Kevin Z. Leder

CONTACT INFORMATION
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Minneapolis, MN 55455 (612)624-7965 (office)
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EDUCATION

Brown University, Providence, Rhode Island USA
Ph.D., Applied Mathematics, May 2008
Sc.M., Applied Mathematics, May 2005
University of Colorado, Boulder, Colorado USA
B.E. Applied Mathematics, May 2002

RESEARCH INTERESTS

Applied probability, mathematical modeling in biology and medicine, rare event simulation.

ACADEMIC EXPERIENCE

University of Minnesota **09/11-present**
College of Science and Engineering
Department of Industrial and Systems Engineering
Assistant Professor

Harvard University **09/09-09/11**
School of Public Health, Biostatistics
Dana Farber Cancer Institute, Biostatistics and Computational Biology
Postdoctoral research in development and analysis of stochastic evolutionary models for cancer systems biology.
(Research group moved from Sloan Kettering Institute in 2010).

Columbia University **06/08-06/09**
Department of Industrial Engineering and Operations Research
Postdoctoral research in refined analysis of rare event simulation methods for stochastic networks.

Brown University **09/03-06/08**
Division of Applied Mathematics
Graduate research in design and analysis of importance sampling algorithms for rare event estimation in queueing networks.

Lucent Research Center **06/06-08/06**
Murray Hill, NJ
Large deviations analysis of buffer overflow events at wireless communication towers.

University of Colorado **09/00-08/02**
Department of Applied Mathematics
Worked on encryption algorithm based on discretization of Non-Linear Schrodinger Equation.

Awards

2016 NSF CAREER Award

2010 Best Publication Prize, INFORMS Simulation Society
Awarded for the best publication in the field of stochastic simulation during the previous three years: *'Importance sampling for sums of random variables with regularly varying tails'*

VIGRE NSF Graduate Fellowship, Brown University, 2004-2006.

Dissertation Fellowship, Brown University, 2005.

Travel award for 2005 Summer School on Rare Events in Stochastic Networks at the University of Ottawa.

Dean's Fellowship, Brown University, 2002-2003.

"Outstanding" (top 2%) designation in COMAP Mathematical Modelling Contest 2002.

Research Funding

- PI. National Science Foundation, Program in Service Enterprise Systems, Division of Civil, Mechanical and Manufacturing Innovation (2014-2017). *"CAREER: Rare Events in Cancer Evolution"*.
- PI. National Science Foundation, Program in Service Enterprise Systems, Division of Civil, Mechanical and Manufacturing Innovation (2014-2017). *"New Mathematical Models for Optimal Anti-Cancer Therapy"*.
- Co-PI. National Science Foundation, Program in Mathematical Biology, Division of Mathematical Sciences (2012-2015) *"Understanding stochasticity in cancer recurrence timing"*.
- Co-PI. National Cancer Institute PSOC Trans-Network Grant (2010-2012) *"Development of quantitative models of penetrance of resistance,"*
- Co-PI. National Cancer Institute PSOC Young Investigator Award (2010-2011) *"Towards an evolutionary framework for identifying driver mutations,"*

Journal Publications

(* denotes alphabetical naming of authors)

1. Storey, K., Ryser, M., Leder, K., Foo, J., 'Spatial measures of genetic heterogeneity during carcinogenesis,' *submitted* 2015.

2.* Xu, G., Jiang, T., Leder, K., 'Rare-event analysis for extremal eigenvalues of the Beta-Laguerre ensemble,' *submitted* 2014.

3. Watanabe, Y., Dahlman, E., Leder, K., Hui, S., 'A mathematical model of tumor growth and its response to single irradiation,' *submitted* 2014.

4. Badri, H., Watanabe, Y., and Leder, K., 'Robust and probabilistic optimization of dose schedules in radiotherapy,' *Physics in Medicine and Biology*, accepted for publication 2015.

5. Badri, H., Ramakrishnan, J., and Leder, K., 'Minimizing Metastatic Risk in Radiotherapy Fractionation Schedules,' *Physics in Medicine and Biology*, accepted for publication 2015.

6. Badri, H., Pitter, K., Holland, EC., Michor, F., and Leder, K. 'Optimization of radiation dosing schedules for proneural glioblastoma,' *Journal of Mathematical Biology*, accepted for publication 2015.

7.* Durrett, R., Foo, J. and K. Leder. 'Spatial Moran models, II: cancer initiation in spatially structured tissue,' *Journal of Mathematical Biology*, accepted for publication 2015.

8. Foo, J., Liu, L., Leder, K., Riester, M., Iwasa, Y., Lengauer, C., and Michor, F. 'An evolutionary approach for identifying driver mutations in colorectal cancer,', *PLoS Computational Biology*, accepted for publication 2015.

9. Mumentaler, S., Foo, J., Choi, N., Heise, N., Leder, K., Agus, D., Pao, W., Michor, F., and P. Mallick. 'The Impact of Microenvironmental Heterogeneity on the Evolution of Drug Resistance in Cancer Cells,' *Cancer Informatics*, Volume 14, 19-31, 2015.

10.* Foo, J., Leder, K. and Zhu, J. 'Escape times for branching processes with random mutational fitness effects,' *Stochastic Processes and Their Applications*, Volume 124, 3661-3697, 2014.

11.* Foo, J., Leder, K. and Ryser, M. 'Multifocality and recurrence risk: a quantitative model of field cancerization,' *Journal of Theoretical Biology*, Volume 355, 170-184, 2014.

12. Leder, K., Pitter, K., LaPlante, Q., Hambardzumnyan, D., Ross, B., Chan, T., Holland, E., and Michor, F. 'Mathematical modeling of Proneural Glioblastoma reveals optimized radiation dosing schedules,' *Cell*, Volume 156, 603-616, 2014.

13.* Blanchet, J., Hult, H., Leder, K. 'Importance sampling for stochastic recurrence equations with heavy tailed innovations,' *ACM Transactions on Modeling and Computer Simulation*, Volume 23, No. 22, 2013.

14.* Foo, J., Leder, K., Mumenthaler, S. 'Moving targets in cancer: Understanding the composition and rebound growth kinetics of recurrent tumors,' *Evolutionary Application*, Volume 6, 54-69, 2013.

15.* Foo, J., Leder, K. 'Dynamics of Cancer Recurrence,' *Annals of Applied Probability*, Volume 23, 1437-1468, 2013.

16.* Blanchet, J., Glynn, P., Leder, K. 'On Lyapunov inequalities and subsolutions for efficient importance sampling,' *ACM Transactions on Modeling and Computer Simulation*, Volume 22, No. 13, 2012.

17. Leder, K., Foo, J., B. Skaggs, M. Gorre, C. Sawyers, Michor, F. 'Diversity in pre-existing resistance to BCR-ABL inhibitors in Chronic Myeloid Leukemia,' *PLOS ONE*, e27682 2011.

18.* Blanchet, J., Leder, K., Shi, Y. 'Analysis of a splitting estimator for rare event probabilities in Jackson Networks,' *Stochastic Systems*, Volume 1, 306-339, 2011.

19. Foo, J., Mumenthaler, S., Leder, K., Choi, N., Agus, D., Pao, W., Mallick, P., Michor, F. 'Evolutionary modeling of combination strategies to overcome resistance to tyrosine kinase inhibitors in non-small cell lung cancer,' *Molecular Pharmaceutics*, Volume 1 2069-2079, 2011.

20.* Durrett, R., Foo, J., Leder, K., Mayberry, J., Michor, F. 'Intra-tumoral heterogeneity in tumors with random fitness advances,' *Genetics*, Volume 8, 461-477, 2011.

21. Leder, K., Holland, E., Michor, F. 'The therapeutic implications of plasticity of the cancer stem cell phenotype,' *PLoS ONE*, e14366 2010.

22.* Foo, J., Leder, K., Michor, F. 'A stochastic process model of cancer initiation from a homeostatic compartment,' *Physical Biology*, 8, 015002, 2010.

23.* Durrett, R., Foo, J., Leder, K., Mayberry, J., Michor, F. 'Evolutionary dynamics of tumors with random fitness values,' *Theoretical Population Biology*, Volume 78, 54-66, 2010.

24.* Dupuis, P., Leder K., Wang, H. 'Large deviations and importance sampling for the weighted-serve-the-longest queue policy,' *Mathematics of Operations Research*, Volume 34, 642-660, 2009.

25.* Dupuis, P., Leder K., Wang, H. 'Large deviations and importance sampling for a tandem network with slow-down,' *Queueing Systems*, Volume 57, 71-83, 2007.

26.* Dupuis, P., Leder K., Wang, H. 'On the large deviations properties of the weighted-serve-the-longest queue policy,'. *Progress in Probability Vol 60*, [V. Sidoravicius and M.E. Vares eds]. Birkauser, 229-256, 2008.

27.* Dupuis, P., Leder K., Wang, H. 'Importance sampling for sums of random variables with regularly varying tails,' *ACM Transactions on Modeling and Computer Simulation*, Volume 17, No. 14, 2007.

Refereed Conference Proceedings

1. Foo, J., Leder, K., 'Rare events in cancer recurrence timing,' (to appear Proceedings of the Winter Simulation Conference 2012).

2. Blanchet, J., Hult, H., Leder, K. 'Importance sampling for stochastic recurrence equations with heavy tailed increments,' *Proceedings of the Winter Simulation Conference 2011*, 3824-383.

3. Blanchet, J., Glynn, P., Leder, K. 'Efficient simulation of light-tailed sums: an old-folk song sung to a faster new tune...' *Monte Carlo and Quasi-Monte Carlo Methods 2008*, [P. L'Ecuyer and A. Owen eds], Springer, 227-248 (2009).

Seminars

- University of Minnesota, Masonic Cancer Seminar, January 2016
- Northwestern University, Mathematical Neuro-Oncology Research Lab, July 2014
- University of Minnesota, Department of Statistics, February 2014
- University of Florida, Industrial and Systems Engineering, February 2014
- Singapore University of Technology and Design, January 2014
- University of Minnesota, Department of Mathematics, April 2013
- University of Colorado Health Sciences Center, March 2013
- University of Minnesota, Department of Radiation Oncology, March 2013
- University of Minnesota, Department of Mathematics, February 2013.
- Duke University, Department of Mathematics, January 2013.
- Brown University, Division of Applied Math, Providence, RI, April 2012
- Massachusetts Institute of Technology, Department of Mathematics, April 2011
- Arizona State University, Beyond Center, June 2010.
- California State University Northridge, Department of Mathematics, February 2011
- University of Delaware, Department of Mathematics, February 2011
- Ohio State University, Department of Mathematics, February 2011
- University of Minnesota, Industrial and Systems Engineering, February 2011
- University of British Columbia, Sauder School of Business, Operations and Logistics Division, January 2011
- Naval Postgraduate School, Department of Operations Research, March 2010.
- College of William and Mary, Mathematics Department, February 2008.

Selected Conference Presentations

- European Conference on Mathematical and Theoretical Biology, Gothenberg, Sweden June 2014.
- SIAM Optimization, San Diego, May 2014.
- Applied Probabilty Society Meeting, Costa Rica, July 2013.
- Workshop on Computational Statistics, Columbia University, December 2012.
- SIAM Life Sciences Meeting, San Diego, CA, August 2012
- World Congress Probability and Statistics, Invited Session, Istanbul, Turkey, July 2012
- SAMSI Workshop on Rare Event Simulation, Research Triangle Park, NC, February 2012

Service and Professional Memberships

Member of INFORMS
INFORMS 2013 Conference Committee, INFORMS Session and Cluster Chair
University of Minnesota Service: Seminar Committee, 2013-2014 ISyE Faculty Search Committee, Fall 2012 ISyE Qualifying Exam Committee, 2013 and 2014 ISyE Fellowship Committee, College of Science and Engineering UROP Evaluation.
Reviewer for various journals in probability theory and theoretical biology *(ACM TOMACS, Advances in Applied Probability, Annals of Applied Probability, Stochastic Processes and their Applications, Queueing Systems, Theoretical Population Biology, Operations Research Letters, Management Science, Annals of Operations Research)*

Teaching/Mentoring Experience

Instructor for IE 3521/4521. University of Minnesota-Twin Cities. (Fall 2011, 2012, 2013, 2015)

Instructor for IE 3553/5553. University of Minnesota-Twin Cities. (Spring 2012, 2013, 2014, 2015)

Instructor for undergraduate course on stochastic methods in operations research. Brown University. (Spring 2007)

Tutor/Mentor at Providence Youth in Action (2004-2007).

University of Colorado Tutor for *Calculus and Physics* (1998-2002).

Personal

Citizenship: USA