

Nawaf Bou-Rabee

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Positions

- Visiting Professor, Probability Theory and Stochastic Analysis, Institute for Applied Mathematics, Rheinische Friedrich-Wilhelms-Universität Bonn, 2019–2021.
- Associate Professor of Mathematics, Rutgers University–Camden, 2017–present.
- Assistant Professor of Mathematics, Rutgers University–Camden, 2011–2017.
- Courant Instructor, New York University, 2009–2011.

Education

- Ph.D. Applied & Computational Mathematics, California Institute of Technology 2007.
- B.A. Computational & Applied Mathematics, Rice University 2001.
- B.S. Mechanical Engineering, Rice University 2001.

Support

- 2021 - 2024** US National Science Foundation Grant # DMS-2111224
Collaborative Research: Numerical Methods for High-Dimensional Sticky Diffusions, PI: N. Bou-Rabee
- 2019 - 2021** Alexander von Humboldt Foundation
Humboldt Research Fellowship for Experienced Researchers
- 2018 - 2021** US National Science Foundation Grant # DMS-1816378
Stochastic Partial Differential Equations and Their Numerical Solution, PI: N. Bou-Rabee
- 2017 - 2018** Rutgers Camden Provost’s Catalyst Grant # 205536
Randomized Hamiltonian Monte-Carlo, PI: N. Bou-Rabee
- 2012 - 2015** US National Science Foundation Grant # DMS-1212058
Towards Fast & Stable Schemes for Brownian Dynamics with Hydrodynamic Interactions, PI: N. Bou-Rabee
- 2008 - 2011** US National Science Foundation Grant # DMS-0803095
Mathematical Sciences Postdoctoral Research Fellowship, PI: N. Bou-Rabee

Publications

A) Publications with peer review process

1. **Bou-Rabee, N.***, Eberle A. (2021): Mixing Time Guarantees for Unadjusted Hamiltonian Monte Carlo. Bernoulli (to appear) arXiv:2105.00887 [math.PR].
2. **Bou-Rabee, N.***, Eberle A. (2020): Couplings for Andersen Dynamics. Annales de l’Institut Henri Poincaré (B) Probabilités et Statistiques (to appear) arXiv:2009.14239 [math.PR].
3. **Bou-Rabee, N.***, Eberle, A. (2021): Two-scale coupling for preconditioned Hamiltonian Monte Carlo in infinite dimensions, Stochastics and Partial Differential Equations: Analysis and Computations, Vol. 9, pp. 207-242.
4. J. L. Rosa-Raíces, J. Sun, **Bou-Rabee, N.***, T. F. Miller III (2021): A generalized class of strongly stable and dimension-free T-RPMD integrators. Journal of Chemical Physics, 154, 024106.

5. Korol R., Rosa-Raíces, J. L., **Bou-Rabee, N.***, and Miller III, T. F. (2020): Dimension-free path-integral molecular dynamics without preconditioning. *Journal of Chemical Physics*, 152, 104102 [Editor's Pick].
6. **Bou-Rabee, N.***, Holmes-Cerfon, M. (2020): Sticky Brownian Motion and its Numerical Solution. *SIAM Review*, Vol. 62, No. 1, 164–195.
7. **Bou-Rabee, N.***, Eberle, A., and Zimmer, R. (2020): Coupling and Convergence for Hamiltonian Monte Carlo. *Annals of Applied Probability*, Vol. 30, No. 3, 1209–1250.
8. Korol R., **Bou-Rabee, N.***, and Miller III, T. F. (2019): Cayley modification for strongly stable path-integral and ring-polymer molecular dynamics. *Journal of Chemical Physics*, 151, 124103, [Editor's Pick].
9. **Bou-Rabee, N.***, Sanz-Serna, J. M. (2018): Geometric Integrators and the Hamiltonian Monte Carlo Method. *Acta Numerica*, Vol. 27, pp. 113–206.
10. **Bou-Rabee, N.*** (2018): Spectrwm: Spectral Random Walk Method for the Numerical Solution of SPDEs. *SIAM Review*, Vol. 60, No. 2, 386–406.
11. **Bou-Rabee, N.***, Vanden-Eijnden, E. (2018): Continuous-Time Random Walks for the Numerical Solution of SDEs. *Memoirs of the American Mathematical Society*, Vol. 256, No. 1228.
12. **Bou-Rabee, N.***, Sanz-Serna, J. M. (2017): Randomized Hamiltonian Monte Carlo. *Annals of Applied Probability*, 27, 2159–2194.
13. **Bou-Rabee, N.***, Donev, A., Vanden-Eijnden, E. (2014): Metropolized Integration Schemes for Self-Adjoint Diffusions. *Multiscale Modeling and Simulation*, 12, 781–831.
14. **Bou-Rabee, N.*** (2014): Time Integrators for Molecular Dynamics. *Entropy*, 16, 138–162.
15. **Bou-Rabee, N.***, Hairer, M. (2012): Non-asymptotic mixing of the MALA algorithm. *IMA Journal of Numerical Analysis*, 33, 80–110.
16. **Bou-Rabee, N.***, Vanden-Eijnden, E. (2012): A patch that imparts unconditional stability to explicit integrators for Langevin-like equations. *Journal of Computational Physics*, 231, 2565–2580.
17. **Bou-Rabee, N.***, Vanden-Eijnden, E. (2010): Pathwise Accuracy and Ergodicity of Metropolized Integrators for SDEs. *Communications of Pure and Applied Mathematics*, 63, 655–696.
18. **Bou-Rabee, N.***, Owhadi, H. (2010): Long-Run Accuracy of Variational Integrators in the Stochastic Context. *SIAM Journal of Numerical Analysis*, 48, 278–297.
19. **Bou-Rabee, N.***, Owhadi, H. (2009): Stochastic Variational Integrators. *IMA Journal of Numerical Analysis*, 29, 421–443.
20. E. Akhmatskaya, **Bou-Rabee, N.**, Reich, S.* (2009): A Comparison of GHMC with & without Momentum Flips. *Journal of Computational Physics*, 228, 2256–2265.
21. **Bou-Rabee, N.***, Marsden, J. E., Romero, L. A. (2008): Dissipation-Induced Heteroclinic Orbits in Tippe Tops. *SIAM Review: SIGEST*, 50, 325–344.
22. **Bou-Rabee, N.***, Marsden, J. E. (2008): Hamilton-Pontryagin Integrators on Lie Groups: Introduction and Structure-Preserving Properties. *Foundations of Computational Mathematics*, 9, 197–219.
23. **Bou-Rabee, N.**, P. Chossat* (2005): The Motion of the Spherical Pendulum Subjected to a \mathbf{D}_n Symmetric Perturbation. *SIAM Journal of Applied Dynamical Systems*, 4, 1140–1158.
24. **Bou-Rabee, N.***, Marsden, J. E., Romero, L. A. (2005): A Geometric Treatment of Jellett's Egg. *ZAMM Journal of Applied Mathematics and Mechanics*, 85, 618–642.

25. **Bou-Rabee, N.***, Marsden, J. E., Romero, L. A. (2004): Tippe Top Inversion as a Dissipation-Induced Instability. *SIAM Journal of Applied Dynamical Systems*, 3, 352–377.
26. **Bou-Rabee, N.***, Romero, L. A., Salinger, A. G. (2002): A Multi-Parameter, Numerical Stability Analysis of a Tubular Cantilever Conveying Fluid. *SIAM Journal of Applied Dynamical Systems*, 1, 190–214.

B) Submitted publications with peer review process

1. **Bou-Rabee, N.***, Schuh K. (2020): Convergence of Unadjusted Hamiltonian Monte Carlo for Mean-Field Models. arXiv:2009.08735 [math.PR].

Recognition

- Editor’s Pick, *Journal of Chemical Physics*, 2020
- Editor’s Pick, *Journal of Chemical Physics*, 2019
- Humboldt Research Fellowship for Experienced Researchers, 2019-2021
- Editor’s Choice, *IMA J. of Numerical Analysis*, 2009
- NSF Mathematical Sciences Postdoctoral Research Fellowship, 2008-2011
- SIGEST (best paper award) paper in *SIAM Review*, 2008
- Associated Students of Caltech (ASCIT) Teaching award, 2007
- Caltech Graduate Student Council (GSC) Teaching and Mentoring Award, 2005
- US DOE Computational Science Graduate Fellowship, 2002-2006
- Outstanding Sandia Labs Student Intern, 2001
- Rice Engineering Alumni Award in Computational and Applied Mathematics, 2001

Invited Talks (since 2018)

- Jan 2022** *Maxwell Institute Probability Seminar*, Virtual
- Dec 2021** *KTH Probability and Mathematical Statistics Seminar*, Stockholm, Sweden
- May 2021** *Minisymposium on Computational Statistical Physics and Related Fields*, SIAM Virtual Conference on Mathematical Aspects of Materials Science.
- March 2021** *Hybrid Oberwolfach Workshop: Geometric Numerical Integration*. Oberwolfach, Germany
- March 2021** *Online Mathematics Colloquium*. RWTH Aachen, Germany
- June 2020** *Computational Statistics and Machine Learning Online Seminar*. Oxford University, UK
- Feb 2020** *Inverse Problems: Algorithms, Analysis, and Applications*. Department of Computing and Mathematical Sciences, Caltech, CA
- Jan 2020** *Contributed Session: MCMC-based Bayesian Inference on Hilbert spaces*. Bayes Comp 2020, University of Florida, FA
- May 2019** *DelMar Numerics Day 2019*, University of Maryland College Park, MD
- April 2019** *Session on Stochastic Dynamics in Nonlinear Systems*, Eleventh IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, University of Georgia, GA
- March 2019** *Recent Advances in Pure and Applied Stochastics*, Department of Mathematics, Tulane University, New Orleans, LA
- March 2019** *Probability Seminar*, Department of Mathematical Sciences, University of Delaware, Delaware
- January 2019** *Probability Seminar*, Institute for Applied Mathematics, Bonn University, Germany
- October 2018** *Applied Mathematics Colloquium*, Columbia University, NY
- April 2018** *Computational and Applied Mathematics Colloquium*, Penn State University, PA
- April 2018** *Applied Mathematics and Scientific Computing Seminar*, Temple University, PA

Service

2013 - present Associate Editor, *Journal of Computational Dynamics*,
a publication of the American Institute of Mathematical Sciences.

I have reviewed grant proposals for the National Science Foundation and the European Research Council. I have reviewed papers or books for the Annals of Applied Probability, Stochastic Processes and Applications, Electron. Commun. Probab., Journal of Machine Learning Research, Annales de l'Institut Henri Poincaré - Probabilités et Statistiques, Annals of Statistics, Mathematical Finance, Journal of Chemical Physics, SIAM/ASA Journal of Uncertainty Quantification, Stochastics and Partial Differential Equations, CRC Press, Foundations of Computational Mathematics, Archive of Rational Mechanics and Analysis, Discrete and Continuous Dynamical Systems-A, Journal of Non-linear Science, Communications for Mathematical Sciences, SIAM Journal of Numerical Analysis, BIT, Journal of Computational Physics, Multiscale Modeling and Simulation, IMA Journal of Numerical Analysis and the Journal of Computational and Graphical Statistics.

Schools for Advanced Studies

Previously involved in the following schools.

1. *Online Hausdorff School on MCMC: Recent developments and new connections.* Sept. 14-18 and Sept. 21-25, 2020. Co-organizer with Andreas Eberle.
2. *Gene Golub SIAM Summer School 2016: Stochastic Differential Equations and Wave Propagation.* Taught a mini-course entitled **Spectrum for the Numerical Solution of SPDEs**. July 25-Aug. 5, 2016 in Philadelphia.
3. *New Perspectives in Markov Chain Monte Carlo.* Taught a mini-course entitled **MCMC-based Integrators for the Numerical Solution of SDEs**. June 8-12, 2015 in Valladolid, Spain.

Last updated: December 12, 2021