Curriculum vitae

Education

2010	"Habilitation à diriger les recherches" (diploma needed to supervise PhD's), title : "Probabilités : aspects théoriques et applications en filtrage non linéaire, systèmes de particules et processus stochastiques" (Probability: theoretical aspects and applications in non-linear filtering, particle systems and stochastic processes).
1999-2002	PhD in mathematics, specialization: probability (Paris 6), advisor: Jean Jacod, title: " Méthodes de Monte-Carlo en filtrage non-linéaire et pour certaines équations différentielles stochastiques" (Monte-Carlo methods in non-linear filtering and for some stochastic differential equations).
2000	Master of mathematics, École Normale Supérieure de Paris.
1998-1999	DEA dissertation (DEA stands for "diplôme d'études approfondies", a post-graduate dilpoma), "Agrégation externe" of mathematics, specialized in probability, rank: 61/∼350 (competitive French graduate exam designed to select people to teach at the post-secondary level).
1997-1998	"DEA" of probability, stochastic processes (Master's degree in probability, stochastic processes), Paris 6.
1996–1996	"Licence et Maîtrise de mathématiques" (Master of sciences in mathematics) at École Normale Supérieure de Paris.
1996	Admitted to École Normale Supérieure de Paris and École Polytechnique. Entered the École Normale Supérieure de Paris.
1993-1996	Classes préparatoires, lycée Kléber, Strasbourg (a two/three years intensive course in sciences designed to prepare students for the selective admission test to the French "Grandes Écoles" such as "École Normale Supérieure" and "École Polytechnique") .
1993	Baccalauréat (equivalent to high school degree), lycée Fustel de Coulanges, Strasbourg.

Professional experience

2010-2011	C.N.R.S. visitor (Centre National de la Recherche Scientifique, French research national institute) in the international unit P.I.M.S.-C.N.R.S. (Pacific Center for the Mathematical Sciences, University of British Columbia, Vancouver).
March 2008-August 2008	Visitor at I.N.R.I.A. (Institut National de la Recherche en Informatique et en Automatique, French computer science institute), TOSCA team (director: Denis Talay)
2003-present	One year sabbatical funded by C.N.R.S. at Pacific Institute for the Mathematical Science, University of British Columbia, Vancouver (UMI 3069 du CNRS)
1999-2002	PhD (Paris 6).

Research Areas

Non-linear filtering. Particle algorithms. Bayesian statistics. Coupling. Financial mathematics. Turbulence. Stochastic calculus for neurobiology.

Spoken Languages

French. English.

Computer Skills

Coding in C, `scilab`, R, Python. Html.

1 Publications

1.1 Articles

[1] Van Bien Bui and Sylvain Rubenthaler. Stability of the optimal filter in continuous time : beyond the Beneš filter. *To appear in Stochastic Analysis an Applications*, 2020.

[2] S. Rubenthaler. Expansion of the propagation of chaos for Bird and Nanbu systems. *Annales de la Faculté des Sciences de Toulouse*, 25(4) :829–873, 2016.

[3] Pierre E. Jacob, Lawrence M. Murray, and Sylvain Rubenthaler. Path storage in the particle filter. *Stat. Comput.*, 25(2) :487–496, 2015.

[4] François Delarue, James Inglis, Sylvain Rubenthaler, and Etienne Tanré. Global solvability of a networked integrate-and-fire model of McKean-Vlasov type. *Ann. Appl. Probab.*, 25(4) :2096–2133, 2015.

[5] F. Delarue, J. Inglis, S. Rubenthaler, and E. Tanré. Particle systems with a singular mean-field self-excitation. Application to neuronal networks. *Stochastic Process. Appl.*, 125(6) :2451–2492, 2015.

[6] Amarjit Budhiraja, Jiang Chen, and Sylvain Rubenthaler. A numerical scheme for invariant distributions of constrained diffusions. *Math. Oper. Res.*, 39(2) :262–289, 2014.

[7] Bruno Rémillard and Sylvain Rubenthaler. Optimal hedging in discrete time. *Quantitative Finance*, 13(6) :819–825, 2013.

[8] Amarjit Budhiraja, Pierre Del Moral, and Sylvain Rubenthaler. Discrete time markovian agents interacting through a potential. *ESAIM : Probability and Statistics*, eFirst, 8 2012.

[9] P. Del Moral, F. Patras, and S. Rubenthaler. Convergence of U-statistics for interacting particle systems. *J. Theoret. Probab.*, 24(4) :1002–1027, 2011.

[10] N. Chopin, P. Del Moral, and S. Rubenthaler. Stability of Feynman-Kac formulae with path-dependent potentials. *Stochastic Process. Appl.*, 121(1) :38–60, 2011.

[11] P. Del Moral, L. Miclo, F. Patras, and S. Rubenthaler. The convergence to equilibrium of neutral genetic models. *Stoch. Anal. Appl.*, 28(1) :123–143, 2010.

[12] Antonio Celani, Sylvain Rubenthaler, and Dario Vincenzi. Dispersion and collapse in stochastic velocity fields on a cylinder. *J. Stat. Phys.*, 138(4-5) :579–597, 2010.

[13] Sylvain Rubenthaler, Tobias Rydén, and Magnus Wiktorsson. Fast simulated annealing in $\mathbb{R}^d$ with an application to maximum likelihood estimation in state-space models. *Stochastic Process. Appl.*, 119(6) :1912–1931, 2009.

[14] Miguel Martinez, Sylvain Rubenthaler, and Etienne Tanré. Approximations of a continuous time filter. Application to optimal allocation problems in finance. *Stoch. Anal. Appl.*, 27(2) :270–296, 2009.

[15] Pierre Del Moral, Frédéric Patras, and Sylvain Rubenthaler. Tree based functional expansions for Feynman-Kac particle models. *Ann. Appl. Probab.*, 19(2) :778–825, 2009.

[16] Nadia Oudjane and Sylvain Rubenthaler. Stability and uniform particle approximation of nonlinear filters in case of non ergodic signals. *Stoch. Anal. Appl.*, 23(3) :421–448, 2005.

[17] Sylvain Rubenthaler and Magnus Wiktorsson. Improved convergence rate for the simulation of stochastic differential equations driven by subordinated Lévy processes. *Stochastic Process. Appl.*, 108(1) :1–26, 2003.

[18] Sylvain Rubenthaler. Numerical simulation of the solution of a stochastic differential equation driven by a Lévy process. *Stochastic Process. Appl.*, 103(2) :311–349, 2003.

1.2 Preprints

[19] George Deligiannidis, Arnaud Doucet, and Sylvain Rubenthaler. Ensemble rejection sampling, 2020.

[20] Sylvain Rubenthaler. CENTRAL-LIMIT THEOREM FOR CONSERVATIVE FRAGMENTATION CHAINS. working paper or preprint, July 2019.

[21] Bruno Rémillard and Sylvain Rubenthaler. Option pricing and hedging for regime-switching geometric brownian motion models. Technical report, Social Science Research Network, http ://dx.doi.org/10.2139/ssrn.2599064, April 2015.

[22] A. Doucet, P. E. Jacob, and S. Rubenthaler. Derivative-Free Estimation of the Score Vector and Observed Information Matrix with Application to State-Space Models. *ArXiv e-prints*, April 2013.

[23] C. Andrieu, N. Chopin, A. Doucet, and S. Rubenthaler. Perfect simulation for the Feynman-Kac law on the path space. *ArXiv e-prints*, October 2012.

1.3 Books, chapters in books

[24] P. Del Moral, B. Rémillard, and S. Rubenthaler. *Une introduction aux probabilités*. Ellipses, 2006.

[25] Pierre Del Moral, Bruno Rémillard, and Sylvain Rubenthaler. Monte carlo approximations of American option that preserve monotonicity and convexity. In René A. Carmona, Pierre Del Moral, Peng Hu, and Nadia Oudjane, editors, *Numerical Methods in Finance*, Springer Proceedings in Mathematics, Heidelberg, 2012. Springer.

[26] P. Del Moral, F. Patras, and S. Rubenthaler. A mean field theory of nonlinear filtering. In *The Oxford Handbook of Nonlinear Filtering*, pages 705–740. Oxford Univ. Press, Oxford, 2011.

1.4 Open access courses

- Intégration et probabilités (cours et exercices corrigés), L3 MASS [1].
- Processus stochastiques et modélisation (Cours et exercices corrigés). L3 MIAGE[2].
- Méthodes de simulation stochastique (ou Monte-Carlo), M1 IM [3].
- Séries chronologiques, M1 IM [4].

Sources available on : `https://math.unice.fr/~rubentha/cours.html`.

2 Recent presentations

2.1 Seminars, working groups

- April, 11th 2019 : Simulation exacte de certaines trajectoires, seminar of the institut Camille Jordan, Lyon.

[1] `https://math.unice.fr/~rubentha/enseignement/poly-integration-probas.pdf`
[2] `https://math.unice.fr/~rubentha/enseignement/poly-cours-miage-2011-2012-version-02-web.pdf`
[3] `https://math.unice.fr/~rubentha/enseignement/poly-cours-monte-carlo-m1-im.pdf`
[4] `https://math.unice.fr/~rubentha/enseignement/poly-cours-series-temp-m1-im.pdf`

- November, 1st 2018 : Exact Simulation of a Gibbs Law on Trajectories, PDE seminar series, NYU Shangaï.

- February, 23rd 2018 : Simulation d'une trajectoire sous une loi de Feynman-Kac, seminar of the probability and statistics team of Marseille.

- February, 13th 2017 : Stabilité du filtre optimal en temps continu, au-delà du filtre de Beneš, seminar of the probability and statistics team of Besançon.

- December, 4th 2014 : Population de neurones en interaction champ moyen, probability and statistics seminar, Institut Élie Cartan, Nancy.

- June, 19th 2014 : Simulation exacte de trajectoires sous une loi de Feynman-Kac, probability and financial mathematics seminar, analysis and probability department, Évry University.

- March, 11th 2013 : Simulation exacte de trajectoires sous une loi de Feynman-Kac, probability and statistics seminar of Franche-Comté University (Besançon).

- January, 24th 2013 : Simulation exacte de trajectoires sous une loi de Feynman-Kac, probability and statistics seminar, laboratoire Jean Kuntzmann, Grenoble.

- February, 6th 2013 : Simulation exacte de trajectoires sous une loi de Feynman-Kac, stochastic calculus seminar (Institut de Recherches Mathématiques avancées, Strasbourg).

- January, 7th 2013 : Simulation exacte de trajectoires sous une loi de Feynman-Kac, probability and statistics seminar, Nice.

- July, 11th 2012: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, St Flour talks.

- March, 29th 2012: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, probability and statistics seminar, Clermont-Ferrand.

- March 20th, April 2nd, April 17th 2012 : talk on determinantal processes, working group on KPZ equation.

- January, 9th 2012: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, probability and statistics seminar, Montpellier.

- December, 9th 2011: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, stochastic calculus seminar, institut de recherche mathématique avancée, université de Strasbourg.

- November, 29th 2011, Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, stochastic calculus seminar, institut de mathématiques de Toulouse, université Paul Sabatier.

- October, 28th 2011, Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, probability and statistics seminar, centre de mathématiques et informatique (CMI), université de Provence.

- April 11th 2011: Particle systems, Kalman interacting filter, definitions and proof of convergence., seminar of the Center for Research in Financial Mathematics and Statistics, University of California, Santa Barbara.

- January 20th 2011: Metropolis algorithm: application to the Ising model, PIMS/WMAX Postdoctoral Colloquium.

- November, 9th 2010: *Particle systems, definitions and proof of convergence (uniformly in time)*, UBC statistics seminar.

- October, 27th 2010: Propagation of chaos for particle systems: Exploration of the asymptotics and applications, UBC probability seminar.

- May, 27th 2010: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, séminaire ADAP'MC, institut Henri Poincaré.

- March, 18th 2010: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, working group in probability and statistics, laboratoire J. A. Dieudonné, Nice.

- March, 4th 2010: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, working group MEV, École Polytechnique.

- February, 8th 2010: Développement dans la propagation du chaos pour les systèmes de Bird et Nanbu, probability seminar in Rennes.

- November, 10th 2009: Introduction to particle filtering, probability and statistics seminar, Imperial College.

- November, 4th 2008: Tree based functional expansion for particles models, probability and statistics seminar, Imperial College.

- October, 10th 2008: Tree based functional expansion for particles models, working group "Population Monte-Carlo", part of the SAMSI "Sequential Monte-Carlo program".

- October, 3rd 2008: Tree based functional expansion for particles models, statistical seminar, Duke University.

- September, 26th 2008: Particle approximation for Boltzmann equation (mollified) , working group " Population Monte-Carlo ", part of the SAMSI " Sequential Monte-Carlo program ",

- November, 6th 2007: Coalescent tree based representations for some Feynman-Kac particle models, probability seminar, Imperial College, London.

- September, 6th 2007: Coalescent tree based representations for some Feynman-Kac particle models, workshop " Stochastic processes and algorithms ", Hausdorff Institute, Bonn.

- August, 20th 07: Coalescent tree based representations for some Feynman-Kac particle models, workshop " Stochastic Filtering and Control ", 20-22 août, University of Warwick.

- June, 5th 2007: Convergence à l'équilibre pour un modèle gétique neutre, probability and statistics seminar, Université Paul Sabatier, Toulouse.

- February, 14th 2007: m Recuit rapide pour l'estimation par maximum de vraisemblance, séminaire du GERAD (HEC Montréal, Canada).

- February, 9th 2007: Fast simulated annealing in $\mathbb{R}^d$ and an application to maximum likelihood estimation, probability and statistics seminar, Ottawa University (Canada).

- January, 25th 2007: Développement limité de l'erreur dans la propogation du chaos pour un système de particules associé a une équation de Feynman-Kac, Séminaire ADAP'MC, Méthodes de Monte Carlo Adaptatives, Institut Henri Poincaré.

2.2 Invited Conferences

- 2016, December, 9th-11th : Stability of the optimal filter in continuous time: beyond the Beneš filter, CMStatistics, University of Seville Spain, session "Recent advances in sequential Monte-Carlo and related methods".

- 2015, December, 21st-23rd: Stability of the optimal filter in continuous time: beyond the Beneš filter, workshop on particles and Monte-Carlo methods, Imperial College, London.

- September, 28th 2015: Stability of the optimal filter in continuous time: beyond the Beneš filter, Sequential Monte-Carlo 2015, ENSAE, Paris.

- June, 9th 2015: Neurons in mean-field interaction, ICMNS 2015 (1st International Conference on Mathematical Neuroscience), Antibes-Juan les Pins, France.

- October, 10th 2012: Perfect simulation algorithm of a trajectory under a Feynman-Kac law, Sequential Monte Carlo methods and Efficient simulation in Finance, École Polytechnique.

- September, 26th 2012: Perfect simulation algorithm of a trajectory under a Feynman-Kac law, Data Assimilation, Oxford-Man Institute of Quantitative Finance.

- September, 9th 2012: Perfect simulation algorithm of a trajectory under a Feynman-Kac law, Recent Advances in Sequential Monte Carlo - Sep. 19-21, 2012, University of Warwick.

- September 28th 2008, discussion on the talks of É. Moulines and D. Crisan, Kick-off Workshop, Program on Sequential Monte Carlo Methods, SAMSI, Radisson hotel, Research Triangle Park, North Carolina.

- May, 28th 2008: Fast simulated annealing in $\mathbb{R}^d$ and application to maximum likelihood estimation , SSC-SFDS meeting, Ottawa.

- May, 29th 2007: The convergence to equilibrium of neutral genetic models, colloque "Asymptotic properties of stochastic systems", Laboratoire Dieudonné, Nice.

2.3 Other conferences

- May, 27th 2007: The convergence to equilibrium of neutral genetic models, colloque "Asymptotic properties of stochastic systems", Laboratoire Dieudonné, Nice, 29-30/5/07.
- September, 6th 2007: Coalescent tree based representations for some Feynman-Kac particle models, workshop "Stochastic processes and algorithms", Hausdorff Institute, Bonn.

3 Academic Mobility

- September 2010-August 2011: CNRS fellowship at PIMS-UBC (Pacific Institute for the Mathematical Sciences, University of British Columbia, Vancouver). Worked with Arnaud Doucet.

- September, 1st-30th 2009: Invited Professor position, The Institute of Statistical Mathematics, Tokyo. Worked with Arnaud Doucet.

- 2003-2013: Frequent meetings with TOSCA team (INRIA) in Sophia Antipolis + first semester of 2008 at INRIA as a member of this team.

- August, 1st-October, 10th 2008: Invited in SAMSI (Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, North Carolina. U.S.A.) and in (University of North Carolina at Chapel Hill) thanks to the program "Sequential Monte Carlo" of SAMSI (Statistical and Applied Mathematical Sciences Institute, North Carolina) and UNC (University of North Carolina at Chapel Hill). Worked with Amarjit Budhiraja and Arnaud Doucet.

4 Responsibilities and service

4.1 Internal the department

- January 2019-. . . : innovation contact for the laboratoire J. A. Dieudonné

- 2013-2018: Heading the first year of graduate studies in mathematics-economics, http://math.unice.fr/departement/master-1-im.

- 2012-2014: participating to the Computer Committee of the department.

- 2007-2010: Maintained the probability-statistics web-page

- 2005-present: Writing reports on candidates applying for a position at our department. Recruiting committees (3) in our department in 2010.

- 2007-2010: Organised the probability-statistics seminar.

4.2 External to the department

- Lead of PHC-EGIDE grant application (accepted in 2009 and 2010).

- Writing reports for various journals (Annals of Applied Probability, Stochastic Processes and their Applications, Probability Theory and Related Fields) on papers about non-linear filtering, Euler scheme, financial mathematics, theory of processes.

- 2017-... : writing reports for Math Reviews.

5 Teaching

5.1 Courses

My teaching web page can be found at http://math.unice.fr/%7Erubentha/cours.html. Here is a list of my most significant courses.

- 2017-... : introduction to SAS.

- 2013-2016: Time series with `R`.

- 2012-2013: Basic statistics for undergraduates in mathematics.

- 2012-2013: Biostatistical analysis (based on J.H. Zar's book, Biostatistical Analysis), in collaboration with colleagues from the biology department.

-2011-2013: Preparation to "agrégation de mathématiques".

- 2011-2012: Probability for computer scientists (undergraduate courses), notes available on my teaching web page.

- 2004-2005: Graduate finance course, "Pricing using Martingale Theory".

- 2004-present: Introduction to Monte-Carlo methods (stochastic engineering), with `scilab` and `R`, graduate course.

- 2003-2011: Introduction to integration and probability, advanced undergraduate course, notes available on my teaching web page .

- 2005-2006: Exercise courses for students in economy (undergraduate level).

- 2004-2006 and 2008-2009: Preparation to "Grandes Écoles".

5.2 Supervising

- PhD student (March 2013-February 2016) (Van Bien Bui). The work of Mr Bui was to study stability of the optimal filter and of its particle approximations in a continuous time setting. This setting is very interesting for the practitioners and the questions posed are very challenging since usual techniques does not apply here.

- Three Master's Thesis in 2012.

- Small research project of Bruno Ziliotto, student of " École Normale Supérieure de Lyon", May-July 2010. After reading a paper describing a Metropolis algorithm in an extended space whose invariant law has a marginal which is the Feynman-Kac law in a path space (Andrieu, Doucet, Holenstein, Particle Markov Chain Monte Carlo,

Journal Royal Statistical Society B), B. Ziliotto computed some estimates of the rate of convergence towards the invariant law using classical techniques.

- Various essays of undergraduate and graduate students between 2004 and 2018 (two in 2018).