

List of publications: Dr. Indranil SenGupta

1. *Hypothesis tests on high-dimensional data streams with application in financial market*, to appear in Sankhya B, Accepted: March, 2026 (with M. Roberts, J. Cao, and S. Awasthi). [click here]
2. *From pixels to profits: a novel approach to identify rare events for a group of US equities*, to appear in Annals of Data Science, Accepted: June, 2025 (with L. Mondal, K. Chandak, and G. Chakrabarty). [click here]
3. *Synthetic Stocks and Market Movement Estimation: An Analysis with Gaussian Process, Drawdown, and Data Science*, Annals of Financial Economics, Vol. 20, No. 4, 2025, pp. 2550024 (31 pages) (with M. Gebreslasie¹). [click here]
4. *Oil commodity movement estimation: analysis with Gaussian process and data science*, Commodities, Vol. 4, 2025, pp. 9 (17 pages) (with M. Gebreslasie¹). [click here]
5. *Some asymptotics for short maturity Asian options*, Stochastic Models, Vol. 41, Issue 3, 2025, pp. 356-382 (with H. Shoshi). [click here]
6. *Analysis of optimal portfolio on finite and small-time horizons for a stochastic volatility model with multiple correlated assets*, International Journal of Theoretical and Applied Finance, Vol. 27, Nos. 5 & 6, 2024, pp. 2450023 (32 pages) (with M. Lin¹). [click here]
7. *Predicting ocean freight rates using machine learning methods*, Journal of Artificial Intelligence and Machine Learning, Vol. 4, Issue 1, 2025, pp. 1-26 (with P. Lakkakula, W. Wilson, and S. Awasthi¹). [click here]
8. *Estimation of VaR with jump process: Application in corn and soybean markets*, Applied Stochastic Models in Business and Industry, Vol. 40, Issue 5, 2024, pp. 1337-1354 (with M. Lin¹ and W. Wilson). [click here]
9. *Stochastic volatility modeling of high-frequency CSI 300 index and dynamic jump prediction driven by machine learning*, Electronic Research Archive, Vol. 31, Issue 3, 2023, pp. 1365-1386 (with X. Hui, B. Sun, Y. Zhou, and H. Jiang). [click here]
10. *Analysis of stock index with a generalized BN-S model: an approach based on machine learning and fuzzy parameters*, Stochastic Analysis and Applications, Vol. 41, Issue 5, 2023, pp. 938-957 (with X. Hui¹, B. Sun, and H. Jiang). [click here]
11. *Machine learning and neural network based model predictions of soybean export shares from US Gulf to China*, Statistical Analysis and Data Mining: The ASA Data Science Journal, Vol. 15, Issue 6, 2022, pp. 707-721 (with S. Awasthi¹, W. Wilson, and P. Lakkakula). [click here]
12. *A novel implementation of Siamese type neural networks in predicting rare fluctuations in financial time series*, Risks, Vol. 10, No. 2: 39, 2022 (16 pages) (with T. Basu, O. Menzer, and J. Ward). [click here]

¹Graduate student (during the time when this paper is written) supervised by Dr. SenGupta

13. *Analysis of optimal portfolio on finite and small time horizons for a stochastic volatility market model*, SIAM Journal on Financial Mathematics, Vol. 12, No. 4, 2021, pp. 1596-1624 (with M. Lin¹). [[click here](#)]
14. *Fractional Barndorff-Nielsen and Shephard model: applications in variance and volatility swaps, and hedging*, Annals of Finance, Vol. 17, 2021, pp. 529–558 (with N. Salmon¹). [[click here](#)] or for full-text (view-only version) [[click here](#)]
15. *Hedging and machine learning driven crude oil data analysis using a refined Barndorff-Nielsen and Shephard model*, International Journal of Financial Engineering, Vol. 8, No. 4, 2021, pp. 2150015 (29 pages) (with H. Shoshi¹). [[click here](#)]
16. *Stochastic analysis and neural network-based yield prediction with precision agriculture*, Journal of Risk and Financial Management, Vol. 14, Issue 9, 2021 (17 pages) (with H. Shoshi¹, E. Hanson, and W. Nganje). [[click here](#)]
17. *First exit-time analysis for an approximate Barndorff-Nielsen and Shephard model with stationary self-decomposable variance process*, Journal of Stochastic Analysis (formerly, Communications on Stochastic Analysis), Vol. 2, No. 1, Article 5, 2021 (26 pages) (with S. Awasthi¹). [[click here](#)]
18. *Refinements of Barndorff-Nielsen and Shephard model: an analysis of crude oil price with machine learning*, Annals of Data Science, Vol. 8, Issue 1, 2021, pp. 39-55 (with W. Nganje and E. Hanson). [[click here](#)]
19. *Sequential hypothesis testing in machine learning, and crude oil price jump size detection*, Applied Mathematical Finance, Vol. 27, No. 5, 2020, pp. 374-395 (with M. Roberts¹). [[click here](#)]
20. *Multi-asset generalised variance swaps in Barndorff-Nielsen and Shephard model*, International Journal of Financial Engineering, Vol. 7, No. 4, 2020, pp. 2050051 (36 pages) (with S. Biswas and D. Mukherjee). [[click here](#)]
21. *Infinitesimal generators for two-dimensional Lévy process-driven hypothesis testing*, Annals of Finance, Vol. 16, No. 1, 2020, pp. 121-139 (with M. Roberts¹). [[click here](#)] or for full-text (view-only version) [[click here](#)]
22. *Barndorff-Nielsen and Shephard model for hedging energy with quantity risk*, High Frequency, Vol. 2, Issue 3-4, 2019, pp. 202-214 (with W. Wilson, W. Nganje, and S. Gebresilasie). [[click here](#)]
23. *Barndorff-Nielsen and Shephard model: oil hedging with variance swap and option*, Mathematics and Financial Economics, Vol. 13, Issue 2, 2019, pp. 209-226 (with W. Wilson and W. Nganje). [[click here](#)]
24. *Volatility and variance swap using superposition of the Barndorff-Nielsen and Shephard type Lévy processes*, Sankhya B: The Indian Journal of Statistics, Vol. 81, Issue 1, 2019, pp. 75-92 (with S. Habtemicael and M. Ghebremichael). [[click here](#)]
25. *Moments of the asset price for the Barndorff-Nielsen and Shephard model*, Lithuanian Mathematical Journal, Vol. 58, Issue 4, 2018, pp. 408-420 (with A. Ihsan). [[click here](#)]

26. *A new analysis of VIX using mixture of regressions: examination and short-term forecasting for the S&P 500 market*, High Frequency, Vol. 1, Issue 1, 2018, pp. 53-65 (with T. Miljkovic). [[click here](#)]
27. *Analysis of variance based instruments for Ornstein-Uhlenbeck type models: swap and price index*, Annals of Finance, Vol. 13, No. 4, 2017, pp. 401-434 (with A. Issaka¹). [[click here](#)] or for full-text (view-only version) [[click here](#)]
28. *Feynman path integrals and asymptotic expansions for transition probability densities of some Lévy driven financial markets*, Journal of Applied Mathematics and Computing, Vol. 54, Issue 1, 2017, pp. 159-182, (with A. Issaka¹). [[click here](#)]
29. *Pricing variance and volatility swaps for Barndorff-Nielsen and Shephard process driven financial markets*, International Journal of Financial Engineering, Vol. 03, Issue 04, 2016, pp. 1650027 (35 pages), (with S. Habtemicael¹). [[click here](#)]
30. *Pricing covariance swaps for Barndorff-Nielsen and Shephard process driven financial markets*, Annals of Financial Economics, Vol. 11, 2016, pp. 1650012 (32 pages), (with S. Habtemicael¹). [[click here](#)]
31. *Generalized BN-S stochastic volatility model for option pricing*, International Journal of Theoretical and Applied Finance, Vol. 19, No. 02, 2016, pp. 1650014 (23 pages). [[click here](#)]
32. *Numerical methods applied to option pricing models with transaction costs and stochastic volatility*, Quantitative Finance, Vol. 15, Issue 8, 2015, pp. 1417-1424, (with M. C. Mariani and G. Sewell). [[click here](#)]
33. *PIDE and solution related to pricing of Lévy driven arithmetic type floating Asian options*, Stochastic Analysis and Applications, Vol. 33, Issue 4, 2015, pp. 630-652, (with S. R. Chandra and D. Mukherjee). [[click here](#)]
34. *Pricing Asian options in financial markets using Mellin transforms*, Electronic Journal of Differential Equations, Vol. 2014 (2014), No. 234, 2014, pp. 1-9. [[click here](#)]
35. *Option pricing with transaction costs and stochastic interest rate*, Applied Mathematical Finance, Vol. 21, No. 5, 2014, pp. 399-416. [[click here](#)]
36. *Option pricing with transaction costs and stochastic volatility*, Electronic Journal of Differential Equations, Vol. 2014 (2014), No. 165, 2014, pp. 1-19, (with I. Florescu and M. C. Mariani). [[click here](#)]
37. *Ornstein-Uhlenbeck processes for geophysical data analysis*, Physica A: Statistical Mechanics and its Applications, Vol. 399, 2014, pp. 147-156, (with S. Habtemicael¹). [[click here](#)]
38. *Lévy models and scale invariance properties applied to Geophysics*, Physica A: Statistical Mechanics and its Applications, Vol. 392, 2013, pp. 824-839, (with M. C. Mariani, I. Florescu, M.P. Beccar Varela, P. Bezdek and L. Serpa). [[click here](#)]
39. *Spherical harmonics approach to parabolic partial differential equations*, Analysis and Mathematical Physics, Vol. 2, No. 4, 2012, pp. 461-471, (with M. C. Mariani). [[click here](#)]

40. *Spherical harmonics applied to differential and integro-differential equations arising in mathematical finance*, Differential Equations and Dynamical Systems, Vol. 20, No. 2, 2012, pp. 93-109, (with M. C. Mariani). [[click here](#)]
41. *Concentration problems for bandpass filters in communication theory over disjoint frequency intervals and numerical solutions*, Journal of Fourier Analysis and Applications, Vol. 18, 2012, pp. 182-210, (with B. Sun, W. Jiang, G. Chen and M. C. Mariani). [[click here](#)]
42. *Solutions to integro-differential problems arising on pricing options in a Lévy market*, Acta Applicandae Mathematicae, Vol. 118, 2012, pp. 237-249, (with M. C. Mariani and P. Amster). [[click here](#)]
43. *Nonlinear problems modeling stochastic volatility and transaction costs*, Quantitative Finance, Vol. 12, Issue 4, 2012, pp. 663-670, (with M. C. Mariani). [[click here](#)]
44. *Numerical solutions for option pricing models including transaction costs and stochastic volatility*, Acta Applicandae Mathematicae, Vol. 118, 2012, pp. 203-220, (with M. C. Mariani and P. Bezdek). [[click here](#)]
45. *Detecting Market crashes by analyzing long memory effects using high frequency data*, Quantitative Finance, Vol. 12, Issue 4, 2012, pp. 623-634, (with E. Barany, M.P. Beccar Varela and I. Florescu). [[click here](#)]
46. *Two-point boundary value problems for a class of second order ordinary differential equations*, International Journal of Mathematics and Mathematical Sciences, Vol. 2012, 2012, Article ID 794040, 13 pages, (with M. C. Mariani). [[click here](#)]
47. *Spectral analysis and generation of certain highly oscillatory curves related to chaos*, Physica A: Statistical Mechanics and its Applications, Vol. 391, 2012, pp. 1453-1468, (with G. Chen, M. C. Mariani and N. Mai). [[click here](#)]
48. *Solutions to a gradient-dependent integro-differential parabolic problem arising in the pricing of financial options in a Lévy market*, Journal of Mathematical Analysis and Applications, Vol. 385, 2012, pp. 36-48, (with M.C. Mariani and M. Salas). [[click here](#)]
49. *Solutions to an integro-differential parabolic problem arising in the pricing of financial options in a Lévy Market*, Nonlinear Analysis: Real World Applications, Vol. 12, 2011, pp. 3103-3113, (with M. C. Mariani). [[click here](#)]
50. *Solutions to a nonlinear Black-Scholes equation*, Electronic Journal of Differential Equations, Vol. 2011 (2011), No. 158, 2011, pp. 1-10, (with M. C. Mariani and E. K. Ncheuguim). [[click here](#)]
51. *Superradiance problem in a 3D annular domain*, Discrete and Continuous Dynamical Systems, Vol. 2011, Issue Special, 2011, pp. 1309 - 1318, (with W. Jiang, B. Sun and M. C. Mariani). [[click here](#)]
52. *Spectral analysis for a three-dimensional superradiance problem*, Journal of Mathematical Analysis and Applications, Vol. 375, 2011, pp. 762-776. [[click here](#)]

53. *Differential operator related to the generalized superradiance integral equation*, Journal of Mathematical Analysis and Applications, Vol. 369, 2010, pp. 101-111. [click here]
54. *Korteweg-de Vries- Burgers equation with a higher-order nonlinearity*, Differential Equations and Dynamical Systems, Vol. 16, Nos. 1 & 2, January & April 2008, pp. 3-27, (with Z. Feng). [click here]
55. *On a new nonlinear transformation and its applications to special functions*, Advanced Studies in Contemporary Mathematics, Vol. 15, No. 2, 2007, pp. 229-242, (with L. Debnath). [click here].
56. *Korteweg-de Vries-Burgers equation with higher-order nonlinearities*, DCDIS A Supplement, Advances in Dynamical Systems, Vol. 14(S2), 2007, pp. 209-214, (with Q. Meng, Z. Feng, L. Debnath and Y. Li). [click here]
57. *Some properties of the Mittag-Leffler functions*, Integral Transforms and Special Functions, Vol. 18, No. 5, 2007, pp. 329-336, (with L. Debnath). [click here]
58. *Broadband tuning limits on UWB antennas based on Fano's formulation*, Proceedings of IEEE Antennas and Propagation International Symposium, Albuquerque, NM., July 9-14, 2006, pp. 171-174, (with M. C. Villalobos, H. D. Foltz and J. S. McLean). [click here]
59. *On a new simple method for evaluation of certain multiple definite integrals*, International Journal of Mathematical Education in Science and Technology. Vol. 37, No. 5, 2006, pp. 624-628, (with L. Debnath). [click here]

Unpublished REU paper

1. *A data-science-driven short-term analysis of Amazon, Apple, Google, and Microsoft stocks*, submitted, (with S. Ekapure, N. Jiruwala, and S. Patnaik). [Summer REU paper. Co-authors are undergraduate students from Indian Institute of Technology (IIT)- Kharagpur, India.] [arXiv link]

Book-chapters (peer-reviewed)

1. *Analysis of Strategic Market Management in Light of Stochastic Processes, Recurrence Relation, Abelian Group and Expectation*, Advances in Artificial Intelligence and Data Engineering, (part of the Advances in Intelligent Systems and Computing book series), N. Chiplunkar, T. Fukao (eds), Springer, 2021, Singapore, pp. 701-710 (with P. Chakrabarti, T. Chakrabarti, S. Bane, B. Satpathy, and J. A. Ware). [click here]
2. *Study of volatility structures in geophysics and finance using GARCH models*, Handbook of High-Frequency Trading and Modeling in Finance; I. Florescu, M. C. Mariani, H. E. Stanley, F. G. Viens (eds), Wiley, 2016, ISBN: 978-1118443989, New York, pp. 295-340, (with M. C. Mariani and F. Biney). [click here]
3. *Scale invariance and Lévy models applied to earthquakes and financial high-frequency data*, Handbook of High-Frequency Trading and Modeling in Finance; I. Florescu, M. C. Mariani, H. E. Stanley, F. G. Viens (eds), Wiley, 2016, ISBN: 978-1118443989, New York, pp. 341-370, (with M-P. Beccar-Varela and I. Florescu). [click here]

4. *Analysis of generic diversity in the fossil record, earthquake series, and high-frequency financial data*, Handbook of High-Frequency Trading and Modeling in Finance; I. Florescu, M. C. Mariani, H. E. Stanley, F. G. Viens (eds), Wiley, 2016, ISBN: 978-1118443989, New York, pp. 371-423, (with M-P. Beccar-Varela, F. Biney, M. C. Mariani, M. Shpak, and P. Bezdek). [\[click here\]](#)
5. *Solutions to integro-differential parabolic problem arising on financial mathematics*, Handbook of Modeling High-Frequency Data in Finance; F. G. Viens, M. C. Mariani, I. Florescu (eds), Wiley, 2011, ISBN: 978-0470876886, New York, pp. 347-382, (with M.C. Mariani and M. Salas). [\[click here\]](#)
6. *Existence of solutions for financial models with transaction costs and stochastic volatility*, Handbook of Modeling High-Frequency Data in Finance; F. G. Viens, M. C. Mariani, I. Florescu (eds), Wiley, 2011, ISBN: 978-047087688-6, New York, pp. 383-419, (with M.C. Mariani and E.K. Ncheuguim). [\[click here\]](#)
7. *Broadband tuning limits on UWB antennas based on Fano's formulation*, Ultra Wideband, Short Pulse Electromagnetics, Vol. 8, 2007, C.E. Baum, A.P. Stone, J.S. Tyo (Eds.), pp. 83-87, (with M. C. Villalobos, H. D. Foltz, and J. S. McLean). [\[click here\]](#)

Doctoral dissertation

- *Analysis of the three-dimensional superradiance problem and some generalizations*, Texas A&M University, 2010. [\[click here\]](#)