Alexander “Sasha” Gutfraind, Ph.D.

Research Assistant Professor

Contact

Division of Epidemiology and Biostatistics
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Education

Ph.D. Applied Mathematics (02/2010), Cornell University
with Minor in Computer Science

M.Math. Applied Mathematics (6/2006), University of Waterloo
with Certificate in University Teaching

B.Math. Applied Mathematics (5/2004), University of Waterloo
with Minor in Physics

Distinctions and Honors

Work featured in
Science News, SIAM News, Phalanx, and others

Adj. Research Assistant Professor (lecturer)
Division of Hepatology, Stritch School of Medicine, Loyola University of Chicago

Computational Epidemiology and Hepatitis C Virus Clinical Vaccine Trial Design
$180k fellowship at the Food and Drug Administration

Optimization research in control of infections disease - multiple NIH awards
$175k total value (share as co-investigator)

Robust Network Interdiction Under Uncertainty - DTRA research grant
$180k (share as co-investigator)

Multiscale Models of HCV infection - University of Illinois R&D grant
$35k (share as co-investigator)

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Funding and Awards

“Dynamic data-driven decision models for infectious disease control” 2014 - 2019 NIH U01 grant as co-investigator ($80k)

“Disrupting Vector-borne Disease Transmission in Complex Urban Environments” 2013 - 2017 NIH R01 grant as co-investigator ($123k)

“Multiscale Models of HCV infection” 2012 - $75k - University of Illinois seed R&D grant (co-investigator $35k)

“Robust Network Interdiction Under Uncertainty” 2009 - successful $1.09M DTRA grant (co-investigator $180k)

Best Graduate Student Paper in Mathematical Sociology 2008 - ASA.

NSERC Postgraduate Scholarship ($20k + tuition), 2004-2006.

Employment

Research and Development

- 2012 - present: University of Illinois at Chicago
  Research Assistant Professor, School of Public Health
- 2012 - 2014: Food and Drug Administration
  Research Fellow, ORISE Research project for Hepatitis C vaccines
- 2011 - 2012: University of Texas at Austin
  Fellow, Center for Computational Biology and Bioinformatics
  Mathematical and Network Modeling of Infections & Optimization of Intervention Measures
- 2009 - 2011: Los Alamos National Laboratory
  Postdoctoral Research Associate, Center for Nonlinear Studies
  Discrete Optimization & Models of Networks
- 2002-2008: Multiple internships
  University of Waterloo, Los Alamos National Lab

Teaching

- 2015 Statistical methods in Network Analysis (PhD-level), University of Illinois at Chicago
- 2014 Dynamic models in Epidemiology (PhD-level special topics course), University of Illinois at Chicago
- 2014- External Dissertation Committee member: Industrial Engineering and Management Sciences, Northwestern University.
- 2012-2013, Guest Lecturer, “Epidemiology”, University of Illinois at Chicago.
- Winter 2011, Guest Lecturer, “Network Security”, University of New Mexico School of Business.

- Spring 2009, Cornell
  Course designer, instructor and supervisor: Math 101A
  Textbook: Bittinger&Beecher: Developmental Mathematics
  Responsibilities: syllabus design, materials, class instruction, supervision of 3 TAs.
- Spring 2009, Cornell
  Course instructor: Transition to Object-Oriented Programming (200+ students)
  Textbook: Gries&Gries Rated 4.33/5 in a mid-course student survey.
- Fall 2008, Cornell
  TA: Introduction to Programming with Java
  Textbook: Gries&Gries
  Rated 4.2/5 in a mid-course student survey.
- Spring 2008, Cornell
  TA: Dynamic Models in Biology
  Textbook: Ellner&Guckenheimer
  Rated 4.6/5 in a post-course student survey.
- Fall 2007, Cornell
  Instructor: Single-Variable Calculus
  Textbook: R.A. Adams
  Responsibilities: design, class instruction, supervision of TA and graders.
- 2004-2005, Waterloo
  TA: Sophomore calculus (250+ students)
  Rated 4.5/5 in a student survey.
- 2003-2004, Waterloo
  Undergraduate TA: Freshman calculus

Publications

Refereed Journal Papers

A. Gutfraind and L. A. Meyers, “Evaluating large-scale blood transfusion therapy for the current Ebola epidemic in Liberia,” *Journal of Infectious Diseases*, to appear 2015.

A. Gutfraind, A. Galvani, and L. A. Meyers, “Efficacy and optimization of palivizumab injection regimens against RSV,” *JAMA Pediatrics*, April 2015.

B. Singh, H.-C. Huang, D. P. Morton, G. P. Johnson, A. Gutfraind, A. P. Galvani, B. Clements, and L. A. Meyers, “Optimizing Distributions of Pandemic Influenza Antivirals,” *Emerging Infectious Diseases*, vol. 21, Feb 2015.

A. Gutfraind, M. Bradonjic, and T. Novikoff, “Modeling the Neighbor Aid Phenomenon for Installing Costly Complex Networks,” *Journal of Complex Networks*, Aug 2014. 10.1093/comnet/cnu033.

M. P. Johnson, A. Gutfraind, and K. Ahmadizadeh, “Evader interdiction: Algorithms, complexity and collateral damage,” *Annals of Operations Research*, vol. 222, pp. 341–359, Nov 2014.

A. Gutfraind, "New Models of Interdiction in Networked Systems," *Phalanx - Journal of the Military Operations Research Society*, vol. 44, pp. 25–27, June 2011.

M. P. Atkinson, A. Gutfraind, and M. Kress, "When do armed revolts succeed: lessons from Lanchester theory," *Journal of the Operational Research Society*, vol. 63, no. 10, pp. 1363–1373, 2012.

A. Gutfraind, "Optimizing topological cascade resilience based on the structure of terrorist networks," *PLoS ONE*, vol. 5, p. e13448, 11 2010.

A. Gutfraind, "Understanding terrorist organizations with a dynamic model," *Studies in Conflict and Terrorism*, vol. 32, pp. 45–59, Jan 2009.

A. Gutfraind and A. Kempf, "Error-reducing structure of the genetic code indicates code origin in non-thermophile organisms," *Orig Life Evol Bios*, vol. 38, no. 1, pp. 75–85, 2008.

Submitted

A. Gutfraind, B. Boodram, N. Prachand, A. Hailegiorgis, H. Dahari, and M. Major, "Agent-based model forecasts aging of the population of people who inject drugs in metropolitan Chicago and changing prevalence of hepatitis C infections," *In review in PLOS Computational Biology*, 2015.

E. Massaro, A. Ganin, A. Gutfraind, N. Steen, J. Keisler, A. Kott, R. Mangoubi, and I. Linkov, "Resilient complex systems and networks: concepts, design and analysis," *Submitted to the Proceedings of the National Academy of Sciences*, 2014.

A. Gutfraind, J. Kuhn, A. Lelkes, and L. Reyzin, "Network installation and recovery: approximation lower bounds and faster exact formulations," *In review in Journal of Complex Networks*, 2014.

M. Genkin and A. Gutfraind, "Understanding Self-Starter Terrorism: A Network Mobilization Perspective," *In review in the Journal of Peace Research*, Apr 2014.

A. Gutfraind, "Game-theoretic analysis of interdiction of arms build-up in a frozen conflict," *In review in Risk Analysis*, Apr 2014.

Invited and Conference Papers

A. Gutfraind, B. Boodram, S. Feinstone, S. M. Mniszewski, R. Novak, L. J. Ouellet, N. Prachand, S. D. Valle, A. S. Perelson, H. Dahari, and M. Major, "Implementing a data-driven model of hepatitis C infections in metropolitan Chicago," in *Proceedings of the INFORMS Workshop on Data Mining and Health Informatics* (O. Seref, N. Serban, and D. Zeng, eds.), Oct 2013.

A. Gutfraind, A. Hagberg, D. Izraelevitz, and F. Pan, "Interdiction of a Markovian Evader," in *Proceedings of the 12th INFORMS Computing Society Conference on OR, Computing, and Homeland Defense* (R. K. Wood and R. F. Dell, eds.), pp. 3–15, INFORMS, Jan 2011. Acceptance Rate: 46%.

A. Gutfraind, M. Bradonjic, and T. Novikoff, "Graph-theoretic model of sequential optimal infrastructure recovery," in *Proceedings of the 11th International Conference on Structural Safety and Reliability (ICOSSAR)* (K. Zuev, S.-K. Au, and J. Beck, eds.), Taylor and Francis, Netherlands, 2013. Refereed extended abstract.

M. P. Johnson and A. Gutfraind, "Evader Interdiction and Collateral Damage," in *Proceedings of the 7th International Symposium on Algorithms for Sensor Systems, Wireless Ad Hoc Networks and Autonomous Mobile Entities (ALGOSENSORS)* (S. N. Thomas Erlebach and P. Orponen, eds.), Lecture Notes in Computer Science, Springer-Verlag, Germany, 2011.

A. Gutfraind in *Handbook of Optimization in Complex Networks* (M. T. Thai and P. M. Pardalos, eds.), ch. Optimizing Network Topology for Cascade Resilience, New York: Springer, 2011. Invited Chapter.

A. Gutfraind, "Targeting by transnational terrorist groups," in *Counterterrorism and Open Source Intelligence* (U. K. Wiil, ed.), vol. 2 of *Lecture Notes in Social Networks*, Springer, June 2011.

A. Gutfraind, "Monotonic and non-monotonic infections on networks," in *NATO Advanced Research Workshop on Examining Robustness and Vulnerability of Critical Infrastructure Networks* (S. Butenko, ed.), NATO Science for Peace and Security Series, IOS Press, 2013.

A. Gutfraind, A. Hagberg, and F. Pan, "Optimal interdiction of unreactive Markovian evaders," in *CPAIOR 2009* (J. Hooker and W.-J. van Hoeve, eds.), vol. 5547 of *Lecture Notes in Computer Science*, pp. 102–116, Springer, May 2009. Acceptance rate 48%.

A. Gutfraind, "Understanding terrorist organizations with a dynamic model," in *Mathematical Methods in Counterterrorism* (N. Memon, J. D. Farley, D. L. Hicks, and T. Rosenorn, eds.), Springer, 2009. Invited Chapter.

Technical Reports
Total: 10

Current Work
Total: 7

Talks and Posters
Total: 59

Major Professional Service

Open source research software: MUSKETEER (network modeling), Agent-based Pathogen Kinetics model (Hepatitis C epidemiology), Repast/HGT

Council Member - INFORMS Health Applications Society (2012-2014)

National Science Foundation - External Reviewer: Program on Methodology, Measurement, and Statistics.

Referee: American Control Conference, American Gastroenterological Association Digestive Disease Week 2014, Annals of Operations Research, American Political Science Review, Decision Analysis, Environment Systems and Decisions, European Physics Letters, European Journal of Operational Research, IEEE Conference on Decision and Control, IMA Journal of Management Mathematics, International Journal of Computer Mathematics, International Journal of Computational Science and Engineering, Journal of Mathematical Biology, Journal of the Operational Research Society, Journal of Physics A: Mathematical and Theoretical, Naval Research Logistics, Operations Research Letters, Parasites & Vectors, Public Library of Science - ONE, Physics Letters A, Risk Analysis, SIAM Journal on Discrete Mathematics, Social Networks

Technical Committee Member: SIAM Workshop on Network Science 2015, 2014 international workshop on data mining and decision analytics for public health and wellness (dmda14), complenet 2015 complenet 2014 complenet 2013 complenet 2012 (international workshop on complex networks), ccnet 2011 (ieee globecom workshop on complex communications networks), simplex 2011 (networks workshop of icdcs 2011)

Professional Service

Invited Panelist: Homeland Security Risk Assessments for Complex Adaptive Systems, Department of Homeland Security 2011.

Invited Panelist: Mathematical Approaches to Counter-Terrorism, University of Reading, UK 2011.

External Dissertation Committee member: Industrial Engineering and Management Sciences, Northwestern University, 2014-2015.

Member: INFORMS, INFORMS Health Application Society, INFORMS Computing Society, Computational Social Science Society of the Americas (2013-2015)

Member: Colloquium Committee, Center for Nonlinear Studies, Los Alamos National Lab

Undergraduate Adviser: Rose Huang (UIC 2014), Murillo Marco Carvalho Cunha (UIC 2014), Krishna Patel (U. of Texas Austin) 2012-2014, Raman Allawirdi (U. of Illinois at Chicago) 2013-2014

Graduate Advisor: Edward Chien (Los Alamos 2010)

Organizer: *Healthcare Practitioner Engagement*
a panel at the INFORMS Annual Conference 2014, San Francisco, CA

Organizer: *Data-driven network models*
a session at INFORMS Annual Conference 2013, Minneapolis, MN

Organizer: *Dynamic Optimization of Clinical Treatments*

a session at INFORMS Healthcare 2013 conference, Chicago, IL

Organizer: *Robust Simulation of Networks*
a session at INFORMS ICS 2013, Santa Fe, NM

Organizer: *New Models in National Security*
session at INFORMS annual meeting 2010, Austin, TX

Co-Organizer: *Models and Applications of Network Dynamics*
a mini-symposium at SIAM DS2011, Snowbird, UT

Organizer: *Terrorism as a Dynamical System*
a mini-symposium at SIAM DS2009, Snowbird, UT

Organizer: Student Talk Series, Center for Nonlinear Studies, Los Alamos National Lab

Founder and chair: *"Networks Journal Club" (2006-2009)*
a biweekly interdisciplinary (Math, Sociology, Computer Science) forum for discussing papers in theory and applications of networks. Sponsored by Cornell and Yahoo! and with $70+$ members.

Misc Service

Volunteer - Los Alamos Auxiliary Fire Brigade (2008-2012)

Member - Toastmasters International (2009-2012)

Technical Skills

Fields: Analytics, Optimization, Agent-based modeling, Dynamic modeling, Network and Relational databases, Machine learning, GIS, Pedagogy

Programming languages: Java, Python, R, C/C++, Matlab, UNIX Shell Scripting, Maple, PHP

Platforms: Windows, Linux, Android

Technologies: XML, Parallel programming

Languages: English, Hebrew, Russian

Alexander “Sasha” Gutfraind, Ph.D.

References

Prof. Lauren Ancel Meyers
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http://www.bio.utexas.edu/research/meyers/

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Compiled February 4, 2015