Abdul-Lateef Haji-Ali

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Research Interests: Uncertainty Quantification, Stochastic Differential Equation, Numerical methods for SDEs and PDEs, Multilevel Monte Carlo, Particle systems, Crowd modelling, Mean-field theory, Sparse Grids, Combination techniques, Multi-index techniques, Inverse problems.

Education

King Abdullah University of Science and Technology (KAUST), Saudi Arabia

PhD, Applied Mathematics, December 2012 to May 2016

Thesis Title: *Efficient multilevel and multi-index sampling methods in stochastic differential equations*
Advisor: Raúl Tempone

MSc, Applied Mathematics, September 2010 to December 2012

Thesis Title: *Pedestrian Flow in the Mean-field Limit*
Advisor: Raúl Tempone

Arab International University, Damascus, Syria

BSc, Informatics Engineering, September 2005 to August 2010

Employment

Maxwell Institute for Mathematical Sciences & School of Mathematical and Computer Sciences, Heriot-Watt University, Scotland, UK
- Associate Professor, 01 August 2022 – ongoing.
- Assistant Professor, 03 January 2019 – 31 July 2022.

Mathematical Institute, University of Oxford, UK
- Hooke Research Fellowship, 05 September 2016 to 31 December 2018.

St. Anne's College, University of Oxford, UK
- College Association, January 2017 to January 2019.

Refereed Journal Publications

1. M. B. Giles and A.-L. Haji-Ali. "Sub-sampling and other considerations for efficient risk estimation in large portfolios". In: 26.1 (June 2022). DOI: 10.21314/JCF.2022.019.
2. A.-L. Haji-Ali, J. Spence, and A. L. Teckentrup. "Adaptive Multilevel Monte Carlo for probabilities". In: *SIAM Journal on Numerical Analysis* 60.4 (2022), pp. 2125–2149. DOI: 10.1137/21M1447064.
3. N. Ben Rached, A.-L. Haji-Ali, G. Rubino, and R. Tempone. "Efficient importance sampling for large sums of independent and identically distributed random variables". In: *Statistics and Computing* 31.6 (Oct. 2021). ISSN: 0960-3174, 1573-1375. DOI: 10.1007/s11222-021-10055-1.
4. A.-L. Haji-Ali, F. Nobile, R. Tempone, and S. Wolfers. "Multilevel weighted least squares polynomial approximation". In: *ESAIM: Mathematical Modelling and Numerical Analysis* 54.2 (Mar. 2020), pp. 649–677. ISSN: 0764-583X, 1290-3841. DOI: 10.1051/m2an/2019045.
5. M. B. Giles and A.-L. Haji-Ali. "Multilevel Nested Simulation for Efficient Risk Estimation". In: *SIAM/ASA Journal on Uncertainty Quantification* 7.2 (Jan. 2019), pp. 497–525. ISSN: 2166-2525. DOI: 10.1137/18m1173186.

6. A.-L. Haji-Ali, H. Harbrecht, M. Peters, and M. Siebenmorgen. "Novel results for the anisotropic sparse grid quadrature". In: *Journal of Complexity* 47 (Aug. 2018), pp. 62–85. ISSN: 0885-064X. DOI: 10.1016/j.jco.2018.02.003.

7. A.-L. Haji-Ali and R. Tempone. "Multilevel and Multi-index Monte Carlo methods for the McKean–Vlasov equation". In: *Statistics and Computing* 28.4 (Sept. 2017), pp. 923–935. ISSN: 0960-3174, 1573-1375. DOI: 10.1007/s11222-017-9771-5.

8. A.-L. Haji-Ali, F. Nobile, L. Tamellini, and R. Tempone. "Multi-Index Stochastic Collocation for random PDEs". In: *Computer Methods in Applied Mechanics and Engineering* 306 (July 2016), pp. 95–122. ISSN: 0045-7825. DOI: 10.1016/j.cma.2016.03.029.

9. A.-L. Haji-Ali, F. Nobile, L. Tamellini, and R. Tempone. "Multi-index Stochastic Collocation Convergence Rates for Random PDEs with Parametric Regularity". In: *Foundations of Computational Mathematics* 16.6 (Aug. 2016), pp. 1555–1605. ISSN: 1615-3375, 1615-3383. DOI: 10.1007/s10208-016-9327-7.

10. A.-L. Haji-Ali, F. Nobile, and R. Tempone. "Multi-index Monte Carlo: When sparsity meets sampling". In: *Numerische Mathematik* 132.4 (June 2015), pp. 767–806. ISSN: 0029-599X, 0945-3245. DOI: 10.1007/s00211-015-0734-5.

11. A.-L. Haji-Ali, F. Nobile, E. von Schwerin, and R. Tempone. "Optimization of mesh hierarchies in multilevel Monte Carlo samplers". In: *Stochastics and Partial Differential Equations Analysis and Computations* 4.1 (June 2015), pp. 76–112. ISSN: 2194-0401, 2194-041X. DOI: 10.1007/s40072-015-0049-7.

12. N. Collier, A.-L. Haji-Ali, F. Nobile, E. von Schwerin, and R. Tempone. "A continuation multilevel Monte Carlo algorithm". In: *BIT Numerical Mathematics* 55.2 (Sept. 2014), pp. 399–432. ISSN: 0006-3835, 1572-9125. DOI: 10.1007/s10543-014-0511-3.

Preprints

13. E. B. Amar, N. B. Rached, A.-L. Haji-Ali, and R. Tempone. "Efficient Importance Sampling Algorithm Applied to the Performance Analysis of Wireless Communication Systems Estimation". In: (2022). arXiv: 2201.01340 [stat.CO].

14. N. B. Rached, A.-L. Haji-Ali, M. Shyam, and R. Tempone. "Multilevel Importance Sampling for McKean-Vlasov Stochastic Differential Equation". In: (2022). arXiv: 2208.03225.

15. N. B. Rached, A.-L. Haji-Ali, M. Shyam, and R. Tempone. "Single Level Importance Sampling for McKean-Vlasov Stochastic Differential Equations". In: (2022). arXiv: 2207.06926.

16. M. B. Giles and A.-L. Haji-Ali. "Multilevel Path Branching for Digital Options". In: (2022). arXiv: 2209.03017.

17. A.-L. Haji-Ali, H. Hoel, and R. Tempone. "A simple approach to proving the existence, uniqueness, and strong and weak convergence rates for a broad class of McKean–Vlasov equations". In: (2021). arXiv: 2101.00886.

Awards

- Second-place Leslie Fox Prize, June 2019.
- Fulford Non-stipendiary Junior Research Fellowship, Somerville College, University of Oxford, October 2017 to September 2019.
- Hooke Research Fellowship, Mathematical Institute, University of Oxford, September 2016 to September 2019.

- King Abdullah University of Science and Technology Fellowship 2010
- Academic Excellence Award, King Abdullah University of Science and Technology 2010.

Grants

- Sabbatical, Royal Society of Edinburgh Research Grant, Project: "Accelerating the Monte Carlo Method for Detecting Orbital Collisions", 1 May 2019 to 30 April 2020.
- Co-Investigator, Medical Research Council, Project: "What is the value of adaptive designs? Estimating expected value of sample information for adaptive trial designs", 1 Dec 2019 to 31 May 2022.
- Co-Investigator, Medical Research Council, Project: "Project: Reliable and Efficient Estimation of the Economic Value of medical Research (REEEVR)".

Research Visits

- University of Dundee, United Kingdom, May 2022.
- Issac Newton Institute, Cambridge, United Kingdom, April 2018.
- École Polytechnique Fédérale de Lausanne, Switzerland, July 2017.
- RWTH Aachen University, Germany, June 2017.
- École Polytechnique Fédérale de Lausanne, Switzerland, April 2016.
- École Polytechnique Fédérale de Lausanne, Switzerland, August 2015.
- University of Pavia, Pavia, Italy, July 2015.
- Königlich Technische Hochschule, Stockholm, Sweden, June 2015.
- University of Austin, Austin, Texas, USA, July 2014.
- Universidad de la República, Montevideo, Uruguay, December 2013.
- University of Austin, Austin, Texas, USA, June 2013.

Conferences

Organization:

- Co-organized mini-symposium "Decision making under uncertainty" in BAMC, April 2022.
- Co-organized mini-symposium "Monte Carlo methods for discontinuous functions" in MCM 2021.
- Co-organized mini-symposium "Theory and Applications of Particle Systems" in MCM 2021.
- Co-organized SIAM UKIE annual meeting, January 2019.
- Co-organized mini-symposium: "Forward and inverse UQ with hierarchical models", MCQMC, Rennes, France, United Kingdom, July, 2018.
- Co-organized of mini-symposium: "Numerical Methods for PDEs in Uncertainty Quantification", SciCADE, University of Bath, United Kingdom, September, 2017.

Recent Talks:

- MCQMC, Linz, Austria, July 2022.
- "Stochastic Numerics and Statistical Learning: Theory and Applications Workshop", KAUST, Saudi Arabia, May 2022.
- "Multilevel and multifidelity sampling methods in UQ for PDEs", Vienna, Austria, May 2022.
- "British Applied Mathematics Colloquium", Loughborough University, UK, April 2022.
- University of Dundee, School of Science and Engineering, UK, October 2021.
- MCM, Mannheim, Germany, August 2021.
- "Applied Maths Seminar", University of Leicester, February 2021.
- AvH RWTH UQ: hybrid seminar, February 2021.
- LMS/MAC-MIGS Workshop on Inverse Problems and Optimisation for PDEs, May 2020.
- One World Stochastic Numerics and Inverse Problems, May 2020.

- Multilevel and multifidelity sampling methods in UQ for PDEs, May 2020.

Technical Skills Proficient in C, C++, C#, Java, JavaScript, Python, UNIX shell scripting, GNU make, MySQL, MATLAB, Mathematica.