# Daniel CONUS (Ph.D.)

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## Research Interests.

- Stochastic analysis, stochastic partial differential equations and random fields.
- Intermittency and chaotic properties of spde's. Connection to KPZ equation.
- Applications and connection of SPDEs with other areas of Probability.
- Series expansions and numerical aspects of spde's.
- Stochastic optimization, mathematical finance.

## Employment.

2011 – **Tenure-Track Assistant Professor.**
*Lehigh University*, Bethlehem, PA (USA).

2009 – 2011 **Wylie Assistant Professor (Lecturer).**
*The University of Utah,* Salt Lake City, UT (USA).

2009 **Postdoctorate Researcher.**
*The University of Utah*, Salt Lake City, UT (USA).
Fellowship from the Swiss National Fundation for Scientific Research (SNF).

2003 – 2008 **Research and teaching assistant**.
*EPFL, Institute of Mathematics,* Lausanne (Switzerland).

2001 – 2003 Student teaching assistant.
*EPFL, Section of Mathematics,* Lausanne (Switzerland).

## Education.

2003 – 2008 **Ph.D.** under the supervision of Prof. R.C. Dalang.
*EPFL, Institute of Mathematics,* Lausanne (Switzerland).

***Ph.D. thesis :*** *The non-linear stochastic wave equation in high dimensions : existence, Hölder-continuity and Itô-Taylor expansion.* (Completion date : 16 Dec. 2008).
***Thesis committee :***
- Prof. Stephan Morgenthaler (EPFL), president;
- Prof. Robert C. Dalang (EPFL), advisor;
- Prof. Thomas Mountford (EPFL), referee;
- Prof. Francesco Russo (Univ. Paris 13), referee;
- Prof. Marta Sanz-Solé (Univ. of Barcelona), referee.

***Doctoral Courses :***

- *Markov Processes.* Prof. R.Dalang.
- *Random Matrices and Communication Systems.* Dr. O.Lévêque.
- *Parabolic Anderson Model.* Prof. T.Mountford.
- *Introduction to SPDE's.* Prof. R.Dalang.
- *Conformal Invariance and Lattice Models.* Prof. S.Smirnov.
- *Dirichlet Forms and Symmetric Markov Processes.* Prof. T.Mountford.
- *Lévy Processes.* Prof. R.Dalang.
- *Malliavin Calculus.* Prof. M.Sanz-Solé.

1998 – 2003 ***Master of Science*** *in Mathematical Sciences.*
*EPFL,* Lausanne (Switzerland).

***Master thesis :*** *Approximating Snell Envelopes and American Options Pricing.*
(Supervised by Prof. R.Dalang).

***Semester projects :***

- *Stochastic Integration and Calculus.* Prof. G.Ben Arous.
- *Percolation Models.* Prof. G.Ben Arous.
- *Optimal Stopping Theory and Application in Options Pricing.* Prof. A.Dubey.
- *Fermat's Last Theorem.* (Science-Technology-Society). Dr. J.Sesiano.

1995 – 1998 ***Swiss High School Degree*** (Maturité Fédérale, type C).
Gymnase Auguste Piccard, Lausanne (Switzerland).
Mathematics award, physics-mathematics award and annual best results award.

## Grants and Fellowships.

2015-2018 **NSF Standard Research Grant** (DMS-1513556). $138,995

2011 Centre Interfacultaire Benoulli (CIB), EPFL, Lausanne (Switzerland).
Visiting researcher position (one month).

2009 **Swiss National Science Foundation (SNF).** Prospective Researcher Fellowship.
Stay (one year) at the University of Utah.

2007 Swedish Royal Academy of Science.
Grant to stay (one month) at the Mittag-Leffler Institute, Djursholm (Sweden).

## Publications.

***Textbook***

- Dalang R.C. & Conus D. *Introduction à la théorie des probabilités.* 2nd Edition. [In French] Presses Polytechniques et Universitaires Romandes (2015).

- Dalang R.C. & Conus D. *Introduction à la théorie des probabilités.* [In French] Presses Polytechniques et Universitaires Romandes (2008).

***Published (peer-reviewed)***

[1] Balan R. & Conus D. *Intermittency for the wave and heat equations with fractional noise in time.* Annals of Probability, Vol 44 (2016), n°2, 1488-1534.

[2] Zhang, J. & Blum, R. & Lu, X. & Conus, D. *Asymptotically optimum distributed estimation in the presence of attacks.* IEEE Transactions on Signal Processing, Vol. 63 (2015), n°5, 1086-1101.

[3] Balan R. & Conus D. *A note on intermittency for the fractional heat equation.* Statistics & Probability Letters, Vol.95 (2014), 6-14.

[4] Conus D. & Joseph M. & Khoshnevisan D. & Shiu S.-Y. *Initial measures for the stochastic heat equation.* Annales de l'Institut Henri Poincaré in Probability and Statistics. Vol. 50 (2014) n°1, 136-153.

[5] Conus D. *Moments for the parabolic Anderson model : on a result by Hu and Nualart.* Communications on Stochastic Analysis, Vol.7, n°1 (2013), 125-152.

[6] Conus D. & Joseph M. & Khoshnevisan D. & Shiu S.-Y. *Intermittency and chaos for a stochastic non-linear wave equation in dimension 1.* In: Malliavin Calculus and Stochastic Analysis: A Festschrift in honor of David Nualart. Springer Proceedings in Mathematics & Statistics, Vol. 34 (2013), pp 251-279.

[7] Conus D. & Joseph M. & Khoshnevisan D. & Shiu S.-Y. *On the chaotic character of the stochastic heat equation, II.* Probability Theory and Related Fields, Vol. 156 (2013) n° 3-4, 483-533.

[8] Conus D. & Joseph M. & Khoshnevisan D. *On the chaotic character of the stochastic heat equation, before the onset of intermittency.* Annals of Probability, Vol. 41, n°3B (2013), 2225-2260.

[9] Conus D. & Joseph M. & Khoshnevisan D. *Correlation-length bounds, and estimates for intermittent islands in parabolic SPDEs.* Electronic Journal of Probability, Vol. 17 (2012), n°102, 15 pp.

[10] Conus D. & Khoshnevisan D. *Existence and position of the farthest peaks for a family of parabolic and hyperbolic SPDE's*. Probability Theory and Related Fields, Vol. 152 (2012) n°3-4, 681-701.

[11] Conus D. & Khoshnevisan D. *Weak non-mild solutions to some SPDE's.* Illinois Journal of Mathematics, Vol. 54 (2010) n°4, 1329-1341 (2012).

[12] Conus D. & Dalang R.C. *The non-linear stochastic wave equation in high dimensions.* Electronic Journal of Probability, Vol. 13 (2008), 629-670.

[13] Conus D. *The non-linear stochastic wave equation in high dimensions: existence, Hölder-continuity and Itô-Taylor expansion.* EPFL Ph.D. Thesis n°4265 (2008).

***Submitted***

- Conus D. & Jentzen A. & Kurniawan R. *Weak convergence rates of spectral Galerkin approximations for stochastic evolution equations with nonlinear diffusion coefficients.*
  Submitted to Annals of Applied Probability.

## Work in progress.

***Preprints***

- Convergence of Itô-Taylor expansions for solutions to spde's.
  Joint work with Prof. R.C.Dalang.
- Position of the farthest peaks for a parabolic equation in dimension d > 2.
  Joint work with Prof. D. Khoshnevisan.
- Options pricing and Dobric-Ojeda processes.
  Joint work with M.Wildman (Ph.D. student).

***Active projects (research in progress)***

- Stochastic heat equation driven by gradient-multiplicative noise.
  Joint work with Prof. H. Bessaih.
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- Stochastic heat equation driven by a fractional-type noise.
  Joint work with M.Wildman (Ph.D. student).

- Stochastic transport with additive and multiplicative noise.
  Joint work with D. Khoshnevisan, K. Kim and A. Krishnan.

- Moment formulae and height of the peaks for the stochastic wave and heat equation driven by fractional noise.
  Joint work with Prof. R. Balan.

- Connections between Stochastic PDEs and Stochastic Geometry: a random convex hull problem.
  Joint work with Prof. J. Yukich and Prof. P. Calka.

- Drawing from multi-sets, a poker application.
  Joint work with Prof. G. Isaak.

***Potential future projects***

- Asymptotic behavior of intermittent peaks for the stochastic heat equation.

- Basic examples of intermittent processes and their behavior.
  Lecture notes project.

- KPZ scaling for the heat equation started from a Brownian motion trajectory.
  Discussions with Prof. D. Khoshnevisan.

- A stochastic wave equation with a friction type non-linearity.
  Discussions with Prof. C. Mueller.

## Awards.

- Outstanding Instructor Award. Dept. of Mathematics, University of Utah (2010).

- Award for high quality teaching. Mathematics Dept., EPFL. (2005 and 2007).

## Conferences and Seminar talks (and poster presentations).

***Upcoming***

- *11th AIMS Conference on Dynamical Systems, Differential Equations and Applications.* Orlando, FL. **Invited talk.** (July 2016)

***2016***

- *AMS Western Sectional Meeting,* Salt Lake City, UT (USA). Special Session on Topics in Stochastic Partial Differential Equations. **Invited talk.**

***2015***

- *University of Illinois at Chicago.* Probability Seminar.
- *AMS Southeastern Sectional Meeting,* Huntsville, AL (USA). *Special session on Stochastic Analysis and Applications.* ***Invited talk.***
- *AMS Eastern Sectional Meeting*, Washington, DC (USA). Special session on Stochastic Analysis and SPDEs. **Invited talk.**

***2014***

- *University of Delaware, Newark, DE (USA). Probability Seminar.*
- *2nd Barcelona Summer School in Stochastic Analysis*, Barcelona (Spain). **Invited speaker.**
- *EPFL,* Lausanne (Switzerland). Probability Seminar.

- *Temple University*, Philadelphia, PA (USA). Analysis Seminar.

***2013***

- *University of Kansas,* Lawrence, KS (USA). Colloquium.
- *Rutgers University*, New Brunswick, NJ (USA). Probability and Mathematical Finance Seminar.
- *NSF/CBMS Regional Conference on Analysis of SPDEs.* **Invited speaker.** Michigan State University, East Lansing MI,USA.
- *36th International Conference on Stochastic Processes and Their Applications (SPA).* **Invited speaker.** Boulder, CO, USA.
- *City University of New York (CUNY),* New York, NY (USA). Probability Seminar.
- *University of Ottawa,* Ottawa, ON (Canada). Probability Seminar.
- *Seminar on Stochastic Processes 2013.* Duke University, Durham, NC (USA). Contributed talk.

***2012***

- *University of Rochester,* Rochester, NY (USA). Probability Seminar.
- *Semester Program on Stochastic Analysis and Applications.* **Invited speaker.** CIB (Centre Interfacultaire Bernoulli), EPFL, Lausanne (Switzerland).
- *Workshop on Stochastic Analysis and SPDEs.* **Invited speaker.** Banff International Research Station, Banff (Canada).
- *Lehigh University*, Bethlehem, PA (USA). Probability and Statistics Seminar.

***2011***

- *Lehigh University*, Bethlehem, PA (USA). Colloquium.
- *7th Seminar on Stochastic Analysis, Random Fields and Applications.* **Invited talk.** Centro Stefano Franscini, Ascona, Switzerland.
- *AMS Sectional Meeting,* Las Vegas, NV (USA). Special session on recent advances on SPDE's. **Invited talk.**
- *Lehigh University,* Bethlehem, PA (USA). Colloquium.
- *University of Montréal,* Montréal (Canada). Colloquium.

***2010***

- *EPFL,* Lausanne (Switzerland). Probability Seminar.
- *NSF/CBMS Conference on Recent Advances in the Numerical Approximation of SPDE's.* Illinois Institute of Technology, Chicago, IL (USA). Poster presentation.
- *University of Utah,* Salt Lake City, UT (USA). Stochastics Seminar.

***2009***

- *EPFL,* Lausanne (Switzerland). Probability Seminar.
- *33rd International Conference on Stochastic Processes and Their Applications (SPA). TU,* Berlin, Germany. Contributed talk.
- *University of British Columbia,* Vancouver, Canada. Probability Seminar.
- *University of Washington,* Seattle, WA (USA). Probability Seminar.
- *University of Kansas,* Lawrence, KS (USA). Probability and Statistics Seminar.
- *Seminar on Stochastic Processes 2009.* Stanford University, Palo Alto, CA (USA). Contributed talk.
- *University of Utah,* Salt Lake City, UT (USA). Stochastics Seminar.

***2008***

- *6th Seminar on Stochastic Analysis, Random Fields and Applications.* Centro Stefano Franscini, Ascona (Switzerland). Poster presentation.
- *VIIIth International Conference on Stochastic Partial Differential Equations and Applications.* Levico Terme, Italy. Poster presentation.

***2007***

- *Semester on Stochastic Partial Differential Equations.* The Mittag-Leffler Institute, Djursholm, Sweden.

Contributed talks in the « *Workshop on SPDE's* » and in the « Young Researchers' Seminar ».

***2006***

- *University of Barcelona*, (Spain). Probability Seminar.
- *EPFL,* Lausanne (Switzerland). Probability Seminar.

***Conferences attended (without speaking).***

- *Mathematical Finance and PDE conference 2015.* Rutgers University, New Brunswick, NJ (USA).
- *Seminar on Stochastic Processes 2015.* University of Delaware, Newark, DE (USA).
- *Frontier Probability Days.* University of Utah, Salt Lake City, UT (USA). (2011 + 2009)
- *Workshop in Probability and Statistical Mechanics.* University of Neuchâtel (Switzerland). (2008)
- *31st International Conference on Stochastic Processes and Their Applications (SPA)*. University René Descartes (Paris 5), Paris, France. (2007)
- *Workshop on Stochastic Partial Differential Equations.* Centro di Ricerca Matematica Ennio de Giorgi, Scuola Normale Superiore, Pisa (Italy). (2006)
- *5th Seminar on Stochastic Analysis, Random Fields and Applications.* Centro Stefano Franscini, Ascona (Switzerland). (2005)

## Conferences Organized.

***2015***

- *Mini-symposium in memory of Vladimir Dobric.* Lehigh University. Main organizer.

## Teaching Activities.

### *Lehigh University (2011-)*

*Ph.D. students supervised.*

- Mackenzie Wildman (Ph.D. in Mathematics, 2016). Advisor (co-advisor Vladimir Dobric).
  Thesis subject: «Gaussian Markov processes of fractional type : applications to options pricing and the stochastic heat equation».

*Ph.D. Committees.*

- Omid Javidbakht (Ph.D. in Electrical Engineering, Lehigh University). Advisor : Prof. Parv Venkitasubramaniam.
- Sarah Charley Dumnich (Ph.D. in Mathematics, 2016 Lehigh University). Advisor : Prof. Robert Neel.

*Other students supervised.*

- James Patounas (MS in Statistics).
  Reading course on Numerical Simulation of Stochastic Differential Equations (Spring 2014).
- Shijue Wang (MS in Statistics).
  Reading course on Lévy Processes in Finance. (Fall 2014).
- Vasileios Christou (Ph.D. in Civil Engineering).
  Reading course on Functional Quantization for Probability Distributions. (Fall 2015).

*Classes.*

- Financial Calculus I. Fall 2015, 50 stud.
- Financial Calculus II. Spring 2016, 45 stud.
  Full-year graduate level course on Stochastic Calculus applied to Finance.
- Advanced Probability. Spring 2014, 6 stud.
  Graduate level Probability: Limit Theorems, Random walk, Conditional Expectation, Martingales.
- Ordinary Differential Equations. Spring 2013, 12 stud.
  Bachelor level class for Math students.
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- Fundations of Analysis. Fall 2012, 2014, 28 stud.
  Bachelor level Real Analysis for Math students.
- Introductory Probability and Statistics. Spring 2012, 45 stud.
  Introductory class for Engineers.
- Calculus III. Spring 2013, ~60 stud.
- Calculus II. Spring 2012, 2014, ~75 stud.
- Calculus I. Fall 2011, 2013, 2014, Spring 2016, ~80 stud. Spring 2016, ~ 30 stud.

### *University of Utah (2009-2011)*

*Classes.*

- Statistical Inference II. Fall 2010, 15 stud.
  Second class on statistical inference, confidence intervals, tests, linear regression.
- Introduction to Probability. Spring 2010 + 2011, ~50 stud.
  Introductory probability course.
- Introduction to Mathematical Finance II. Spring 2010, 15 stud.
  Brownian motion and stochastic calculus with applications to options pricing.
- Introduction to Mathematical Finance I. Fall 2009, 20 stud.
  Discrete time models for options pricing.

### *EPFL (2003-2008)*

*Supervising students in Mathematics.*

- Master thesis « *Levy processes and financial assets modelling* ». Master student, 2007.
- Master thesis « *Optimal control of a Poisson process* ». Master student, 2005.
- Six semester projects on subjects such as: *« Brownian motion: theory and simulation », « Stochastic integration », « Levy Processes »* and *« The optimal strategy for 'Who wants to be a Milionaire ?' ».*
  Master and bachelor students, 2004-2008.

*Classes for students in Mathematics.*

- Probability. 2004-2008, ~40 stud. Introductory course for Math students. Head assistant. **Writing of a textbook**.
- Stochastic Control. 2004 + 2006, 10 stud. Master course. Head assistant.
- Stochastic Processes. 2006, 30 stud. Bachelor course. Head assistant.
- Martingales and Applications. 2004, 20 stud. Bachelor course. Head assistant.

*Classes for students in Engineering.*

- Calculus IV. 2007-2008, ~140 stud. Course on Fourier Analysis, ODEs, PDEs for Microtechnology and Life Sciences. Assistant.
- Linear Algebra. 2003-2005, ~120 stud. For Communication Sciences. Assistant.
- Calculus I. 2003, ~100 stud. For Computer Sciences. Assistant.

## Service duties.

2015 - 2016
2013 - 2014 Elected member of the Chair Advisory Committee.

2016 + 2014 Member of the Admission Committee of the *Master program in Analytical Finance*.
Joint program with the Colleges of Business and Engineering.

2013 - Member of the Calculus Committee (Service courses committee).

2012 - Member of the organizing committee for Graduate Qualifying Exams.
(Analysis, Differential Equations, Probability).

2014 – 2015 Member of the Hiring Committee for a Professor of Practice position.

2012 – 2015 Organizer of the Math Department Colloquium.

2012 - Co-organizer of the Probability and Statistics Seminar.

2005 - 2008 Representative for the teaching assistants in the Dept. Council, Math. Dept., EPFL.

2002 - 2003 Representative for the math. stud. in the Council of the School of Basic Sciences, EPFL.
Representative for the math. stud. in the Council of the Math. Dept., EPFL.

## Refereeing duties.

*Research papers for journals:*

- Annals of Probability
- Bernoulli
- Electronic Communications in Probability
- Electronic Journal of Probability
- Mathematical Analysis and Applications
- Mathematical Communications
- SPDEs: Analysis and Computations
- Stochastic Processes and Applications
- Stochastics

*Grant reviews:*

- NSA (National Security Agency), Mathematical Sciences Program
- Hong Kong RGC (Research Grants Council)

*Textbook reviews:*

- W.H.Freedman & Co. / MacMillan Higher Education

## Languages.

French : Mother tongue.
English : Fluent. Working language.
German : Very good knowledge.

## Miscellaneous.

Military service : sergeant in the Swiss Army (2000-2008).

## References.

- **Prof. Robert C. Dalang**
  Institut de Mathématiques
  Ecole Polytechnique Fédérale de Lausanne
  robert.dalang@epfl.ch

- **Prof. Davar Khoshnevisan**
  Department of Mathematics
  University of Utah
  davar@math.utah.edu

- **Prof. Marta Sanz-Solé**
  Facultat de Matemàtiques
  Universitat de Barcelona
  marta.sanz@ub.edu

- **Prof. Carl Mueller**
  Department of Mathematics
  University of Rochester
  http://www.math.rochester.edu/people/faculty/cmlr

- **Prof. David Nualart**
  Department of Mathematics
  University of Kansas
  nualart@math.ku.edu

- **Prof. Thomas Mountford**
  Institut de Mathématiques
  Ecole Polytechnique Fédérale de Lausanne
  thomas.mountford@epfl.ch

- **Prof. Henryk Hecht**
  Department of Mathematics
  University of Utah
  hecht@math.utah.edu
  (teaching only)