Christiane Lemieux

Department of Statistics and Actuarial Science
University of Waterloo
Born in Quebec City, December 14, 1972
Married, three children (born 2003, 2005, 2009)

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Current Position

Professor, Department of Statistics and Actuarial Science, University of Waterloo, July 2017 – present.

Previous Positions

Associate Professor, Department of Statistics and Actuarial Science, University of Waterloo, July 2006 – June 2017.

Associate Professor, Department of Mathematics and Statistics (2/3), and Department of Computer Science (1/3), University of Calgary, July 2005 – June 2006.

Assistant Professor, Department of Mathematics and Statistics (2/3), and Department of Computer Science (1/3), University of Calgary, July 2000 – June 2005.

Postdoctoral Scholar, Department of Statistics, Stanford University, January 2000 – June 2000 (supervisor: Art B. Owen).

Education

Ph.D. (Computer Science), Université de Montréal, May 2000 (supervisor: Pierre L'Ecuyer).

M.Sc. (Mathematics), Université de Montréal, September 1996.

B.Sc. (Actuarial Science), Université Laval, May 1994.

Prizes and Awards

Co-winner of the 2004 "Journal of Complexity IBC Young Researcher Award"
Outstanding Performance Award, University of Waterloo, 2012

Membership in professional societies

Associate of the *Society of Actuaries* (since Nov. 1993)

Research Interests

Quasi-Monte Carlo methods, low-discrepancy sequences, variance reduction techniques, dependence, risk theory.

Books

1. C. Lemieux. Monte Carlo and Quasi-Monte Carlo Sampling. Springer Series in Statistics. Springer, New York, 2009. (373 pages)

Book chapters and other refereed contributions

2. P. Arbenz, M. Cambou, M. Hofert, C. Lemieux, Y. Taniguchi*. Importance sampling and stratification for copula models. In Contemporary Computational Mathematics - a celebration of the 80th birthday of Ian Sloan (J. Dick, F. Y. Kuo, H. Woźniakowski, eds.), Springer-Verlag, 75–96, 2018.

3. C. Lemieux. Quasi-random number techniques. *Handbook in Operations Research and Management Science*, vol. 13 (Simulation), S. Henderson and B. Nelson, eds., Elsevier, 351–379, 2006.

4. P. L'Ecuyer and C. Lemieux. Recent advances in randomized quasi-Monte Carlo methods. In *Modeling Uncertainty: An Examination of Stochastic Theory, Methods, and Applications*, M. Dror, P. L'Ecuyer, and F. Szidarovszki, eds., Kluwer Academic, 419–474, 2002.

Refereed Journal Papers

5. H. Faure and C. Lemieux. Implementation of irreducible Sobol' sequences in prime power bases. To appear in *Mathematics and Computers in Simulation*, 2019.

6. C. Lemieux. Negative dependence, scrambled nets, and variance bounds. —em Mathematics of Operations Research, (published online on September 5, 2017), 43 (1), 228–251, 2018.

7. H. Faure and C. Lemieux. Low-discrepancy sequences: Atanassov's methods revisited. *Mathematics and Computers in Simulation*, 132, 236–256, 2017

8. M. Cambou, M. Hofert and C. Lemieux. Quasi-random numbers for copula models. Statistics and Computing, 27 (5), pp.1307–1329, 2017

9. H. Faure and C. Lemieux. Irreducible Sobol' sequences in prime power bases. *Acta Arithmetica*, 173, 59–80, 2016.

10. J. Cai, C. Lemieux and F. Liu*. Optimal reinsurance from the perspective of both an insurer and a reinsurer. *ASTIN Bulletin*, 46, 815–849, 2016.

11. H. Faure and C. Lemieux. A review of discrepancy bounds for (t, s) and $(t, \mathbf{e}, s)$-sequences with numerical comparisons, *Mathematics and Computers in Simulation*. In press (published online on October 7, 2014).

12. S. Li*, D. Landriault and C. Lemieux. A risk model with varying premiums: its risk management implications. *Insurance: Mathematics and Economics*, 60, 38–46, 2015.

13. C. Lemieux. Tractability using periodized generalized Faure Sequences. *Journal of Complexity*, 31, 42–56, 2015 (appeared online on August 20, 2014).

Supervised students are marked with a * in the authorship

14. J. Cai, C. Lemieux and F. Liu*. Optimal reinsurance with regulatory capital and default risk. *Insurance: Mathematics and Economics*, 57, 13–24, 2014.

15. H. Faure and C. Lemieux. A variant of Atanassov's methods for (t, s)-sequences and $(t, \mathbf{e}, s)$-sequences. *Journal of Complexity*, 30, 620–633, 2014.

16. H. Faure and C. Lemieux. Improvements on the star discrepancy of (t, s)-sequences. *Acta Arithmetica*, 154, 61–78, 2012.

17. D. Landriault, C. Lemieux and G. E. Willmot. An adaptive premium policy with a Bayesian motivation in the classical risk model. *Insurance: Mathematics and Economics*, 51, 370–378, 2012.

18. H. Faure and C. Lemieux. Improved Halton sequences and discrepancy bounds. *Monte Carlo Methods and Applications*, 2010.

19. H. Faure and C. Lemieux. Generalized Halton Sequences in 2008: A Comparative Study. *ACM Transactions on Modeling and Computer Simulation*, 19 (Article 15), 2009.

20. M. Cieslak*, C. Lemieux, J. Hanan and P. Prusinkiewicz. Quasi-Monte Carlo Simulation of the Light Environment for Plants. *Functional Plant Biology*, 35, 837-849, 2008.

21. H. S. Gill* and C. Lemieux. Searching for extensible Korobov rules. *Journal of Complexity*, 23, 603–613, 2007.

22. R. V. Craiu and C. Lemieux. Acceleration of the Multiple-Try Metropolis algorithm using antithetic and stratified sampling. *Statistics and Computing*, 17, 109-120, 2007

23. C. Lemieux and P. Sidorsky*. Exact sampling with highly-uniform point sets. *Mathematical and Computer Modelling*, 43, 339–349, 2006.

24. F. J. Hickernell, C. Lemieux and A. B. Owen. Control variates for quasi-Monte Carlo. *Statistical Science*, 20, 1–31, 2005.

25. H. Ben Ameur, P. L'Ecuyer and C. Lemieux. Combinations of general antithetic transformations and control variables. *Mathematics of Operations Research*, 29, 946–960, 2004.

26. C. Lemieux and P. L'Ecuyer. Randomized polynomial lattice rules for multivariate integration and simulation, *SIAM Journal on Scientific Computing*, 24, 1768–1789, 2003.

27. F. J. Hickernell, H. S. Hong, P. L'Ecuyer and C. Lemieux. Extensible lattice sequences for quasi-Monte Carlo quadrature. *SIAM Journal on Scientific Computing*, 22, 1117–1138, 2001.

28. C. Lemieux and P. L'Ecuyer. On selection criteria for lattice rules and other quasi-Monte Carlo point sets. *Mathematics and Computers in Simulation*, 55, 139–148, 2001.

29. P. L'Ecuyer and C. Lemieux. Variance reduction via lattice rules. *Management Science*, 46, 9, 1214–1235, 2000.

Publications in Refereed Conference Proceedings

30. H. Faure, C. Lemieux and X. Wang*. Extension of Atanassov's methods for Halton sequences. In: *Monte Carlo and Quasi-Monte Carlo Methods 2010*, L. Plaskota and H. Woźniakowski (Eds.), Springer (2012), 345–362.

31. R.G. Esteves*, C. Lemieux and M. McCool, "Real Options for Mobile Communication Management", Proc. IEEE Global Telecommunications Conference (GLOBECOM) 2011 Workshop - UbiCoNet, Houston, USA.

32. R.G. Esteves*, C. Lemieux and M. McCool. Input-adaptive QMC-Kalman filters for track fitting. Proceedings of *ADAPTIVE 2011*, 9–14, 2011.

33. C. Lemieux and H. Faure. New Perspectives on $(0, s)$-Sequences, *Monte Carlo and Quasi-Monte Carlo 2008*, P. L'Ecuyer and A. B. Owen eds, Springer-Verlag, 113–130, 2009.

34. C. Bernard and C. Lemieux. Fast simulation of equity-linked life insurance contracts with a surrender option. *Proceedings of the 2008 Winter Simulation Conference*, 444-452, IEEE Press, Piscataway, NJ, 2008.

35. C. Lemieux and J. La*. A study of variance reduction techniques for American option pricing. *Proceedings of the 2005 Winter Simulation Conference*, 1884–1891, IEEE Press, Piscataway, NJ, 2005.

36. C. Lemieux. Randomized quasi-Monte Carlo: a tool for improving the efficiency of simulations in finance. *Proceedings of the 2004 Winter Simulation Conference*, 1565–1573, IEEE Press, Piscataway, NJ, 2004.

37. C. Lemieux and A.B. Owen. Quasi-regression and the relative importance of the ANOVA components of a function, *Monte Carlo and Quasi-Monte Carlo 2000*, K.-T. Fang, F. J. Hickernell, and H. Niederreiter eds, Springer-Verlag, 331-344, 2002.

38. C. Lemieux and P. L'Ecuyer. On the use of quasi-Monte Carlo methods in computational finance, *Computational Science - ICCS 2001 (part I)*, Lecture Notes in Computer Science vol. 2073, Springer, 607 - 618, 2001.

39. D. Ormoneit, C. Lemieux and D. Fleet. Lattice particle filters. *Proceedings of the Seventeenth Conference on Uncertainty in Artificial Intelligence*, D. Koller and J. Breese Eds., Morgan Kaufmann Publishers, 395–402, 2001.

40. C. Lemieux and P. L'Ecuyer. Using lattice rules for variance reduction in simulation. *Proceedings of the 2000 Winter Simulation Conference*, 509–516, IEEE Press, December 2000.

41. C. Lemieux and P. L'Ecuyer. A comparison of Monte Carlo, lattice rules and other low-discrepancy point sets. *Monte Carlo and Quasi-Monte Carlo Methods 1998*, H. Niederreiter and J. Spanier Eds., 326–340, Springer, Berlin, 1999.

42. H. Ben Ameur, P. L'Ecuyer and C. Lemieux. Variance reduction of Monte Carlo and randomized quasi-Monte Carlo estimators for stochastic volatility models in finance. *Proceedings of the 1999 Winter Simulation Conference*, 336–343, IEEE Press, December 1999.

43. P. L'Ecuyer and C. Lemieux. Quasi-Monte Carlo via linear shift-register sequences. *Proceedings of the 1999 Winter Simulation Conference*, 632–639, IEEE Press, December 1999.

44. C. Lemieux and P. L'Ecuyer. Lattice rules for the simulation of ruin problems. *Proceedings the 13th European Simulation MultiConference*, vol.2, 533–537, Society for Computer Simulation, Ghent, Belgium, 1999.

45. C. Lemieux, P. L'Ecuyer. Efficiency improvement by lattice rules for pricing Asian options. *Proceedings of the 1998 Winter Simulation Conference*, 97–104, IEEE Press, December 1998.

46. C. Lemieux and P. L'Ecuyer. An empirical comparison of diffusion approximation and simulation in ATM networks, *Proceedings of the Sixth International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems*, 101–106, 1998.

Other Publications

47. C. Lemieux. Control variates. Contributed entry in "Wiley StatsRef-Statistics Reference Online", 2016

48. C. Lemieux. Discussion of "Sequential Quasi-Monte Carlo" by M. Gerber and N. Chopin, *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 77, 3 (2015), 566–567.

49. H. Faure and C. Lemieux, Corrigendum to: Improvements on the star discrepancy of (t, s)-sequences. *Acta Arithmetica*, 159, 299–300, 2013.

50. X. Wang*, C. Lemieux and H. Faure. A note on Atanassov's discrepancy bound for the Halton sequence. Working paper 2008-04, Department of Statistics and Actuarial Science, University of Waterloo, 2008. (Updated September 2013)

51. C. Lemieux. A comparison of copy rules and Korobov rules. Yellow Series, Research Paper No. 836, Department of Mathematics and Statistics, University of Calgary, 2004.

52. C. Lemieux, M. Cieslak* and K. Luttmer*. RandQMC user's guide: a package for randomized quasi-Monte Carlo methods in C. Technical Report 2002-712-15, Department of Computer Science, University of Calgary, 2002.

53. P. L'Ecuyer and C. Lemieux. On the choice of quasi-random point sets with a lattice structure, *Proceedings of Monte Carlo Simulation 2000*, Monte Carlo, June 2000.

54. C. Lemieux. *L'utilisation de règles de réseau en simulation comme technique de réduction de la variance.* Ph.D. Thesis, Université de Montréal, 2000.

55. C. Lemieux. *L'évaluation des options asiatiques.* M.S. Thesis, Université de Montréal, 1996.

Software

56. R package `qrng`, M. Hofert and C. Lemieux, released in 2015, last update June 11, 2016.

Work in progress

57. F. Liu, J.Cai, C. Lemieux, and R. Wang. Convex risk functionals: representation and applications. Submitted for publication, 2018. (29 pages)

Selected Invited Talks

Monte Carlo and Quasi-Monte Carlo Methods 2018, Rennes, France, July 2018

IMACS Seminar on Monte Carlo Methods, Montreal, Canada, July 2017.

(Plenary talk) Monte Carlo and Quasi-Monte Carlo Methods 2016, Stanford, CA, August 2016

ICERM Workshop on Discrepancy Theory, Brown University, Providence, RI, October 2014.

ICERM Workshop on Information-Based Complexity and Stochastic Computation, Brown University, Providence, RI, September 2014.

Statistical Society of Canada Annual Meeting, Edmonton, May 2013

Computational Statistics Seminar, University of Guelph, March 2013

Montreal MPRIME Seminar of Actuarial & Financial Mathematics, UQAM, Montreal, March 2012

(Plenary Talk) Monte Carlo and Quasi-Monte Carlo Methods 2008, Montreal, July 2008.

Statistical Society of Canada Annual Meeting, St. John's, Canada, June 2007.

Canadian Mathematical Society Summer Annual Meeting, Calgary, Canada, June 2006

NPCDS/SAMSI Workshop on The Design and Analysis of Computer Experiments for Complex Systems, Banff, July 2004.

Monte Carlo and Quasi-Monte Carlo Methods 2002, Singapore, November 2002.

IMACS Seminar on Monte Carlo Methods, Salzburg, Austria, September 2001.

Grants

Co-investigator on NSERC CREATE grant "Machine Learning in Quantitative Finance and Business Analytics", $1.65M (with 10 others including PI)

Discovery Grant of NSERC-Canada: $85,000 (2015–2020), $100,000 (2010–2015); $90,000 (2005–2010)

Individual Research Grant of NSERC-Canada, $48,000 (2001–2005).

Professional Activities

Member of the Fields Distinguished Lecturer in Statistical Sciences (DLSS) committee, 2013–2016

Co-organizer of Workshop "Approximation of High-Dimensional Numerical Problems - Algorithms, Analysis and Applications " with I.H. Sloan (University of New South Wales) and H. Woźniakowski (Columbia University and Warsaw University) at Banff International Research Station, September 27, 2015– October 2, 2015.

Member of the Advisory Board for large research project "Special Research Area (SFB): Quasi-Monte Carlo-Methods, Theory and Applications" (PI: Prof. G. Larcher) funded by the Austrian Research Foundation.

Associate Editor for ESAIM Probability & Statistics, 2013–present

Associate Editor for ACM Transactions on Modeling and Computer Simulation, 2010–present

Program committee of *Monte Carlo and Quasi-Monte Carlo* (2010, 2012, 2014, 2016, 2018).

Program committee for IMACS Conference on Monte Carlo Methods, 2013, 2015, 2017, 2019

External referee for Swiss National Science Foundation, Austrian Science Fund, NSERC, NATEQ, NSF.

Referee for *ACM TOS*, *ACM TOMACS*, *Computational Statistics and Data Analysis*, *Journal of Computational Finance*, *J. of the American Statistical Association*, *J. of Multivariate Analysis*, *J. of Complexity*, *J. of Computational and Applied Mathematics*, *Journal of The Royal Statistical Society Series B*, *Management Science*, *Mathematical Programming: Series A*, *Mathematics and Computers in Simulation*, *Methodology and Computing in Applied Probability*, *Monatshëfte für Mathematik*, *Operations Research*, *Operations Research Letters*, *Princeton University Press*, *SIAM J. on Financial Mathematics*, *SIAM J. on Numerical Analysis*, *Statistics and Computing*, *Technometrics*, and various refereed conference proceedings.

Student Supervision

Current students

Jaspar Wiart, Postdoctoral researcher, January 2018–present

Gracia Dong, PhD (Statistics), September 2018– present

Erik Hintz (co-supervised with M. Hofert), PhD (Statistics), September 2017–present

Graduated PhD students

Y. Taniguchi (PhD Statistics): January 2014 – December 2017. Thesis title: Importance Sampling and Stratification Techniques for Multivariate Models with Low-Dimensional Structures

S. Li (PhD Actuarial Science, co-supervised with D. Landriault): graduated August 2015. Thesis title: Adaptive policies in insurance risk models

F. Liu (PhD Actuarial Science, co-supervised with J. Cai) : graduated August 2015. Thesis title: Risk Measures and Optimal Reinsurance

R. G. Esteves, (Computer Science, co-supervised with M. McCool), graduated September 2012. Thesis title: *A study of adaptation mechanisms for simulation algorithms*

Graduated Masters students (thesis-based)

M.Math Statistics (U. Waterloo), Y. Taniguchi, Dependence concepts and selection criteria for lattice rules, December 2013

M.Sc. Statistics (U. Calgary): J. La., A Study of Quasi-Monte Carlo Methods and Variance Reduction Techniques for Improving the Least-Squares Monte Carlo Algorithm for American Option Pricing, July 2007

M.Sc. Computer Science (U. Calgary): M. Cieslak, RQMC Methods in a Light Distribution Model for Plant Development Simulations, December 2005

M.Sc. Computer Science (U. Calgary): D. Dembeck, Dynamic Numerical Integration Using Quasi-Monte Carlo Methods, December 2003

Graduated Masters students (course-based)

Computational Mathematics: E. Kovalova (December 2013), N. McNeilly (August 2011), J. de Maeseneire (August 2010). L. Serre (August 2010), S. Zgheib (August 2009)

Actuarial Science: R. Jain (December 2016); B. Zhou (December 2012), R. Agarwal (August 2010), J. Gu (Agust 2009), J. Liang (August 2009), W. Bao (December 2008)

Statistics: G. Dong (August 2018), P. Li (April 2018), E. Hintz (August 2016), X. Hao (December 2011), L. Wang (August 2011)

Statistics-computing: Y. Yao (December 2010)

Quantitative Finance & Statistics-Finance: J. Su (December 2018), M. Zuber (April 2015), H. Munawar (December 2010), Y. Zhao (December 2008), Y. Lin (December 2008), R. Krook (December 2007), T. Huang (December 2007)

Undergraduate research students:

Waterloo: Y. Xun (Winter 2016–URI), Z. Li (Fall 2015), J. Funk (USRA–Spring 2013), Y. Wei (Spring 2012), F. Liu (Spring 2009), M. Glot (Spring 2009), H. Munawar (Winter 2009), X. Wang (Winter and Spring 2008), B. Cheng (Spring 2007–URI); Calgary: H. Gill (USRA–Spring 2004), J. La (Spring 2004), M. Cieslak (USRA–Spring 2002), K. Luttmer (USRA–Spring 2002)

External Examiner for Ph.D. Defenses:

Hélène Perrier, Université Lyon 1, France, March 2018

Iltre Mtalai, Université Laval, Canada, September 2018

Joseph El Maalouf, Université Savoie Mont-Blanc, France, November 2016

Houying Zhu, University of New South Wales, Australia, March 2016

Dameng Tang, University of Toronto, Canada, April 2016

Rami El-Haddad, Université Joseph-Fourier, Grenoble, France, December 2008

Sophia Zaanoun, Hautes Etudes Commerciales, Montreal, Canada, May 2007

Service (University of Waterloo)

Associate Dean of Graduate Studies, Faculty of Mathematics, July 2017–present

Interim Chair, Department of Statistics and Actuarial Science, July 2012–June 2014

Associate Chair for Actuarial Science (July 1, 2008–June 30, 2011; July 1, 2016–June 30, 2017)

UW Committees: Senate Graduate Research Council, July 2017–present; Graduate Operations Committee, July 2017–present; Graduate Supervision Task Force, December 2018–present; GradTalks co-chair, 2018; Salary Anomaly Working Group, September 2015–July 2016; Academic Leadership Advisory Committee, July 2013–June 2014; Pension and Benefits, July 2011–June 2012;

Faculty of Mathematics: Tenure and Promotions, July 2017–present; Graduate Studies Committee, July 2017–present; Strategic Plan Committee, July 2017–present; Undergraduate Affairs Committee, 2016–2017; Dean's Advisory Council, 2012–2014, July 2017–present; Computing Advisory Committee, 2011–2012; Strategic Plan Working Group, 2011–2012

Department Committees: Appointments (2008–2010, 2011-2014, 2015-2016); Tenure and Promotion (2009, 2011–2014); Chair Nominating (2011–2012; 2017); Programs (2012–2013, 2016–2017), Graduate Operations (2008–2011)