

**Amarjit S. Budhiraja**  
Department of Statistics & Operations Research  
University of North Carolina  
Chapel Hill, NC 27599  
(919) 962-2189  
E-mail: budhiraj@email.unc.edu  
*Revised: 08/22/2023*

## Education

- **The University of North Carolina** **Chapel Hill, NC**  
Ph.D. Statistics. March 1994  
*Advisor* : G. Kallianpur.
- **Indian Statistical Institute** **New Delhi, India**  
M.S. Statistics (Specialization: Analysis and Probability). May 1990
- **Delhi University** **New Delhi, India**  
B.S. Mathematics. May 1988

## Professional Experience

- Professor, Department of Statistics and Operations Research, University of North Carolina at Chapel Hill (July 06 -)
- Associate Professor, Department of Statistics, University of North Carolina at Chapel Hill (July 02 -).
- Assistant Professor, Department of Statistics, University of North Carolina at Chapel Hill (July 00 - June 02).
- Assistant Professor, Department of Mathematics, University of Notre Dame (June 98 - June 00).
- Postdoctoral fellow, Division of Applied Mathematics, Brown University (August 96 - May 98).
- Visiting assistant professor, Department of Mathematics, Iowa State University (August 95 - August 96).
- Visiting assistant professor, joint appointment: Department of Statistics and the Center for Stochastic Processes, University of North Carolina (August 94 - August 95).

## Administrative Experience

- Senior Associate Dean for Faculty and Academic Affairs, School of Data Science and Society, UNC (March 2023-).
- Chairman, Department of Statistics and Operations Research, University of North Carolina at Chapel Hill (July 14 -June 19)

## Honors

- Fellow of the Institute of Mathematical Statistics (elected April 2013).

## Research interests

Probability, Stochastic Processes, Large Deviations, Interacting Particle Systems, Stochastic Control, Stochastic Differential Games, Stochastic Networks, Stochastic Partial Differential Equations, Random Graphs, Stochastic Numerics, Nonlinear Filtering.

## Publications

### A. Book

1. ‘Analysis and Approximation of Rare Events: Representations and Weak Convergence Methods’, with P. Dupuis, *Probability Theory and Stochastic Modelling*, Springer-Verlag New York Inc., 2019 (574 pages).

### B. Refereed Journal Articles.

1. ‘Large Deviations for Small Noise Diffusions Over Long Time’, with P. Zouboulglou, *To appear in Trans. Amer. Math. Society*, (2023).
2. ‘Simple form control policies for resource sharing networks with HGI performance’, with D. Johnson, *To appear in Ann. App. Prob.*, (2023).
3. ‘Empirical Measure Large Deviations for Reinforced Chains on Finite Spaces’, with A. Waterbury, *Systems & Control Letters*, (2022), 169: 105379.
4. ‘The Inert Drift Atlas Model’, with S. Banerjee and B. Estevez, *Communications in Mathematical Physics*, (2022), 1–65.
5. ‘Domains of attraction of invariant distributions of the infinite Atlas model’, with S. Banerjee. *The Annals of Probability*, 2022 Jul; 50(4):1610-46.
6. ‘Quasistationary Distributions and Ergodic Control Problems’, with P. Dupuis, P. Nyquist, G-J. Wu, *Stochastic Processes and their Applications*, 2022 Mar 1;145:143-64.
7. ‘Some Large Deviation Asymptotics in Small Noise Filtering Problems’, with A. Apte and A-S. Reddy, *SIAM Journal on Control and Optimization*, 2022;60(1):385-409.
8. ‘Approximating Quasi-Stationary Distributions with Interacting Reinforced Random Walks’, with N. Fraiman, A. Waterbury, *ESAIM: Probability and Statistics*, 2022;26:69-125.
9. ‘Asymptotic Behavior of Stochastic Currents under Large Deviation Scaling with Mean Field Interaction and Vanishing Noise’, with M. Conroy, *Ann. Sc. Norm. Super. Pisa Cl. Sci. (5) Vol. XXIII* (2022), 1749-1805, DOI: 10.2422/2036-2145.202010.012.
10. ‘Near Equilibrium Fluctuations for Supermarket Models with Growing Choices’, with S. Bhamidi and M. Dewaskar, *Ann. App. Prob.*, 32(3): 2083-2138 (June 2022). DOI: 10.1214/21-AAP1729.
11. ‘Heavy Traffic Scaling Limits for shortest remaining processing time queues with heavy tailed processing time distributions’, with S. Banerjee and A. L. Puha, *Ann. App. Prob.*, 32(4): 2587-2651 (August 2022). DOI: 10.1214/21-AAP1741
12. ‘Rare Event Asymptotics for Exploration Processes for Random Graphs’, with S. Bhamidi, P. Dupuis and R. Wu, *Ann. App. Prob.*, 2022 Apr; 32(2):1112-78.
13. ‘Asymptotics of Quasi-Stationary Distributions of Small Noise Stochastic Dynamical Systems in Unbounded Domains’, with A. Waterbury and N. Fraiman, *Advances in Applied Probability*, 2022 Mar;54(1):64-110.
14. ‘Large Deviations of the Entropy Production Rate for a Class of Gaussian Processes’, with Y. Chen and L. Xu, *J. Math. Phys.*, 2021 May 1;62(5):052702.

15. ‘Minimization of a Class of Rare Event Probabilities and Buffer Probabilities of Exceedance’, with S. Lu, Y. Yu, Q. Tran-Dinh, *Ann. Oper. Res.*, 2021 Jul; 302(1):49-83.
16. ‘Many-Server Asymptotics for Join-the-Shortest-Queue: Large Deviations and Rare Events’, with E. Friedlander and R. Wu, *Ann. Appl. Probab.*, 2021 Oct; 31(5):2376-419.
17. ‘Large Deviations for the Single Server Queue and the Reneging Paradox’, with R. Atar, P. Dupuis, R. Wu, *Math. Oper. Res.*, 2022 Feb; 47(1):232-58.
18. ‘Empirical Measure and Small Noise Asymptotics under Large Deviation Scaling for Interacting Diffusions’, with M. Conroy, *J. Theor. Probab.*, 2021, pages 1–55.
19. ‘Robust Bounds and Optimization at the Large Deviations Scale for Queueing Models via Rényi Divergence’, with R. Atar, P. Dupuis and R. Wu, *Ann. Appl. Probab.*, 2021, Vol. 31, No. 3, 1061–1099..
20. ‘A new Approach to Large Deviations for the Ginzburg-Landau Model’, with S. Banerjee and M. Perlmutter, *Elec. J. Probability*, 25, 2020, paper no. 26, 51 pp.
21. ‘Parameter and dimension dependence of convergence rates to stationarity for Reflecting Brownian Motions’, with S. Banerjee, *Ann. Appl. Probab.*, 30(5), 2020, 2005–29.
22. ‘Uniform Large Deviation Principles for Banach Space Valued Stochastic Differential Equations’, with P. Dupuis and M. Salins, *Trans. Amer. Math. Soc.*, 372, 2019, 8363–8421.
23. ‘Control Policies Approaching HGI Performance in Heavy Traffic for Resource Sharing Networks’, with Dane Johnson, *Math. Oper. Res.*, 45 (3), 2020, 797–832.
24. ‘Source Detection Algorithms for Dynamic Contaminants Based on the Analysis of a Hydrodynamic Limit’, with S. A. Almada-Monter and J. Hannig, *SIAM J. Appl. Math.*, 78(5), 2018, 2279–2297.
25. ‘A Numerical Scheme for a Mean Field Game in Some Queueing Systems Based on Markov Chain Approximation Method’, with E. Bayraktar and A. Cohen, *SIAM J. Control Optim.*, 56(6), 2018, 4017–4044.
26. ‘Rate Control under Heavy Traffic with Strategic Servers’, with E. Bayraktar and A. Cohen., *Ann. Appl. Probab.*, 29(1), 2019, 1–35.
27. ‘Supermarket Model on Graphs’, with D. Mukherjee and R. Wu, *Ann. Appl. Probab.*, 29(3), 2019, 1740–1777.
28. ‘Diffusion Approximations for Load Balancing Mechanisms in Cloud Storage Systems’, with E. Friedlander, *Advances in Applied Probability*, 51(1), 2019, 41-86.
29. ‘Large Deviations for Small Noise Diffusions in a Fast Markovian Environment’, with P. Dupuis and A. Ganguly, *Elec. J. Probab.*, paper no. 112, 23, 2018, 33 pp..
30. ‘Weakly Interacting Particle Systems on Inhomogeneous Random Graphs’, with S. Bhamidi and R. Wu., *Stochastic Processes and their Applications*, 129(6), 2019, 2174–2206.
31. ‘Central Limit Results for Jump-Diffusions with Mean Field Interaction and a Common Factor’, with E.Kira and S.Saha., *Stochastic Analysis and Applications*, 35(5), 2017, 767–802.
32. ‘Construction of Asymptotically Optimal Control for a Stochastic Network from a Free Boundary Problem’, with X.Liu and S.Saha., *Stochastic Systems*, 6(2), 2016, 459–518.
33. ‘Diffusion Approximations for Controlled Weakly Interacting Large Finite State Systems with Simultaneous Jumps’, with E. Friedlander., *Annals of Applied Probability*, 28(1), 2018, 204–249.
34. ‘Critical Random Graphs and the Differential Equations Technique’, with S. Bhamidi and S. Sen., *Indian Journal of Pure and Applied Mathematics.*, 48(4), 2017, 633–669.
35. ‘Large Deviations for Brownian Particle Systems with Killing’, with W-T. Fan and Ruoyu Wu., *Journal of Theoretical Probability*, 31(3), 2018, 1779–1818.
36. ‘Uniform in Time Interacting Particle Approximations for Nonlinear Equations of Patlak-Keller-Segel type’, with W-T. Fan., *Electron. J. Probab.*, 22 (2017), 37 pp.

37. ‘Moderate Deviation Principles for Weakly Interacting Particle Systems’, with R. Wu., *Probability Theory and Related Fields*, 168(3–4), 2017, 721–771.
38. ‘Local Stability of Kolmogorov Forward Equations for Finite State Nonlinear Markov Processes’, with P. Dupuis and K.Ramanan, *Elec. J. Prob.*, 20 (2015), 1–30.
39. ‘Limits of Relative Entropies Associated with Weakly Interacting Particle Systems’, with P. Dupuis and K. Ramanan, *Elec. J. Prob.*, 20 (2015), 1–22.
40. ‘Individual Confidence Intervals for True Solutions to Stochastic Variational Inequalities’, with M. Lamm and S. Lu, *Mathematical Programming*, 165(1), 2017, 151–196.
41. ‘Some Fluctuation Results for Weakly Interacting Multi-type Particle System’, with R. Wu, *Stoch. Proc. App.*, 126 (2016), no. 8, 2253–2296.
42. ‘Moderate Deviation Principles for Stochastic Differential Equations With Jumps’, with P. Dupuis and A. Ganguly, *Ann. Prob.*, 44 (2016), no. 3, 1723–1775.
43. ‘On the Multi-dimensional Skew Brownian Motion’, with R. Atar, *Stoch. Proc. App.*, 125 (2015), no. 3, 1911–1925.
44. ‘Long Time Results for a Weakly Interacting Particle System in Discrete Time’, with A. Pal Majumdar, *Stoch. Anal. App.*, 33 (2015), no. 3, 429–463.
45. ‘Large Deviations for Multidimensional State-dependent Shot Noise Processes’, with P. Nyquist, *J. Appl. Probab.*, 52 (2015), no. 4, 1097–1114.
46. ‘On Uniform Positivity of Transition Densities of Small Noise Constrained Diffusions’, with Z.Q. Chen, *Electronic Communications in Probability*, 19 (2014), no. 1, 1–9.
47. ‘The Augmented Multiplicative Coalescent and Critical Dynamic Random Graph Models’, with S.Bhamidi and X. Wang, *Probability Theory and Related Fields*, 160 (2014), 733–796.
48. ‘Bounded-size Rules: the Barely Subcritical Regime’, with S.Bhamidi and X. Wang, *Combinatorics, Probability and Computing*, 23 (2014), no. 4, 505–538.
49. ‘Dynamic Scheduling for Markov Modulated Single-server Multiclass Queueing Systems in Heavy Traffic’, with A. Ghosh and X. Liu, *Queueing Systems*, 78 (2014), no. 1, 57–97.
50. ‘Admission Control for Multidimensional Workload With Heavy Tails and Fractional Ornstein-uhlenbeck Process’, with V. Pipliras and X. Song, *Advances in Applied Probability*, 47 (2015), no. 2, 476–505.
51. ‘Infinite Dimensional Forward-backward Stochastic Differential Equations and the KPZ Equation’, with S. Almada, *Electron. J. Probab.*, 19 (2014), no. 40, 1–21.
52. ‘A Numerical Scheme for Invariant Distributions of Constrained Diffusions’, with Jiang Chen and Sylvain Rubenthaler, *Math. Oper. Res.*, 39 (2013), no. 2, 262–289.
53. ‘Aggregation Models With Limited Choice and the Multiplicative Coalescent’, with Shankar Bhamidi and Xuan Wang, *Random Struc. Alg.*, 46(2015), no. 1, 55–116.
54. ‘Discrete Time Markovian Agents Interacting Through a Potential’, with Pierre Del Moral and Sylvain Rubenthaler, *ESAIM Probab. Stat.*, 17 (2013), 614–634.
55. ‘Stability of Constrained Markov Modulated Diffusions’, with Xin Liu, *Math. Oper. Res.*, November 2012, vol. 37, no. 4, 626–653.
56. ‘Confidence Regions for Stochastic Variational Inequalities’, with Shu Lu, *Math. Oper. Res.*, 38 (2013), no. 3, 545–568.
57. ‘Near Critical Catalyst Reactant Branching Processes With Controlled Immigration’, with Dominik Reinhold, *Ann. Appl. Probab.*, 23 (2013), no. 5, 2053–2098.
58. ‘Large Deviations for Stochastic Partial Differential Equations Driven by a Poisson Random Measure’, with Jiang Chen and Paul Dupuis, *Stochastic Process. Appl.*, 123 (2013), no. 2, 523–560.
59. ‘On Near Optimal Trajectories of Games Associated With The Infinity-laplacian’, with R. Atar, *Probability Theory and Related Fields*, 151 (2011), no. 3-4, 509–528.

60. ‘Exit Time and Invariant Measure Asymptotics for Small Noise Constrained Diffusions’, with A. Biswas, *Stochastic Process. Appl.*, 121 (2011), no. 5, 899–924.
61. ‘Variational Representations for Continuous Time Processes’, with P. Dupuis and V. Maroulas, *Annales de l’Institut Henri Poincaré, Probabilités et Statistiques*, 47 (2011), no. 3, 725–747.
62. ‘Large Deviation Properties of Weakly Interacting Processes via Weak Convergence Methods’, with P. Dupuis and M. Fischer, *Ann. Probab.*, 40, (2012), no. 1, 74–102.
63. ‘An Ergodic Rate Control Problem for Single Class Queueing Networks’, with Arka Ghosh and Chihoon Lee, *SIAM J. Control Optim.*, 49, (2011), no. 4, 1570–1606.
64. ‘Action Time Sharing Policies for Ergodic Control of Markov Chains’, with Adam Shwartz and Xin Liu, *SIAM J. Control Optim.*, 50, (2012), no. 1, 171–195.
65. ‘Multiscale Diffusion Approximations for Stochastic Networks in Heavy Traffic’, with X. Liu, *Stoch. Proc. App.*, 121 (2011), no. 3, 630–656.
66. ‘Controlled Stochastic Networks in Heavy Traffic: Convergence of Value Functions’, with Arka Ghosh, *Ann. Appl. Probab.*, 22, (2012), Number 2, 734–791.
67. ‘Some Asymptotic Results for Near Critical Branching Processes’, with Dominik Reinhold, *Commun. Stoch. Anal.*, 4 (2010), no. 1, 91–113.
68. ‘A Stochastic Differential Game for the Inhomogeneous Infinity-Laplace Equation’, with Rami Atar, *Annals of Probability*, 38, No. 2 (2010), 498–531.
69. ‘Large Deviations for Stochastic Flows of Diffeomorphisms’, with P. Dupuis and V. Maroulas, *Bernoulli*, 16, No. 1 (2010), 234–257.
70. ‘Stationary Distribution Convergence for Generalized Jackson Networks In Heavy Traffic’, with Chihoon Lee, *Math. Oper. Res.*, 34, No. 1 (2009), 45–56.
71. ‘Deterministic and Stochastic Differential Inclusions With Multiple Surfaces of Discontinuity’, with Rami Atar and Kavita Ramanan, *Probability Theory and Related Fields*, 142, no. 1-2 (2008), 249–283.
72. ‘Modified Particle Filter Methods for Assimilating Lagrangian Data Into a Point-vortex Model’, with E. Spiller, K. Ide, C. Jones, *Physica D*, 237, 1498–1506.
73. ‘Large Deviations for Infinite Dimensional Stochastic Dynamical Systems’, with Paul Dupuis and Vasileios Maroulas, *Annals of Probability*, 36, no. 4 (2008), 1390–1420.
74. ‘HJB Equations for Certain Singularly Controlled Diffusions’, with Rami Atar and Ruth J. Williams, *Annals of Applied Probability*, 17 (2007), no. 5-6, 1745–1776.
75. ‘Optimal Stopping and Free Boundary Characterizations for Some Brownian Control Problems’, with Kevin Ross, *Annals of Applied Probability*, 18, no. 6, 2367–2391.
76. ‘Long Time Asymptotics for Constrained Diffusions in Polyhedral Domains’, with Chihoon Lee, *Stochastic Processes and their Applications*, 117, no. 8 (2007), 1014–1036.
77. ‘Diffusion Approximations for Controlled Stochastic Networks: An Asymptotic Bound for the Value Function’, with Arka Ghosh, *Annals of Applied Probability*, 16, no. 4 (2006), 1962–2006.
78. ‘A Survey of Numerical Methods for Nonlinear Filtering Problems’, with Lingji Chen and Chihoon Lee, *Physica D: Nonlinear Phenomena - appeared in special issue on Data Assimilation.*, 230 (2007), 27–36.
79. ‘Convergent Numerical Scheme for Singular Stochastic Control With State Constraints in a Portfolio Selection Problem’, with Kevin Ross, *SIAM J. Cont. Opt.*, 45, no. 6, (2006), 2169–2206.
80. ‘Existence of Optimal Controls for Singular Control Problems With State Constraints’, with Kevin Ross, *Annals of Applied Probability*, 16, no. 4(2006), 2235–2255.
81. ‘Singular Control With State Constraints on an Unbounded Domain’, with R. Atar, *Annals of Probability*, 34, no. 5 (2006), 1864–1909.
82. ‘Molecular Motors, Brownian Ratchets, and Reflected Diffusions’, with John Fricks, *Discrete and Continuous Dynamical Systems, Series B*, 6, no. 4 (2006), 711–734.

83. ‘Ergodic Control for Constrained Diffusions: Characterization Using HJB Equations’, with V. Borkar, *SIAM J. Control Optim.*, 43, no. 4 (2005), 1467–1492.
84. ‘A Large Deviations Approach to Asymptotically Optimal Control Of Crisscross Network in Heavy Traffic’, with A. P. Ghosh, *Annals of Applied Probability*, 15, no. 3 (2005), 1887–1935.
85. ‘A Further Remark on Dynamic Programming for Partially Observed Markov Processes’, with V. Borkar, *Stochastic Processes and their Applications*, 112, no. 1 (2004), 79–93.
86. ‘Stochastic Differential Equation for tcp Window Size: Analysis And Experimental Validation’, with F. Hernández-Campos, V.G. Kulkarni, F. D. Smith, *Probab. Engrg. Inform. Sci.*, 18, no. 1 (2004), 111–140.
87. ‘Asymptotic Stability, Ergodicity and Other Asymptotic Properties Of The Nonlinear Filter’, *Annales de l’Institut Henri Poincare: Probabilités et statistiques.*, 39, no. 6 (2003), 919–941.
88. ‘Large Deviations for the Empirical Measures of Reflecting Brownian Motion and Related Constrained Processes in  $\mathbb{R}^+$ ’, with P. Dupuis. *Electronic Journal of Probability*, 8 (2003), 1–46.
89. ‘An Ergodic Control Problem for Constrained Diffusion Processes: Existence of Optimal Markov Control’, *SIAM J. Cont. and Opt.*, 42, no. 2 (2003), 532–558.
90. ‘Stability Properties of Constrained Jump-diffusion Processes’, with R. Atar. *Electronic Journal of Probability*, 7(2002), 1–31.
91. ‘On Positive Recurrence of Constrained Diffusion Processes’, with R. Atar and P. Dupuis. *Annals of Probability*, 29, no. 2 (2001), 979–1000.
92. ‘On Invariant Measures of Discrete Time Filters in the Correlated Signal-noise Case’, *Annals of Applied Probability*, 12, no. 3 (2002), 1096–1113.
93. ‘Decision-based Collaborative Optimization’, with X .Gu, J. Renaud, L. Ashe, S. Batill and L. Krajewski. *Journal of Mechanical Design*, 124, no. 1, 1–13.
94. ‘Ergodic Properties of the Nonlinear Filter’, *Stochastic Processes and their Applications*, 95, no. 1 (2001), 1–24.
95. ‘Worst Case Propagated Uncertainty of Multidisciplinary Systems in Robust Design Optimization’, with X. Gu, J.E. Renaud, S.M. Batill, R.M. Brach. *Structural and Multidisciplinary Optimization*, 20, no. 3 (2000), 190–213.
96. ‘A Variational Representation for Positive Functionals of an Infinite Dimensional Brownian Motion’, with P.Dupuis. *Probability and Mathematical Statistics*, 20, no. 1 (2000), 39–61.
97. ‘Markov Property and Ergodicity of the Nonlinear Filter’, with A.G. Bhatt and R.L.Karandikar. *SIAM Journal on Control and Optimization*, 39, no. 3 (2000), 928–949.
98. ‘Exponential Stability in Discrete Time Filtering for Non-ergodic Signals’, with D.Ocone. *Stochastic Processes and their applications*, 82 (1999), 245–257.
99. ‘Approximation and Limit Results for Nonlinear Filters over An Infinite Time Interval: Part II, Random Sampling Algorithms’, with H. Kushner. *SIAM Journal on Control and Optimization*, 38, no. 6 (2000), 1874–1908.
100. ‘Simple Necessary and Sufficient Conditions for the Stability Of Constrained Processes’, with P. Dupuis. *SIAM Journal on Applied Mathematics*, 59 (1999), 1686–1700.
101. ‘Approximation and Limit Results for Nonlinear Filters over An Infinite Time Interval’, with H. Kushner. *SIAM Journal on Control and Optimization*, 37, no. 6 (1999), 1946–1979.
102. ‘Robustness of Nonlinear Filters over the Infinite Time Interval’, with H. Kushner. *SIAM Journal on Control and Optimization*, 36 (1998), 1618–1637.
103. ‘A Limit Theorem for Symmetric Statistics of Brownian Particles’, *Stochastic Processes and their Applications*, 77 (1998), 155–174.
104. ‘A Nonlinear Filtering Algorithm Based on Approximation Of Conditional Distribution’, with H. Kushner. *IEEE Trans. Aut. Cont.*, 45, no. 3 (2000), 580–585.

105. ‘Exponential Stability of Discrete Time Filters for Bounded Observation Noise’, with D. Ocone. *System and Control Letters*, 30 (1997), 185–193.
106. ‘The Feynman-stratonovich Semigroup and Stratonovich Integral Expansions in Nonlinear Filtering’, with G. Kallianpur. *Journal of Applied Math. and Opt.*, 35 (1997), 91–116.
107. ‘Two Results on Multiple Stratonovich Integrals’, with G. Kallianpur. *Statistica Sinica*, 7 (1997), 907–922.
108. ‘A Generalized Hu-meyer Formula for Random Kernels’, with G. Kallianpur. *Journal of Applied Math. and Opt.*, 35 (1997), 177–202.
109. ‘Approximations to Solutions of Zakai Equations Using Multiple Wiener And Stratonovich Expansions’, with G. Kallianpur. *Stochastics*, 3 (1996), 271–315.
110. ‘Hilbert Space Valued Traces and Multiple Stratonovich Integrals With Statistical Applications’, with G. Kallianpur. *Probability and Mathematical Statistics*, 15 (1995), 127–163.

### C. Refereed Articles in Books and Conference Proceedings.

1. ‘Does Momentum Help in Stochastic Optimization? A Sample Complexity Analysis’, with S. Ganesh and G. Thoppe, *to appear in the 39th Conference on Uncertainty in Artificial Intelligence (UAI 2023)*.
2. ‘Augmenting Molecular Images with Vector Representations as a Featurization Technique for Drug Classification’, with de Marchi D, *In ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020 May 4, 956–960.
3. ‘Assimilating Data into Models’, with E. Friedlander, C. Guider, C. KRT Jones, J. Maclean, *Handbook of Environmental and Ecological Statistics*, eds. Gelfand, A.E., Fuentes, M., Hoeting, J.A. and Smith, R.L., CRC Press, 2017.
4. ‘Resource Sharing Networks and Brownian Control Problems’, with M. Conroy. *Modeling, Stochastic Control, Optimization, and Applications*. The IMA Volumes in Mathematics and its Applications, vol 164, eds. Yin G., Zhang Q., Springer, 2019.
5. ‘Feller and Stability Properties of the Nonlinear Filter’, *The Oxford Handbook of Nonlinear Filtering*, edited by D. Crisan and B. Rozovskii, Oxford University Press, 2011.
6. ‘Asymptotic Results for Near Critical Bienaymé-Galton-Watson and Catalyst-Reactant Branching Processes’ with D. Reinhold, *2013 Springer Proceedings in Mathematics and Statistics*, Springer New York LLC, Vol. 38, p. 41–59.
7. ‘PFLib - an Object Oriented MATLAB Toolbox for Particle Filtering’ with L. Chen, C. Lee and R. K. Mehra, *2007 Proceedings of SPIE - The International Society for Optical Engineering*. Vol. 6567, 65670S.
8. ‘HJB Equations for Ergodic Control Problems for Constrained Diffusions in Polyhedral Domains’, with V. Borkar, *2005 Proceedings of the 44th IEEE Conference on Decision and Control, and the European Control Conference, CDC-ECC '05*, Vol. 2005, p. 6668-6672.
9. ‘Some Properties of the Nonlinear Filter: Markovity and Ergodicity’, with A. G. Bhatt and R.L. Karandikar, *2001 Proceedings of the IEEE Conference on Decision and Control*, Vol. 2, p. 1699-1704.
10. ‘Monte Carlo Algorithms and Asymptotic Problems in Nonlinear Filtering’, with H.J.Kushner. *Stochastics in finite and infinite dimensions*, edited by Hida et. al.; Trends Math., Birkhäuser , Boston, MA , pp. 59–87, (2001).
11. ‘Representations for Functionals of Hilbert Space Valued Diffusions’, with P. Dupuis. *Stochastic analysis, Control, Optimization and Applications: A Volume in Honor of W. H. Fleming*, edited by W. M. McEneaney, G. Yin and Q. Zhang; Birkhäuser, pp. 1–20, (1999).
12. ‘Hilbert Space Valued Traces and Multiple Stratonovich Integrals With Statistical Applications’, with G. Kallianpur. *Stochastic Analysis on Infinite Dimensional Spaces*, edited by H. Kunita, H. H. Kuo; Pitman research notes in Math, pp. 26–32, (1994).

## D. Papers Submitted for Publication.

1. ‘Extremal invariant distributions of infinite Brownian particle systems with rank dependent drifts’, with S. Banerjee, *Submitted*, arXiv preprint arXiv:2207.08331, (2022).
2. ‘Long time Behavior of finite and infinite dimensional reflected Brownian motions’, with S. Banerjee, *Submitted*, arXiv preprint arXiv:2208.02855, (2022).
3. ‘Load balancing in parallel queues and rank-based diffusions’, with S. Banerjee and B. Estevez, *Submitted*, arXiv preprint arXiv:2302.10317, (2023).
4. ‘Large deviations for empirical measures of self- interacting Markov chains’, with A. Waterbury and P. Zouboulouglou, *Submitted*, arXiv preprint arXiv:2304.01384, (2023).

## Contracts and Grants

### Current.

1. Lead PI on Research and Training Group award, RTG: Networks: Foundations in Probability, Optimization and Data Sciences, (NSF-DMS 2134107), May 15, 2022 – April 30, 2027, co-PI: S. Bhamidi, M. Olvera-Cravioto, V. Pipiras, Q. Tran-Dinh, co-I: S. Banerjee, N. Fraiman, Y. Li. Total award amount: \$2,321,764.
2. PI on Research Grant, ‘Asymptotics for Particle Systems with Topological Interactions’, July 1, 2022–June 30, 2025, NSF grant DMS-2152577. Total award amount:\$ 329,870.

### Completed.

3. PI on Research Grant, ‘Large deviation problems for some interacting particle systems’, May 15, 2019 – May 14, 2023, NSF grant DMS-1853968. Total award amount: \$ 165,000.
4. Co-PI on Research Grant (joint with S. Lu), ‘Optimization and Equilibria with Expectation Functions: Analysis, Inference and Sampling’, Sep 1, 2018 – Aug 31, 2021, NSF grant DMS-1814894. Total award amount: \$ 272,407.
5. PI on Research Grant, ‘Nonlinear Markov processes, large weakly interacting particle systems, and applications’, Aug 1, 2013–July 31, 2018, NSF grant DMS-1305120 . Total award amount: \$ 299,999.
6. Co-PI on Research Grant, ‘Information Metrics for Reliable Uncertainty Quantification in Materials’, October 1, 2015– March 30, 2017, DARPA grant W911NF-15-2-0122, joint with P.Dupuis, J. Doll (Brown U.), P. Bandaru, D. Tartakovsky (UC-San Diego), P. Plechac, D. Vlachos(U. Delaware), M. Dobson, M. Katsoulakis (U. Mass.). UNC Award Amount: \$173,598.
7. PI on Research Grant, ‘Theory and Applications of Weakly Interacting Markov Processes’, July 1, 2014–June 30, 2017, ARO grant W911NF-14-1-0331. Total award amount: \$ 432,381.
8. PI on Research Grant, ‘Topics in the Theory and Applications of Stochastic Analysis’, July 1, 2010–March 15, 2015, ARO grant W911NF-10-1-0158. Total Award Amount: \$ 491,278.
9. Co-PI on Research grant, ‘Stochastic algorithms for countering chemical and biological threats’, Oct 1, 2010–June 30, 2015, joint with J.Hannig and M.R. Leadbetter, NSF grant DMS-1016441. Total award amount: \$ 864,273.
10. PI on Conference grant, ‘Seminar on Stochastic Processes 2013’, January 1, 2013 - December 31, 2015.
11. PI on Research Grant, ‘Scaling limits for some stochastic control problems with applications to stochastic networks’, Aug 15, 2010–July 31, 2014, NSF grant DMS-1004418. Total award amount: \$ 311,261.



12. Co-I on Research Grant, ‘Emerging Frontiers in 3D Breast Cancer Tissue Test Systems’, Nov 1, 2007 - Aug 31, 2011, NSF-EFRI grant (with R. Leadbetter, subcontract from Clemson University). Total Award Amount: \$400,187.
13. Co-PI on Research grant, ‘Blind control of stochastic networks and heavy traffic’, Aug 1, 2009–July 31, 2013, US-Israel Binational Science Foundation grant No. 2008466, joint with R. Atar, A. Schwartz. Total award amount: \$76,000.
14. PI on Research Grant, ‘Some Topics in Stochastic Control’, July 1, 2007 –June 30, 2010, ARO grant W911NF-0-1-0080. Total Award Amount: \$268,437.
15. PI on Research Grant, ‘Topics in the Theory and Applications of Stochastic Analysis’, July 1, 2004 - June 30, 2007, ARO grant W911NF-04-1-0230. Total award amount: \$229,133.
16. PI on Research Contract, ‘Advanced Computational Algorithms for Nonlinear Filtering for Real Time Environment’, August 27, 2004 - August 26, 2006, Scientific Systems Co. (Subcontract for ARMY STTR Phase II, Contract W911NF-04-C-0108 ). Total award amount: \$209,909.
17. PI on a grant for a minisymposium, ‘A minisymposium on Brownian motors and protein dynamics’, July 11-15, 2005, ARO grant W911NF-05-1-0057. Total award amount: \$15,012.
18. PI on Research Contract, ‘Advanced Computational Algorithms for Nonlinear Filtering for Real Time Environment’, July 1, 2003 - Jan 31, 2004, Scientific Systems Co. (Subcontract for ARMY STTR Phase I, Contract DAAD19-03-C-0072). Total award amount: \$29,996.
19. PI on a grant for the conference, ‘Graduate Student Conference in Probability’, March 1, 2009–Feb 28, 2011, NSF grant DMS-0856188. Total award amount: \$12,000
20. PI on the Research Grant, ‘IBM Junior Faculty Development Award, UNC -Chapel Hill’, January 1 - December 31, 2001, Total Award Amount: \$5,000.
21. PI on the Research Grant, 1999-2000, ‘Infinite Time Horizon Problems in Nonlinear Filtering’, Faculty Research Program, Office of Research, University of Notre Dame. Total award amount: \$7,460.
22. Co-PI on the Research Grant, 1998-2001, ‘Simulation Uncertainty in Multidisciplinary Design’, NSF-DMI-9812857 (with Batill, S., Brach, R., Renaud, J.). Total award amount: \$416,844.
23. Co-PI on the Research Grant, 1996-1998, ‘Nonlinear Filtering Approachs to Multitarget Tracking’, ONR Grant N00014-96-1-0279 (with Breidt, J., Carriquiry, A., Kliemann, W., Mirkovic, D., O’Donnell, B.). Total award amount: \$604,342.

## Other Awards

- *Structured Quartet Research Ensembles Award*, American Institute of Mathematics, Summer 2021 (joint award with Xin Liu, Cindy Greenwood, Amber Puha, Anuj Mubayi, and Yunan Liu).
- *Nelder Visiting Fellowship*, Imperial College, Jan 1-March 31, 2020.
- *London Mathematical Society, lectures grant*, Feb 1- March 31, 2020, grant to give lectures at Imperial College London, University of Oxford, University of Cambridge.
- *Visiting Professor*, International Center for Theoretical Science, Tata Institute of Fundamental Research, Oct 4 - Dec 15, 2019.
- *Visiting Professor*, Department of Electrical Engineering, Technion, Israel, Aug 24-Sep 24, 2019.
- *Senior Faculty Research and Scholarly Leave-UNC*, Jan 1 - June 30, 2020.
- *Visiting Fellowship*, Faculty of Science and Technology, University of Macau, Taipa, Macau, China, June 30 - July 4, 2018.

- *Summer Fellowship*, Université de Nice Sophia-Antipolis Laboratoire Dieudonné, Summer 2010.
- *Faculty Fellow associated with the program “Stochastic Dynamics”*, Statistical and Applied Mathematical Sciences Institute, Fall 2009.
- *Visiting Associate Professor of Applied Mathematics*, Division of Applied Mathematics, Brown University, March 15 - May 15, 2005.
- *Faculty Fellow associated with the program “Data Assimilation for Geophysical Systems”*, Statistical and Applied Mathematical Sciences Institute, Spring 2005.
- *Summer Fellowship*, Department of Electrical Engineering, Technion, Israel Institute of Technology, May-August 2003.
- Division of Applied Mathematics, Brown University, Feb 2003.  
*Invited by Professor Paul Dupuis.*
- Department of Mathematics, University of Alberta, June 2001.  
*Invited by Professor M. Kouritzin.*
- Department of Electrical Engineering, Technion, Israel Institute of Technology, July-August 2001.  
*Invited by Professor R. Atar.*
- Summer Internship Award, ‘1999 Intern Program in Probability and Stochastic Processes’, Center for Mathematical Sciences, University of Wisconsin, Madison, June 23 - August 13, 1999.
- Travel Award, 1999, NSF travel grant to present a paper at the 26th Conference on Stochastic Processes and their applications, Beijing, P.R. China, June 14-18, 1999.
- Travel Award, 1998, ‘Young Investigators Travel Grant’, NSF, to present a paper at The VII Latin American Congress on Probability and Statistics (CLAPEM 1998), Cordoba, Argentina, September 21-25, 1998.
- *Travel Award*, conference on ‘Geometry and Analysis of Loop Spaces’, organized by Professors M. Rockner and S. Stolz, Mathematisches Forschungsinstitut Oberwolfach, Germany, April 25 - May 1, 1999.

## Professional Activities

### A. Editorial Work: Current

- Associate Editor. *Proceedings of the American Math Society*, Feb 2022–.
- Associate Editor. *Potential Analysis*, Oct 2020 – .
- Associate Editor. *Math. Oper. Res.*, Sep 2020 – .
- Associate Editor. *SIAM Journal on Control and Optimization*, Jan 2008 – .
- Associate Editor. *Applied Math and Optimization*, Dec 2016 – .
- Associate Editor. *Infinite Dimensional Analysis, Quantum Probability and Related Fields*, June 2021 – .
- Associate Editor. *Involve*, Dec 2008 – .

### B. Editorial Work: Past

- Associate Editor. *Ann. App. Prob.*, 2013 – 2018.
- Associate Editor. *Sankhya, Series A*, 2007 – 2018.

- Associate Editor. *Bernoulli*, 2009 – 2016.
- Associate Editor. *Electronic Journal of Probability and Electronic Communications in Probability*, 2007 – 2012.

### C. Committees:

- Permanent member of the Scientific Committee of the *Seminar on Stochastic Processes*.
- IMS Committee on Special Lectures 2020-2023.
- Program Committee, *INFORMS Applied Probability Conference*, July 3–5, 2019, Brisbane, Australia.
- IMS Committee on Travel Awards 2015-2018.
- IMS Committee on Nominations 2013-2014 and 2014-2015.
- Program Committee, *IMS – Asia Pacific Rim Meeting*, 2016 and 2018.
- Program Committee, *INFORMS Applied Probability Conference*, July 6–8, 2011, Stockholm, Sweden.
- Program Committee, *IISA Conference in Probability and Statistics*, April 21-24, 2011, Raleigh, NC.

### D. Reviewing:

**Grant Panels:** NSF-DMS (January 2009), NSF-CMMI (December 2010), NSF-DMS (January 2011), NSF-DMS (December 2020), NSF-DMS (December 2021), NSF-DMS (December 2022).

**Journals:** *Annals of Probability*, *Annals of Applied Probability*, *Communications in Mathematical Physics*, *Communications in Pure and Applied Mathematics*, *Proceedings of the American Math Society*, *Annales de l’Institut Henri Poincaré*, *Electronic Journal of Probability*, *Random Structures and Algorithms*, *Stochastics and Partial Differential Equations*, *J. Theoretical Probability*, *Math. Oper. Research*, *Probability Theory and Related Fields*, *J. Functional Analysis*, *SIAM Journal on Applied Math.*, *SIAM Journal on Control and Optimization*, *IEEE Transactions on Automatic Control*, *Stochastic Processes and their Applications*, *Applied Mathematics and Optimization*, *Stochastics and Stochastics Reports*, *Physica-D*, *Monthly Weather Review*.

**Books:** Cambridge University Press, IMS Monograph Series.

**Grant Applications:** National Science Foundation, National Security Agency, Army Research Office, Air Force Office of Scientific Research, US-Israel BSF, Banff International Research Station (BIRS), Pacific Institute for the Mathematical Sciences (PIMS), National Scientific Research Council, Romania, Research Grants Council (RGC) of Hong Kong, Swiss National Science Foundation.

### E. Conferences:

- Co-organizer (with Shankar Bhamidi) of the *Southeastern Probability Conference 2022*, August 8-9, 2022, UNC Chapel Hill.
- Co-organizer (with Jonathan Mattingly) of the *Seminar on Stochastic Processes 2013*, March 14-16, 2013.
- Co-organizer (with Rajeeva Karandikar) of the VIMSS-SAVI workshop *Topics in Probability*, Chennai Math Institute, Chennai, December 18-20, 2012.
- Co-organizer of the *2012 Southeastern Probability Conference*, May 14-15, 2012, Duke University, NC.
- Organizer of an invited session on “Stochastic Networks” at *International Workshop on Applied Probability*, June 11-14 (2012), Jerusalem, Israel.

- Co-Organizer( with A. Sommesse) of CAM Workshop entitled ‘Emerging Directions in Probability and Statistics’, Spring 2008.
- Organizer of an invited session on “Stochastic Control of Networks in Heavy Traffic” at *13th INFORMS, Applied Probability Conference, Ottawa, Canada*, July 6-8, 2005.
- Co-organizer (with Harry Chang, ARO) of a minisymposium on “Brownian Motors and Protein Dynamics” at *2005 SIAM Annual Meeting, New Orleans, LA*, July 11-15, 2005.
- Co-organizer (with Montse Fuentes, NCSU) of a mini-workshop on “Bridging Statistical Approaches and Sequential Data Assimilation” at *Statistical and Applied Mathematical Sciences Institute*, June 27, 2005.
- Organizer of an invited session on Stochastic Control at *Fifteenth International Symposium on Mathematical Theory of Networks and Systems*, University of Notre Dame, August 12-16, 2002.

#### **F. Professional Organizations:**

Member of Institute of Mathematical Statistics(IMS), American Math Society(AMS), Society for Industrial and Applied Mathematics(SIAM), and Institute of Operations Research and Management Sciences(INFORMS).

**G.** Served on examination jury for Habilitation á diriger les recherches (H.D.R.), for Dr. Sylvain Rubenthaler, Université de Nice-Sophia Antipolis, entitled *Probabilités : aspects theoriques et applications en Filtrage non linéaire, systèmes de particules et processus stochastiques. (June 2010)*

**H.** Coordinator for *The Virtual Institute for Mathematical and Statistical Sciences (VI-MSS)* at SAMSI, (2011-2013).

## **Professional Service (within UNC)**

#### **A. University Administrative Service:**

- Senior Associate Dean for Faculty and Academic Affairs, School of Data Science and Society, UNC (Mar 2023-).
- UNC Faculty Council (Division of Natural Sciences and Mathematics representative) (Aug 2023-July 2026).
- Director, Chairs Leadership Program (July 2021-June 2023).
- Instructional Budget Advisory Committee, CAS, Fall 2021.
- Committee on Race-Neutral Strategies (Oct 2018 -Dec 2021).
- Chancellor’s Science Scholars Executive Advisory Board (2018-2020).
- Chancellor’s Science Scholars Application Reader (for the 2019 cohort).

#### **B. Departmental Administrative Service:**

- Department Chair, July 2014 -June 2019.
- Member of many promotions and reappointment committees.
- Member of many junior faculty mentoring committees.
- Member of the (STOR Faculty) Advisory Committee, July 2009 - June 2019.
- Director of Undergraduate Studies, June 2003-June 2004.
- Member of the Teaching Assignments Committee, July 2003 - June 2019.
- Faculty Advisor for the Mathematical Decision Sciences Program, August 2000 - June 2014.

## Mentoring

### A. Ph.D Students (completed):

- **John Fricks** (Graduated May 2004), *Biomolecular Motors and Diffusion Ratchets*. NSF postdoctoral fellow, Dept of Mathematics, University of North Carolina, August 2004-August 2005; Assistant Professor, Dept of Statistics, Pennsylvania State University, August 2005-2011. Associate Professor, August 2011–July 2016; School of Mathematical and Statistical Sciences, Arizona State University, August 2016–
- **Arka Ghosh** (Graduated May 2005), *Controlled Stochastic Network in Heavy Traffic*. Assistant Professor, Department of Statistics, Iowa State University, August 2005–2011. Associate Professor, August 2011–
- **Kevin Ross** (Graduated May 2006), *Numerical Approximations for Some Stochastic Singular Control Problems*. VIGRE Postdoctoral Fellow, Stanford University, August 2006-2009. Swathmore College, August 2009 – July 2012. Assistant Professor, Cal. Poly. August 2013–
- **Chihoon Lee** (Graduated May 2008), *Long Time Stability and Control Problems for Stochastic Networks in Heavy Traffic*. Assistant Professor, Colorado State University, August 2008-2014, Associate Professor 2014-15; Associate Professor, Stevens Institute of Technology, 2015–.
- **Vasileios Maroulas** (Graduated May 2008), *Small noise Large Deviations for Infinite Dimensional Stochastic Dynamical Systems*. Postdoctoral fellow, joint appointment, Institute for Mathematics and its Applications, University of Minnesota and Lockheed Martin, August 2008-2010. Assistant Professor, University of Tennessee, August 2010-July 2016, Associate Professor 2016–
- **Xin Liu** (Graduated May 2011), *Multiscale Diffusion Approximations for Stochastic Networks in Heavy Traffic*, Postdoctoral fellow, joint appointment, Institute for Mathematics and its Applications and University of Minnesota, August 2011- July 2013. Assistant Professor, Clemson University, August 2013–
- **Dominik Reinhold** (Graduated May 2011), *Asymptotic Behavior of Near Critical Branching Processes*, Assistant Professor, Clark University, August 2011–July 2015; Research Assistant Professor, Department of Biostatistics & Informatics, University of Colorado Denver, Anschutz Medical Campus, August 2015–
- **Jiang Chen** (Graduated May 2013), *Some Topics in Large Deviations Theory for Stochastic Dynamical Systems*, CEO, Zhiliao Creation Educational Technology, August 2013 –
- **Xuan Wang** (Graduated May 2014, co-advised with S.Bhamidi), *Some Asymptotic Problems for Dynamical Random Graphs*, Postdoctoral Fellow, Indiana University, August 2014-May 2016; Data Scientist, Data Bricks, July 2016–
- **Abhishek Pal Majumder** (Graduated May 2015, co-advised with Jan Hannig), *Long Time Asymptotics of Some Weakly Interacting Particle Systems and Higher Order Asymptotics of Generalized Fiducial Distribution*, Postdoctoral Fellow, University of Copenhagen, August 2015-May 2017.
- **Ruoyu Wu** (Graduated May 2016), *Some Asymptotic Results for Weakly Interacting Particle Systems*, Postdoctoral Fellow, Brown University, July 2016-June 2018; U. Michigan July 2018-June 2020; Assistant Professor, Iowa State University, July 2020–.
- **Eric Friedlander** (Graduated May 2018), *Mean-Field Methods in Large Stochastic Networks*, Postdoctoral Fellow, University of Chicago, Department of Ecology and Evolution, August 2018–
- **Yang Yu** (Graduated May 2019, co-advised with Shu Lu), *Analyzing Sampling in Stochastic Optimization: Importance Sampling and Statistical Inference*. Data Scientist, Google, August 2019–
- **Adam Waterbury** (Graduated May 2021, co-advised with Nicolas Fraiman), *Asymptotics and Approximation of Quasi-Stationary Distributions*. Postdoctoral Fellow, University of California at Santa Barbara, Department of Statistics and Applied Probability.

- **Michael Conroy** ( Graduated May 2021, co-advised with Marianna Olvera-Cravioto), *Rare Event Analysis for Some Branching Process and Interacting Particle Models*. Postdoctoral Fellow, University of Arizona, Department of Mathematics.
- **Miheer Dewasker** (Graduated May 2021, co-advised with Shankar Bhamidi and Andrew Nobel), *High-dimensional Problems in Statistics and Probability: Correlation Mining and Distributed Load Balancing*. Postdoctoral Fellow, Duke University, Department of Statistical Science.

#### B. Ph.D. Students (current):

**Ben Estevez** (joint with Sayan Banerjee, expected graduation May 2024), **Pavlos Zoubouloglu** (expected graduation May 2024), **Dilshad Imon** (joint with Sayan Banerjee, expected graduation May 2026).

#### C. Postdoctoral Fellows:

- Sergio Almada-Monter (2011-2013)
- Xiaoming Song(2011-2013)
- Chia Ying Lee(2011-2013)
- Subhamay Saha(2013-2014)
- Louis Fan(2014-2015)
- Dane Johnson (2015-2017)
- Michael Perlmutter (2016-2017)
- Peter Rudzis (2022-)
- Souvik Ray (2023-)

#### D. Masters Students:

- M. R. Jahan-Parvar (Graduated Dec 2003) *Portfolio Choice with Multifactor Volatility*.

**E. Undergraduate Honors/Research Projects:** Joe Zappa (Spring 2011), Nathan Vos (Spring 2012), Anqi Feng (Fall 2013), Nate McClintock(Spring 2018), Daniel de Marchi (Spring 2019), Maanya Cheekati (Spring 2021), Bob White Jr. Payne(Spring 2021), Grace Brady (Fall 2022-Spring 2023), Tyler Yang (Fall 2023-).

**F. Member of (approximately) thirty Ph.D committees.**

## Selected Invited Talks

1. *Large Deviations and Stochastic Control*, Bahadur Memorial Lecture(**Plenary**), IISA Annual Conference, Colorado School of Mines Golden, Colorado 1–4 June, 2023.
2. *Invariant distributions of the infinite Atlas model: domains of attraction and extremality* , Brin Mathematics Research Center Workshop: Modern Topics in Probability, October 17-21, 2022.
3. *Near Equilibrium Fluctuations for Certain Supermarket Models*, SNAPP virtual seminar, August 30, 2021.
4. *Stochastic Control Methods in the Theory of Large Deviations*, A mini-course (eight two hour lectures) at Imperial College, Jan 16-Mar 5, 2020.
5. *London Mathematical Society Grant Talks*, A series of three talks at Imperial College, University of Cambridge, and University of Oxford on topics in large deviations.

- *Uniform Large Deviation Estimates for SDE in Banach Space*, Imperial College London, January 21, 2020.
  - *Empirical Measure and Small Noise Asymptotics under Large Deviation Scaling for Interacting Diffusions*, University of Cambridge, February 25, 2020.
  - *Empirical Measure and Small Noise Asymptotics under Large Deviation Scaling for Interacting Diffusions*, University of Oxford, March 2, 2020.
6. *Weak Convergence Methods in Large Deviation Problems*, A series of three lectures, Indian Institute of Technology, Bombay, Nov. 18-21, 2019.
  7. *Weak Convergence Methods in Large Deviation Problems*, A series of three lectures, International Center for Theoretical Sciences, TIFR, Bangalore, October 11-16, 2019.
  8. *On Some Calculus of Variations Problems for Rare Event Asymptotics*, BIRS-CMO workshop, “Scaling Limits of Dynamical Processes on Random Graphs”, Oaxaca, Mexico, May 19-May 24, 2019.
  9. *Diffusion Approximations for Controlled Queuing Systems*, Workshop on Operations Research of Biological Systems, The Abdus Salam International Center for Theoretical Physics, Trieste, Italy, 9-14 July 2018.
  10. *Large Deviations from the Hydrodynamic Limit for a System with Nearest Neighbor Interactions*, A Symposium on Optimal Stopping, Rice University June 25-29, 2018.
  11. *Control Policies Approaching HGI Performance in Heavy Traffic for Resource Sharing Networks*. IMA Workshop – Queueing and Networks, Part of the 2017-18 Major Program on Modeling, Stochastic control, optimization, and related applications, May 14-18, 2018.
  12. *Large and Moderate Deviation Problems for Weakly Interacting Markov Processes*. The 8th International Conference on Stochastic Analysis and Its Applications, June 13–17, 2016, Beijing, China.
  13. *Infinity Laplacian and Stochastic Differential Games*. Quasilinear PDEs and Game Theory, December 2-4, 2013, Institut Mittag-Leffler and Uppsala University, Sweden.
  14. *Large Deviations and Variational Representations for Infinite Dimensional Systems*. IMA Annual Program Year Workshop, Theory and Applications of Stochastic PDEs January 14-18, 2013, IMA Minnesota.
  15. *Some Variational Formulas for Space-Time Brownian Motions and Poisson Random Measures*, Thirty Third Midwest Probability Colloquium, October 13-15, 2011, Northwestern University, Evanston, IL. **one of five invited speakers**
  16. *Variational Representations and Large Deviations*, 2009 Barrett Lectures at The University of Tennessee, April 17 - 18, 2009. **one of five invited speakers**
  17. *Diffusion Approximations for Controlled Stochastic Networks*, Stochastic Networks Conference, Ecole Normale Supérieure, Paris, June 23-28, 2008.
  18. *Elliott-Kalton stochastic differential games associated with the infinity Laplacian*, Seminar on Stochastic Processes, University of Delaware, April 3-5, 2008. **one of five invited speakers**
  19. *Singular Control with State Constraints*, Recent Advances in Probability, Indian Statistical Institute, Kolkata, Decemeber 11 - 15, 2007.
  20. *Singular Control with State Constraints*, Conference on Stochastic Networks, University of Illinois at Urbana-Champaign, June 19-24, 2006.
  21. *Brownian Control Problems and Singular Control with State Constraints*, AMS-India conference, Bangalore , India, Dec 17 - 20, 2003.

22. *Ergodic Properties of the Nonlinear Filter*, Filtering Theory and Applications, Edmonton, Canada, July 25 - 30, 2002.
23. *Large Deviations for the Empirical Measures of Constrained Markov Processes*, The Fourth International Symposium on Probability and its Applications, Banff, Canada, July 31 - August 2, 2002.
24. *Asymptotic Problems in Nonlinear Filtering*, Conference on Stochastic Control Theory and its Applications, Mathematical Research and Conference Center, Bedlewo, Poland, 3 - 8 June, 2002.
25. *Empirical Measure Large Deviation Principle for Constrained Processes*, Workshop on the Skorokhod Problem, Bedlewo, Poland, July 16-21, 2001.
26. *Ergodic Problems in Nonlinear Filtering*, Workshop on particle systems and filtering, Centre Émile Borel, Institut Henri Poincaré, June, 18-20, 2001.

## Other Invited Talks

- *Domains of Attraction of Invariant Distributions of the Infinite Atlas Model*, Invited Session: Reflecting diffusions, stochastic networks and applications, 2022 IMS Annual Meeting, June 27-30, 2022.
- *Domains of Attraction of Invariant Distributions of the Infinite Atlas Model*, A conference on Probability & Stochastic Processes in honor of R.L. Karandikar, March 30, 2022. (Virtual)
- *Measure valued processes characterized by a field of reflecting Brownian motions arising from certain queuing problems*, 10th World Congress in Probability and Statistics, July 2021. (Virtual)
- *A Glimpse into the World of Probability*, Scholastic Test of Excellence in Mathematical Sciences (STEMS) Lecture Series, Chennai Math. Institute, Nov 14, 2020. (Virtual)
- *Near Equilibrium Fluctuations For Certain Supermarket Models*, INFORMS Annual Meeting (Virtual), Nov 7-13.
- *On Some Calculus of Variations Problems for Rare Event Asymptotics*, TIFR Centre for Applicable Mathematics, Bangalore, Nov 29, 2019.
- *On Some Calculus of Variations Problems for Rare Event Asymptotics*, Tata Institute of Fundamental Research, Mumbai, Nov 19, 2019.
- *Empirical Measure and Small Noise Asymptotics under Large Deviation Scaling for Interacting Diffusions*, Indian Statistical Institute, Bangalore, Oct 21, 2019.
- *JSQ, LDP and the Golden Ratio*, The 20th INFORMS Applied Probability Society Conference, Brisbane Australia, July 3-5, 2019.
- *Large Deviations from the Hydrodynamic Limit for a System with Nearest Neighbor Interactions*, The 5th IMS Asia Pacific Rim Meeting (IMS-APRM), Singapore, June 26-29, 2018.
- *Large Deviations from the Hydrodynamic Limit for a System with Nearest Neighbor Interactions*, The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 5 - July 9, 2018 Taipei, Taiwan.
- *Scaling Limits for Large Stochastic Networks*. The 39th Conference on Stochastic Processes and their Applications, July 24-28, 2017, Moscow, Russia.
- *Control of Large Stochastic Networks With Mean Field Interaction*. World Congress in Probability and Statistics, July 11–15, 2016, The Fields Institute, Toronto.
- *Moderate Deviation Principles for Weakly Interacting Particle Systems*. The 4th Institute of Mathematical Statistics Asia Pacific Rim Meeting, The Chinese University of Hong Kong, June 27-30, 2016.



- *On Some Free Boundary Problems for Stochastic Systems.* AMS Spring Eastern Sectional Meeting, University of Maryland, Baltimore County, Baltimore, MD, March 29-30, 2014.
- *Moderate Deviations Principles for Stochastic Dynamical Systems.* AMS Southeastern Spring Sectional Meeting University of Tennessee, Knoxville, Knoxville, TN March 21-23, 2014.
- *Asymptotics of Infinite Dimensional Small Noise Systems.* NSF/CBMS Conference: Analysis of Stochastic Partial Differential Equations, August 19-23, Michigan State University, 2013.
- *A Stochastic Differential Game for the Infinity Laplacian.* Special Session on Stochastic Analysis, 2012 AMS Spring Central Section Meeting, March 30 - April 1, 2012, University of Kansas, Lawrence.
- *A Stochastic Differential Game for the Infinity Laplacian.* Special Session on Game Theory, U.S. Army Conference on Applied Statistics, 19-21 October, 2011 Annapolis, MD.
- *Variational Representations for Poisson Random Measures and Infinite Dimensional Brownian Motions,* 35th Conference on Stochastic Processes and their Applications, 19-24 June, 2011, Oaxaca, Mexico.
- *A Stochastic Differential Game for the Inhomogeneous Infinity-Laplace Equation,* Institute of Mathematical Statistics, 73rd Annual Meeting, Aug 9-13, 2010, Gothenburg, Sweden.
- *Some Large Deviation Problems for Infinite Dimensional Stochastic Dynamical Systems,* Theory and Qualitative Behavior of Stochastic Dynamics, SAMSI, February 8-10, 2010.
- *Heavy Traffic Analysis of Controlled Queuing Networks,* U.S. Army Conference on Applied Statistics, Rice University, 17-19 October, 2007.
- *Singular Stochastic Control with State Constraints,* Conference on Differential and Difference Equations and Applications, Melbourne, FL, August 1-5, 2005.
- *Protein Motors, Brownian Ratchets and Reflected Diffusions,* 2005 SIAM Annual Meeting, New Orleans, LA, July 11-15, 2005.
- *Diffusion Approximations for Controlled Stochastic Networks: An Asymptotic Bound for the Value Function,* 13th INFORMS, Applied Probability Conference, Ottawa, Canada, July 6-8, 2005.
- *Stochastic Singular Control with State Constraints,* AIMS- Fifth International Conference on Dynamical Systems and Differential Equations, June 16-19, 2004.
- *Singular Control with State Constraints,* Sixth International Joint Meeting of the AMS and the Sociedad Matematica Mexicana, May 13-15, 2004.
- *A Large Deviations Approach to Asymptotically Optimal Control of Crisscross Network in Heavy Traffic,* Summer Research Conference of the Southern Regional Council on Statistics and the American Statistical Association, Blacksburg, Virginia, June 6-9, 2004.
- *A Large Deviations Approach to Asymptotically Optimal Control of Crisscross Network in Heavy Traffic,* INFORMS Annual Meeting, Atlanta, October 19-22, 2003.
- *Approximate Filters over an Infinite Time Horizon,* Workshop on filtering and related problems of detection and estimation, Center for Mathematical Sciences, University of Wisconsin, Madison, July 16-17, 1999.
- *Approximation and Limit Results for Nonlinear Filters over an Infinite Time Interval,* Fourth SIAM Conference on Control and its Applications(SIAG/CST) (CT 98), Omni Hotel, Jacksonville, Florida, May 7-9, 1998.
- *Exponential Stability of Discrete Time Filters,* Stochastic Control and Nonlinear Filtering Workshop at North Carolina State University, October 1996.

- *A Nonlinear Filtering Algorithm for Multi Models*, Second international ISU workshop on numerics for dynamical systems, Department of Mathematics, Iowa State University, April 1996.
- *Nonlinear Filtering: Exact and Approximate Approaches*, ONR/ NRaD Workshop on tracking, San Diego, February 1996.
- *A System of Integral Equations in Nonlinear Filtering*, International workshop in nonlinear filtering, Chapel Hill, June 1994.

## Invited Colloquia/Seminars

Brown University, Carnegie Mellon University, Colorado State University, Columbia University, Duke University, EPFL-Lausanne, Georgia Tech, Indian Statistical Institute, Indiana University, Institute of Math.–Academia Sinica (Taiwan), John Hopkins University, Louisiana State University, National Taiwan University, NC State University, New York University (Courant Institute), Penn State University, Princeton University, Rutgers University, Stanford University, Technion–Israel Institute of Technology, University of Arizona, University of California-Berkeley, University of California-San-Diego, University of Georgia, University of Macau(China), University of Maryland, University of Minnesota, University of Nice, Sophia-Antipolis, University of Notre Dame, University of Southern California, University of Texas at Austin, University of Virginia, University of Washington-Seattle, University of Wisconsin-Madison, University of Wisconsin-Milwaukee, Virginia Tech., Wayne State University.

## Software

Development of PFLib: An Object Oriented MATLAB Toolbox for various Particle Filtering Algorithms. Available under a GNU GPL license.