Azangulov, G. Deligiannidis, and J. Rousseau. *Convergence of Diffusion Models Under the Manifold Hypothesis in High-Dimensions*. 2024. arXiv: 2409.18804 [stat.ML].

[3] G. Deligiannidis, P. Jacob, E. M. Khribch, and G. Wang. "Coupling and convergence of the particle independent Metropolis–Hastings algorithm". In: (2024).

[4] G. Deligiannidis, P. E. Jacob, E. M. Khribch, and G. Wang. "On importance sampling and independent Metropolis-Hastings with an unbounded weight function". In: *arXiv preprint arXiv:2411.09514* (2024).

[5] M. E. Khribch, G. Deligiannidis, and D. Paulin. "On Mixing Times of Metropolized Algorithm With Optimization Step (MAO): A New Framework". In: *arXiv:2112.00565* (2022).

[6] J. Thornton, G. Deligiannidis, and A. Doucet. "The Masked Bouncy Particle Sampler: A Parallel, Chromatic, Piecewise-Deterministic Markov Chain Monte Carlo Method". In: (2021).

[7] G. Deligiannidis, A. Doucet, and S. Rubenthaler. "Ensemble rejection sampling". In: (2020). arXiv: 2001.09188.