

Curriculum Vitae

Eulalia Nualart

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Research interests: Stochastic analysis, Malliavin calculus and applications to finance. SDEs and SPDEs. Fractional Brownian motion. Jump processes. Parametric and non-parametric inference for models driven by SDEs. High-dimensional covariance estimation for high-frequency pricing data. Stochastic gradient descent and deep neural networks.

University Positions:

- **September 2012-present:** *Tenured Associate Professor Serra Hunter Program*, Department of Economics, Universitat Pompeu Fabra and Barcelona Graduate School of Economics
- **2004-12:** *Maître de Conférences (permanent research and teaching position)*, Department of Mathematics, Université de Paris 13
- **2010-11:** *Research visit* (1 semester), Hausdorff Research Institute of Mathematics, University of Bonn
- **2008-09:** *Invited Professor* (1 year), Department of Statistics, Universidad Pública de Navarra
- **2006-07:** *Invited Professor* (1 semester), Department of Mathematics, University of Utah
- **2002-04:** *PostDoc*, Department of Mathematics, Université de Paris 6
- **1998-02:** *Assistant*, Department of Mathematics, École Polytechnique Fédérale de Lausanne

Degrees and bonus:

- Sexenís (autonòmics): 3 (**2004-2021**).
- Trams de docència (autonòmics): 4 (**1998-2019**).
- **2025:** *Acreditació d'Agregat Catedràtic*, AQU Catalunya
- **2013:** *Acreditació d'Agregat*, AQU Catalunya
- **2011:** *Acreditación Nacional de Profesor Titular de Universidad*, ANECA
- **2010:** *Prime d'Excellence Scientifique (3 years bonus for scientific excellence)*, Université de Paris 13
- **2009:** *Habilitation à Diriger des Recherches (Qualification for Ph.D. supervision)*, Université de Paris 13

- **2009:** *Acreditación Nacional de Contratado Doctor*, ANECA
- **2002:** *Ph.D. in Probability Theory*, École Polytechnique Fédérale de Lausanne
- **2004:** *Master in Financial Analysis*, Universitat Oberta de Catalunya
- **1998:** *Mathematics Degree*, Universitat Politècnica de Barcelona

Grants and scientific projects:

- **2024-27:** Ministerio de Economía y competitividad (MINECO). Plan Estatal de Investigación Científica, Técnica y de Innovación 2021-2023 Project title: Aprendizaje estadístico para datos dependientes y altamente dimensionales. Reference: PID2022-138268NB-100. Principal researcher: Gabor Lugosi. Amount 100.000 euros. Members: 6 UPF + 8 externals.
- **2022-24:** Fundación BBVA, Ayudas a Equipos de Investigación Científica (Matemáticas) 2021. Project Title: Modern challenges in high-dimensional data analysis (MoDA) Principal researcher: Gabor Lugosi. Amount: 150.000 euros. Members: 6 UPF.
- **2019-22:** Ministerio de Economía y competitividad (MINECO). Plan Nacional de I+D+i (2018). Project title: Predicción, inferencia y computación en modelos estructurados de alta dimensión. Reference: PGC2018-101643-B-I00. Principal researcher: Gabor Lugosi. Amount 141.812 euros. Members: 6 UPF + 3 externals.
- **2018-22:** Fundación BBVA, Ayudas a Equipos de Investigación Científica en Big Data 2017. Project Title: High-dimensional problems in structured probabilistic models. Principal researcher: Gabor Lugosi. Amount: 100.000 euros. Members: 5 UPF
- **2016-18:** Ministerio de Economía y competitividad (MINECO). Plan Nacional de I+D+i (2015). Project title: Estimación de redes latentes. Principal researcher: Gabor Lugosi. Amount 43.800 euros. Members: 5 UPF + 3 externals
- **2013-15:** Ministerio de Economía y competitividad (MINECO). Plan Nacional de I+D+i (2008-2011). Project title: Predicción e inferencia en modelos estructurados de dimensión alta. Principal researcher: Gabor Lugosi. Amount 39.780 euros. Members: 5 UPF + 3 externals.
- **2014-16:** Agencia gestió ajuts Universitaris i recerca. Pla de Recerca i Innovació de Catalunya (2010-2013). Project title: Grup d'estadística i investigació operativa. Principal researcher: Gabor Lugosi. Amount 43.000 euros. Members: 12 UPF + 2 externals.
- **2013-17:** Marie Curie European Union programme FP7-PEOPLE-2012-CIG grant agreement 333938. Amount: 100.000 Euros. Members: Eulalia Nualart. Title of the project: Statistical Inference and Malliavin calculus.
- **2010-13:** Title of the project: Grup d'estadística i investigació operativa (ayudas para grupos de investigación SGR-DGR). Entity: AGAUR-Generalitat de Catalunya. Amount: 47.840 euros. Principal researcher: Gabor Lugosi. Mebers: 13.
- **2010-11:** Junior Semester Program in Stochastics at HIM (Hausdorff Research Institute of Mathematics), University of Bonn. Members: C. Marinelli, E. Nualart, L. Quer-Sardanyons. Description: Development of a research project and organisation of mini-courses during 4 months, salary 3.000 euros per month for each member.

- **2008-09:** Contract between the Public University of Navarra and CENER (Centro de Energías Renovables). Members: F. Mallor, E. Nualart, E. Omei. Description: Course of 10h at CENER on statistical and probability methods to evaluate the maximum wind speed in an area for the design of wind turbines, notes of the course and implementation of a code in R. 3.000 euros for the whole project.

Publications:

39. Alòs, E., Nualart, E. and Pradosud, M. **(2025)**, On the implied volatility of Inverse options under stochastic volatility models, *to appear in Decisions in Economics and Finance*.
38. Alòs, E., Nualart, E. and Pradosud, M. **(2025)**, On the implied volatility of European and Asian call options under the stochastic volatility Bachelier model, *to appear in International Journal of Theoretical and Applied Finance*.
37. Nualart, E. **(2025)**, An introduction to the stochastic heat equation: local existence and blowup, *to appear in Proceedings of the XIV Symposium on Probability and Stochastic Processes, Birkhäuser*.
36. Foondun, M., Khoshnevisan, D. and Nualart, E. **(2024)** Instantaneous everywhere-blowup of parabolic SPDEs, *Probability Theory and Related Fields*, 190, 601-624.
35. Alòs, E., Nualart, E. and Pradosud, M. **(2023)**, On the implied volatility of Asian options under stochastic volatility models, *Applied Mathematical Finance*, 30, 249-274.
34. Foondun, M. and Nualart, E. **(2022)**, Non-existence for stochastic wave equations in one dimension, *Journal of Differential Equations*, 318, 557-578.
33. Amorino, C. and Nualart, E. **(2022)**, Optimal convergence rates for the invariant density estimation of jump-diffusion processes, *ESAIM: Probability and Statistics*, 26, 126-151.
32. Kohatsu-Higa, A., Nualart, E. and Tran, N.K. **(2022)**, Density estimates for jump diffusion processes, *Applied Mathematics and Computation*, 420, 1-10.
31. Foondun, M. and Nualart, E. **(2021)**, The Osgood condition for stochastic partial differential equations, *Bernoulli*, 27, 295-311.
30. Besalú, M., Márquez-Carreras, D. and Nualart, E. **(2021)**, Existence and smoothness of the density for fractional stochastic integral Volterra equations, *Stochastics and Stochastic Reports*, 93, 528-554
29. Brownlees, C., Hans, C. and Nualart, E. **(2021)**, Bank Credit Risk Networks: Evidence from the Eurozone, *Journal of Monetary Economics*, 117, 585-599.
28. Brownlees, C., Nualart, E. and Sun, Y. **(2020)**, On the estimation of integrated volatility in the presence of jumps and microstructure noise, *Econometric Reviews*, 39, 991-1013.
27. Liu, Y., Nualart, E. and Tindel, S. **(2019)**, LAN property for stochastic differential equations with additive fractional noise and continuous time observation, *Stochastic Processes and Its Applications*, 129, 2880-2902.
26. Nualart, D. and Nualart, E. **(2018)**, *An Introduction to Malliavin Calculus*, IMS Textbooks, Cambridge University Press.

25. Nualart, E. (2018), Moment bounds for some fractional stochastic heat equations on the ball, *Electronic Communications in Probability*, 23, 1-12.
24. Brownlees, C., Nualart, E. and Sun, Y. (2018), Realized Networks, *Journal of Applied Econometrics*, 33, 986-1006.
23. De Diego, S., Ferreira, E. and Nualart, E. (2018), Importance sampling applied to Greeks for jump-diffusion models with stochastic volatility, *Journal of Computational Finance*, 22, 79-105.
22. Kohatsu-Higa, A., Nualart, E. and Tran, N.K. (2017), LAN property for an ergodic diffusion with jumps, *Statistics*, 51, 419-454.
21. Baudoin, F., Nualart, E., Ouyang, C. and Tindel, S. (2016), On probability laws of solutions to differential systems driven by a fractional Brownian motion, *The Annals of Probability*, 44, 2554-2590.
20. Delarue, F., Menozzi, S. and Nualart, E. (2015), The Landau equation for Maxwellian molecules and the Brownian motion on $SO_N(\mathbb{R})$, *Electronic Journal of Probability*, 20, 1-39.
19. Foondun, M. and Nualart, E. (2015), On the behaviour of stochastic heat equations on bounded domains, *ALEA, Lat. Am. J. Probab. Math. Stat.*, 12, 551-571.
18. Kohatsu-Higa, A., Nualart, E. and Tran, N.K. (2014), LAN property for a simple Lévy process, *C. R. Acad. Sci. Paris*, 352, 859-864.
17. Dalang, R.C., Khoshnevisan, D., and Nualart, E. (2013), Hitting probabilities for systems of non-linear stochastic heat equations in spatial dimension $k \geq 1$, *SPDEs: Analysis and Computations*, 1, 94-151.
16. Marinelli, C., Nualart, E., and Quer-Sardanyons, L. (2013), Existence and regularity of densities for semilinear dissipative parabolic SPDEs, *Potential Analysis*, 39, 287-311.
15. Nualart, E. (2013), On the density of systems of non-linear spatially homogeneous SPDEs, *Stochastics and Stochastics Reports*, 85, 48-70.
14. Nualart, E. and Quer-Sardanyons, L. (2012), Gaussian estimates for the density of the non-linear stochastic heat equation in any space dimension, *Stochastic Processes and their Applications*, 122, 418-447.
13. Dalang, R.C., Khoshnevisan, D., Nualart, E., Xiao, Y., and Wu, D. (2012), Critical Brownian sheet does not have double points, *The Annals of Probability*, 40, 1829-1859.
12. Nualart, E. (2012), L'aplicabilitat de la fórmula d'integració per parts en un espai Gaussià, *Butlletí de la Societat Catalana de Matemàtiques*, 26, 103-136.
11. Foondun, M., Khoshnevisan, D. and Nualart, E. (2011) A local-time correspondence for stochastic partial differential equations, *Trans. Amer. Math. Soc.*, 363, 2481-2515.
10. Nualart, E., García Landeras, J. (2010), Cómo mirar a través de una cámara fotográfica, *Materials Matemàtics*, 28, ISSN: 1887-1097.

9. Malliavin, P. and Nualart, E. (2009) Density minoration of a strongly non-degenerated random variable, *Journal of Functional Analysis*, 256, 4197-4214.
8. Nualart, E. and Viens, F. (2009), The fractional stochastic heat equation on the circle: Time regularity and potential theory, *Stochastic Processes and their Applications*, 119, 1505-1540.
7. Dalang, R.C., Khoshnevisan, D., and Nualart, E. (2009), Hitting probabilities for systems of non-linear stochastic heat equations with multiplicative noise, *Probab. Th. Rel. Fields*, 144, 371-427.
6. Khoshnevisan, D. and Nualart, E. (2008), Level sets of the stochastic wave equation driven by a symmetric Lévy noise, *Bernoulli*, 14, 899-925.
5. Dalang, R.C., Khoshnevisan, D., and Nualart, E. (2007), Hitting probabilities for systems of non-linear stochastic heat equations with additive noise, *ALEA*, 3, 231-271.
4. Guérin, H., Méléard, S. and Nualart, E. (2006), Estimates for the density of a nonlinear Landau process, *Journal of Functional Analysis*, 238, 649-677.
3. Mountford, T.S. and Nualart, E. (2004), Level Sets of Multiparameter Brownian Motions, *Electronic Journal of Probability*, 9, 594-614.
2. Nualart, E. (2004), Exponential divergence estimates and heat kernel tail, *C.R. Math. Acad. Sci. Paris*, 338, 77-80.
1. Dalang, R.C. and Nualart, E. (2004), Potential theory for hyperbolic SPDEs, *The Annals of Probability*, 32, 2099-2148.

Preprints:

- Lugosi, G. and Nualart, E. (2024) Convergence of continuous-time stochastic gradient descent with applications to linear deep neural networks
- Foondun, M., Khoshnevisan, D. and Nualart, E. (2024) On the well-posedness of SPDEs with locally Lipschitz coefficients
- Yadav, A. and Nualart, E. (2025) Differential machine learning for times series prediction.

Ph.D. students:

- *Ngoc Khue Tran*, Université de Paris 13, in co-direction with Arturo Kohatsu-Higa,
Ph.D. title: LAN property for jump diffusion processes with discrete observations via the Malliavin calculus. Presented: 24th September **2014**.
- *Yucheng Sun*, Universitat Pompeu Fabra, in co-direction with Christian Brownlees,
Ph.D. title: Essays in Volatility Estimation Based on High Frequency Data. Presented: 16th March **2017**.
- *Makar Pravosud*, Universitat Pompeu Fabra, in co-direction with Elisa Alòs,
Ph.D. title: Essays of Malliavin Calculus in Finance. Presented: 1st March **2024**.

RAAs and PostDocs:

- *Akash Yadav*, UPF, 1 year RA contract from BBVA grant, year 2023-24.
- *Nicolas Bianco*, UPF, 1,5 year PostDoc in co-direction with Lorenzo Cappello, contract from BBVA grant, 2023-24.

Organisation of International Conferences:

- **February 2024:** Co-organisation with S. Cerrai, M. Hairer, C. Marinelli, L. Scarpa and U. Stefanelli of the workshop *Stochastic Partial Differential equations* at the Erwin Schrödinger Institute.
- **June 2023:** Co-organisation with L. Loosveldt, I. Nourdin, G. Peccati, P. Perruchaud, M. Podolskij, S. Tindel and F. Viens of the workshop *International Conference on Malliavin Calculus and Related Topics* at University of Luxembourg.
- **January-April 2022:** Co-organization with V. Kolokoltsov, J. Lőrinczi, M. Roeckner and L. Sacerdote of a 4 months research programme on *Fractional differential equations* at the Isaac Newton Institute, Cambridge.
- **October 2020:** Co-organisation with Matthias Schulte and Piotr Zwiernik of the Thematic Session: Stochastic Analysis and Random Structures in Barcelona Mathematical Days
- **June 2017:** Co-organisation with Elisa Alòs of the Workshop: *Fractional Brownian motion and rough models* for the Summer Forum 2017 of the Barcelona GSE
- **June 2015:** Co-organisation with Christian Brownlees of the Workshop: *High frequency financial econometrics* for the Summer Forum 2015 of the Barcelona GSE
- **June 2014:** Organisation of the Workshop: *Statistics, jump processes and Malliavin calculus: recent applications* for the Summer Forum 2014 of the Barcelona GSE
- **September 2013:** Co-organisation with L. Quer-Sardanyons of the session *Probabilidad y Modelos Aleatorios* in the *Congreso de Jóvenes Investigadores RSMR*, Universidad de Sevilla
- **March 2011:** Co-organisation with F. Viens, Y. Hu, J. Feng, L. Coutin, L. Quer, I. Nourdin, G. Peccati, C. Tudor, S. Tindel *International Conference on Malliavin Calculus and Stochastic Analysis in Honor of Professor David Nualart*, University of Kansas
- **October 2006:** Co-organisation with D. Khoshnevisan *AMS Western Sectional Meeting*, Interface of stochastic PDEs and Gaussian analysis, University of Utah

Editorial work:

- Since **April 2018** *Associate Editor* for the Journal Stochastic Processes and Its Applications. More than 60 papers handled so far.
- Since **January 2022** *Associate Editor* for the Latin American Journal of Probability and Mathematical Statistics (ALEA).

Referee:

- *Referee for the journals:* Journal of Theoretical Probability, Stochastic Processes and Applications, Electronic Communications in Probability, Electronic Journal of Probability, Conference Proceedings, Mathematics, The Annals of Probability, Probability Theory and Related Fields, Journal of Functional Analysis, Acta Applicandae Mathematicae, ESAIM: Probability and Statistics, Transactions of the American Math. Society, Proceedings of the American Math. Society, Potential Analysis, Stochastic Analysis and Applications, Bernoulli, SPDEs: Analysis and Computations.

Books Edition:

- Co-editor with F. Viens, Y. Hu and J. Feng of the *Malliavin Calculus and Stochastic Analysis: Festschrift in Honor of David Nualart*, Springer, 2013.

Invitation to International Conferences:

- Holetown (Barbados), **2025** 19th annual workshop on probability and combinatorics, McGill University's Bellairs Research Institute
- CRM (Barcelona), **2025**, Barcelona Discrete Mathematics Meeting.
- Holetown (Barbados), **2024** 18th annual workshop on probability and combinatorics, McGill University's Bellairs Research Institute
- Guanajuato (Mexico), **2023** *Symposium on Probability and Stochastic Processes CIMAT*
- Luxembourg, **2023**, *International Conference on Malliavin Calculus and Related Topics*
- Oaxaca (Mexico), **2023** *New Trends in Stochastic Analysis*
- Holetown (Barbados), **2023** 17th annual workshop on probability and combinatorics, McGill University's Bellairs Research Institute
- Luxembourg, **2023**, *Luxembourg Workshop in Stochastic Analysis*
- Brussels (Belgium), **2023** *Actuarial and Financial Mathematics Conference*
- Bejjine Normal University (China, online), **2022** *17th workshop on Markov processes and related topics*
- Holetown (Barbados), **2022** 16th annual workshop on probability and combinatorics, McGill University's Bellairs Research Institute
- CIRM (France), **2018** *Non Standard Diffusions in Fluids, Kinetic equations and Probability*
- CRM (Barcelona), **2018** *Barcelona-Toulouse Probability days*
- Oaxaca (Mexico), **2018** *Theoretical and Applied stochastic analysis*
- CIRM (France), **2018** *SPDEs*
- Barcelona (Spain) **2018** *BMS-BGSMath Junior Meeting*

- Edinburgh (Scotland), **2017** *Joint meeting of the Edinburgh Mathematical Society and Societat Catalana de Matemàtiques, session: Stochastics*
- Moscow (Russia), **2017** *39th Conference on Stochastic Processes and Their Applications (SPA), session: SPDEs*
- Valladolid (Spain), **2017** *IV Encuentro Conjunto RSME-SMM, sesión: Probabilidad*
- Umea (Sweden), **2017** *Join Meeting of the Catalan, Spanish, Swedish Math. Societies, session: SPDEs: from Theory to Simulation,*
- BCAM, Bilbao (Spain), **2016** *4th Fractional Calculus, Probability and non-local operators workshop*
- Barcelona (Spain), **2016** *Session on Mathematical Finance CSASC*
- Aarhus University (Denmark), **2016** *Ambit fields and related topics*
- CIRM, Levico (Italy), **2016** *Stochastic Partial Differential Equations and Applications X*
- Toulouse (France), **2016** *Financial Econometrics Conference*
- Barcelona (Spain), **2015** *Edinburgh Mathematical Society and Societat Catalana de Matemàtiques joint meeting, Session: 'Stochastics'*
- University of Nevada (USA), **2015**, *AMS Spring Eastern Sectional Meeting, Session 'Stochastic analysis and rough paths'*
- Georgetown University (USA), **2015**, *AMS Spring Eastern Sectional Meeting, Session 'Stochastic analysis and SPDEs'*
- TU Dresden (Germany), **2014**, *START 2014-Workshop on Stochastic Analysis and Related Topics*
- Tech Univ Munich (Germany), **2014**, *Mini-Workshop: Malliavin calculus and applications to finance*
- Levico Terme (Italy), **2014**, *SPDEs and Applications IX*
- Michigan University (USA), **2013**, *NSF-CBMS course in SPDEs by Davar Khoshnevisan*
- CIRM (France), **2012**, *Thematic school: Control of PDE's, interactions and application challenges*
- Cambridge (UK), **2012**, *Stochastic Partial Differential Equations-Follow-up Meeting*
- Málaga (Spain), **2012**, *II Congreso Conjunto de la RSME (Real Sociedad Española de Matemáticas) y la SMM (Sociedad de Matemáticas de México)*
- Soria (Spain), **2011**, *Congreso de Jóvenes Investigadores RSME*
- Ascona (Switzerland), **2011**, *7th Seminar on Stochastic Analysis, Random Fields and App.*
- Avila (Spain), **2011**, *Congreso de la Sociedad Española de Matemáticas*
- Rennes (France), **2008**, *Journées MAS*

- Singapore, **2008**, *7th World Congress in Probability and Statistics*
- Northwestern Chicago University, **2007**, *Midwest Probability Colloquium*
- Princeton University, **2006**, *Seminar on Stochastic Processes*
- ZIF, University of Bielefeld (Germany), **2005**, *Workshop on SPDEs*
- Berne (Switzerland), **2005**, *Swiss probability seminar*
- Yep, Eurandom, Eindhoven (Holland), **2005**, *Workshop on self-similar random structures Hausdorff dimension and branching*
- Banff (Canada), **2003**, *Conference on Stochastic Partial Differential Equations*

Teaching activities:

- *Courses at Undergraduate level:*
 - **September 2012-:** Universitat Pompeu Fabra:
 - Probability and Statistics (2nd year Economics)
 - Linear Algebra and Dynamical Systems (3rd-4th year Economics)
 - Mathematics I and II (1st year Economics)
 - **2004-12:** Université de Paris 13:
 - Integration and Probability theory (L3 Math and Financial Engineering)
 - Stochastic Processes in discrete time (Financial Engineering)
 - Statistics (L2 Math and Financial Engineering)
 - Econometrics (L3 Economics)
 - **2008-09:** Universidad Pública de Navarra:
 - Data treatment with computers (L1 Economics)
 - Statistics applied to business (L2 Management)
 - Statistics methods with computers (L2 Management)
 - **1998-02:** EPF-Lausanne:
 - Linear Algebra (Engineering)
 - Analysis (L2 Physics)
 - Probability theory and Stochastic Processes (L3 Math)
- *Courses at Master and Ph.D. level:*
 - **2023:** *Ph.D. course, An introduction to the stochastic heat equation: local existence and blowup*, CIMAT, Mexico
 - **2013-present:** *Master in Finance, Pricing Financial Derivatives/ Fixed income securities and hedging*, BSE
 - **2010-11:** *Ph.D. course, Introduction to Malliavin calculus*, Université de Paris 13
 - **2009-11:** *Master in Finance, Introduction to Malliavin calculus*, ENSAE/Université de Dauphine

- **2009:** *Summer course, Introduction to Malliavin calculus*, University of Madison
- **2008:** *Ph.D. course, Introduction to Malliavin calculus*, Universidad de San José (Costa Rica)
- **2006:** *Ph.D. course, Introduction to Malliavin calculus*, University of Utah
- *Other activities:*
 - **2023-present** Coordinator of the teaching of Ph.D. and Mres students
 - **2022-present** Coordinator of the MQA program in the Economics Undergraduate program
 - **2020-present** Member of the Claustre Universitari of the UPF
 - **2015-present** Deputy Director of the Master in Economics, Barcelona GSE
 - **2014-present** Supervision of 11 Master Projects and 3 times member of the jury of the Master in Finance, Barcelona GSE
 - **2016-present** Head of the Teaching Area of Mathematics of the Department of Economics, UPF
 - **2004-12** Supervision and member of the jury of the final projects of the Financial Engineering students, Université de Paris 13