# Alexander Gutfraind, Ph.D.

Principal Data Scientist and Research Faculty Member


**Contact**

agutfraind@luc.edu
gutfraind.com
+1-505-500-4303

Program for Experimental and Translational Medicine
Department of Medicine, Loyola University Medical Center
2160 S. First Ave., Maywood, IL 60153, USA


**Education**

Ph.D. Applied Mathematics (2/2010), 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

## Contributions to science and practice

Five patent-pending algorithms for industrial and medical analytics

Three major studies in computational medicine (Science Trans Med 2018, JAMA Peds 2015, J Inf Dis 2015)

Work featured in Science News, SIAM News and other media

## Major awards and grants

*Multiple NIH awards* as co-I: Hepatitis C control (R01), Urban vector-borne diseases (R01), Control of outbreaks (U01)

*Major DTRA research grant (Network Analysis and Security)*

*Fellowship at the Food and Drug Administration*

# Alexander Gutfraind, Ph.D.

## Employment

2013 - Present: Loyola University Medical Center
Research Associate Professor (2019) and Lecturer, Department of Medicine
Application of computational methods to medicine

2012 - Present: University of Illinois at Chicago, School of Public Health
Adjunct Res. Assist. Prof., Div. of Epidemiology and Biostatistics

2020 - Present: Anthem, Chicago, IL
AI Principal Data Scientist
Research and development of AI methods for mobile and consumer healthcare

2018 - 2020: Blue Health Intelligence, Chicago, IL
Senior Data Scientist
Lead the R&D of data science algorithms for healthcare
Mentor junior data scientists and develop the data science platform

2012 - 2016: University of Illinois at Chicago
Research Assistant Professor, School of Public Health

2012 - 2014: Food and Drug Administration
Research Fellow, Computational modeling of 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

2015 - 2018: Uptake Technologies, Chicago, IL
Chief Health Data Scientist
Predictive analytics for healthcare and other industries
Business development, management and basic research

2017 - 2018: ST Advanced Concepts Inc - Co-Founder and CTO
A technology start-up developing solutions for safety and security problems

## Teaching

2015 Statistical methods in Network Analysis (PhD-level), University of Illinois at Chicago (Designer & Instructor)

2014 Dynamic models in Epidemiology (PhD-level special topics course), University of Illinois at Chicago (Designer & Instructor)

2014-2015 External dissertation committee member: Industrial Engineering and Management Sciences, Northwestern University.

Spring 2009, Cornell
Math 101A - Community education course

Spring 2009, Cornell
Transition to Object-Oriented Programming (200+ students)

Fall 2008, Cornell
Introduction to Programming with Java (teaching assistant)

Spring 2008, Cornell
TA: Dynamic Models in Biology

Fall 2007, Cornell
Instructor: Single-Variable Calculus
Responsibilities: design, class instruction, supervision of TA and graders.

2004-2005, Waterloo
TA: Sophomore calculus (250+ students)

## Publications

### Refereed Studies

[1] D. Echevarria*, A. Gutfraind*, B. Boodram, J. Layden, J. Ozik, K. Page, S. J. Cotler, M. Major, and H. Dahari, "Modeling indicates efficient vaccine-based interventions for the elimination of hepatitis c virus among persons who inject drugs," *Vaccine*, vol. 37, pp. 2608–2616, May 2019.

[2] V. Bier and A. Gutfraind, "Risk analysis beyond vulnerability and resilience – characterizing the defensibility of critical systems," *European Journal of Operational Research*, vol. 276, no. 2626-636, 2019.

[3] M. Major, A. Gutfraind*, Q. Cui*, L. Shekhtman, A. Kachko, S. J. Cotler, B. Hajarizadeh, R. Sacks-Davis, K. Page, B. Boodram, and H. Dahari, "Model-based analysis of patient immunity profiles indicates that vaccination could reduce hepatitis c transmission via syringe sharing," *Science Translational Medicine*, vol. 10, Jul 2018.

[4] A. Gutfraind, J. K. Peterson, E. B. Rose, C. Arevalo-Nieto, J. Sheen, G. F. Condori-Luna, N. Tankasala, R. Castillo-Neyra, C. Condori, P. Anand, C. Naquira-Velarde, and M. Z. Levy, "Integrating evidence, models and maps to enhance Chagas disease vector surveillance," *PLOS Neglected Tropical Diseases*, 2018.

[5] B. Boodram, A. L. Hotton, L. Shekhtman, A. Gutfraind, and H. Dahari, "High-risk geographic mobility patterns among young urban and suburban persons who inject drugs and their injection network members," *Journal of Urban Health*, vol. 9, no. 1, pp. 71–82, 2017.

[6] A. Gutfraind and M. Genkin, "A Graph Database Framework for Covert Network Analysis: An Application to the Islamic State Network in Europe," *Social Networks*, vol. 51, pp. 178–188, October 2017.

[7] C. L. Staudt, M. Hamann, I. Safro, A. Gutfraind, and H. Meyerhenke, "Generating realistic scaled complex networks," *Applied Network Science*, vol. 2, no. 1, 2017.

[8] R. Fu, A. Gutfraind, and M. L. Brandeau, "Modeling a dynamic bi-layer contact network of injection drug users and the spread of blood-borne infections," *Mathematical Biosciences*, vol. 273, pp. 102–113, Mar 2016.

[9] A. A. Ganin, E. Massaro, A. Gutfraind, N. Steen, J. M. Keisler, A. Kott, R. Mangoubi, and I. Linkov, "Operational resilience: concepts, design and analysis," *Scientific Reports*, vol. 5, Dec 2015.

[10] 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," *PLoS ONE*, Sept 2015.

[11] D. Echevarria, A. Gutfraind, B. Boodram, M. Major, S. D. Valle, S. J. Cotler, and H. Dahari, "Mathematical modeling of Hepatitis C prevalence reduction with antiviral treatment scale-up in persons who inject drugs in metropolitan Chicago," *PLoS ONE*, Aug 2015.

[12] A. Gutfraind, J. Kuhn, A. Lelkes, and L. Reyzin, "Network installation under convex costs," *Journal of Complex Networks*, vol. 4, July 2015. doi:10.1093/comnet/cnv020.

[13] A. Gutfraind and L. A. Meyers, "Evaluating large-scale blood transfusion therapy for the current Ebola epidemic in Liberia," *Journal of Infectious Diseases*, vol. 211, pp. 1262–1267, February 2015.

[14] A. Gutfraind, A. Galvani, and L. A. Meyers, "Efficacy and optimization of palivizumab injection regimens against RSV," *JAMA Pediatrics*, vol. 169, pp. 341–348, April 2015.

[15] 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.

[16] 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.

[17] 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.

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

[19] 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.

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

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

[22] 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.

**Invited and Conference Papers**

[1] A. Gutfraind, E. R. Tatara, N. T. Collier, S. J. Cotler, S. M. Feinstone, K. Page, J. T. Ozik, B. Boodram, M. E. Major, and H. Dahari, "Simulation of HCV vaccine clinical trials reveals opportunities and challenges for candidate HCV vaccines," in *Hepatology*, vol. 70, pp. 990A–990A, 2019.

[2] C. L. Staudt, M. Hamann, I. Safro, A. Gutfraind, and H. Meyerhenke, "Generating scaled replicas of real-world complex networks," in *Proceedings of Complex Networks 2016: Milan, Italy* (H. Cherifi, ed.), 2016. arXiv:1609.02121.

[3] A. Gutfraind, L. A. Meyers, and I. Safro, "Multiscale Network Generation," in *FUSION 2015: IEEE International Conference on Information Fusion*, (Washington, DC), Jul 2015.

[4] 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.

[5] 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.

[6] 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.

[7] 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.

[8] 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.

[9] 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.

[10] 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.

[11] 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.

[12] 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.

**Submitted**

[1] A. Burns and A. Alexander Gutfraind, "Symptom-Based Isolation Policies: Evidence from a Mathematical Model of Outbreaks of Influenza and COVID-19," *medRxiv (in peer review)*, Mar 2020.

[2] E. Tatara, A. Gutfraind, N. T. Collier, S. J. Cotler, M. Major, B. Boodram, J. Ozik, and H. Dahari, "Agent-based modeling of persons who inject drugs in metropolitan chicago suggests that re-treatment with antivirals of persons who are re-infected with hep c is critical to achieve the who incidence reduction objective by 2030," *bioRxiv*, p. 653196, 2019.

[3] J. M. Maisog, W. Li, Y. Xu, B. Hurley, H. Shah, R. Lemberg, T. Borden, S. Bandeian, M. Schline, R. Cross, *et al.*, "Using massive health insurance claims data to predict very high-cost claimants: a machine learning approach," *arXiv preprint arXiv:1912.13032*, 2019.

**Technical Reports**

Total: 10 (through 2020)

**Talks and Posters**

[1] "What models can and cannot say about infectious diseases," June 2020. Invited briefing to the Indiana National Guard Reserve Medical Regimen.

[2] "Realizing ROI from AI projects," Sept 2019. Panelist at DataRobot AI summit, Miami, FL.

[3] "Saving Patient Ryan 2.0: machine learning-driven identification, prediction and prevention of high cost patients," Nov 2018. Plenary talk at the Ai4 Healthcare Conference, New York, NY.

[4] "Cloud-based spatial data analytics with R/Shiny," May 2017. Invited plenary at the Data Science Association conference, University of Chicago, Chicago, Illinois.

[5] M. Major, A. Gutfraind, Q. Cui, L. Shekhtman, A. Kachko, S. J. Cotler, B. Hajarizadeh, R. Sacks-Davis, K. Page, B. Boodram, and H. Dahari, "Modeling reveals the role of hepatitis c titer in transmission risk through syringe sharing: implications for viral elimination via vaccination (oral talk)," April 2017. 20th Annual Conference on Vaccine Research, Bethesda, MD.

[6] "NoSQL databases and covert social networks," March 2017. Talk at the ASA Chicago Chapter conference on Recent Advances in Machine Learning.

[7] S. K. Nutman, A. Gutfraind, E. Billig, R. Castillo-Neyra, M. Z. Levy, and the Zoonotic Disease Research Group in Arequipa Peru, "A bandit algorithm to optimize epidemiological surveillance," 2016. Poster at the Annual meetings of the American Society of Tropical Medicine and Hydiene.

[8] "Nowhere to hide - Analytics in Graphical Databases with Application to Covert Network Forensics," Aril 2017. Talk at the INFORMS Business Analytics conference, Orlando, FL.

[9] "Forecasting surges in the hospital emergency department," 2015. Poster - INFORMS Annual meeting, Philadelphia, PA.

[10] "An OR Emergency: The 2014 Ebola outbreak and transfusion therapy," May 2015. Colloquium at U of Wisconsin - Madison.

[11] A. Gutfraind, M. M. Carvalho-Cunha, B. Boodram, H. Dahari, and M. Major, "Comprehensive mapping of injecting drug users and their networks in the Chicago metropolitan area," 2014. Refereed poster at the Health Systems Optimization Workshop, Chicago, IL.

[12] D. Echevarria, A. Gutfraind, B. Boodram, M. Major, S. J. Cotler, and H. Dahari, "Modeling treatment scale up effect on Hepatitis C prevalence among persons who inject drugs in metropolitan Chicago," 2014. Refereed abstract at the 65th Annual meeting of the American Association for the Study of Liver Diseases. Boston MS, USA: Nov 7 11, 2014; Hepatology 2014; 60:4(Suppl): 671A-672A.

[13] "Epidemics of Hepatitis C among drug injectors - the role of network dynamics," Nov 2014. Invited talk at the INFORMS Annual Meeting, San Francisco, CA.

[14] "Multigrid approach for modeling networks," May 2014. Contributed talk to Graph Theory Workshop in honor for Derek Corneil, The Fields Institute, Toronto, ON.

[15] "Multiscale network generation and modeling," Nov 2013. Invited talk at Northwestern University, Evanston, IL.

[16] "Optimizing control of infectious diseases," Nov 2013. Invited talk at Clemson University, Clemson, SC.

[17] H. Dahari, S. D. Valle, S. Feinstone, A. Gutfraind, M. Major, S. M. Mniszewski, R. Novak, L. J. Ouellet, A. S. Perelson, and N. Prachand, "Integrating rich survey datasets in computational simulations of hepatitis C virus infection among injecting drug users in Chicago area," Oct 2013. Poster at the 10th International Conference on Health Policy Statistics (ICHPS), Chicago, IL.

[18] "Inferring the transmission tree during an outbreak investigation," Oct 2013. Invited talk at the INFORMS Annual Meeting, Minneapolis, MN.

[19] "Optimizing schedules for prophylaxis with antibodies," Oct 2013. Invited talk at the INFORMS Annual Meeting, Minneapolis, MN.

[20] "Generation of realistic networks by multi-scale perturbations," Oct 2013. Talk at the INFORMS Annual Meeting, Minneapolis, MN.

[21] "Winning Networks with MUSKETEER," Jul 2013. Full-meeting talk at the SIAM Workshop on Network Science, San Diego, CA.

[22] "Administering Antibodies for Seasonal Infections: a Dynamic Programming Approach," June 2013. Contributed talk at the INFORMS Healthcare Conference, Chicago, IL.

[23] A. Gutfraind, K. Patel, R. C. Christofferson, D. Wesson, A. Galvani, C. N. Mores, and L. A. Meyers, "Temporal correlations in mosquito vectors for West Nile Virus in St. Tammany Parish, LA," May 2013. Poster at the NIH MIDAS research network meeting, Austin, TX.

[24] "Mapping and Modeling Hidden Risk Networks," Apr 2013. Colloquium to the Division of Epidemiology and Public Health, University of Illinois at Chicago.

[25] "MUSKETEER: Multiscale Generator of Network Data," May 2013. Poster at the 11th Annual Ecology and Evolution of Infectious Disease Conference, College Station, Pennsylvania.

[26] "A proposal for simulating social networks," Feb 2013. Seminar at the Department of Computational Social Science, George Mason University, Fairfax, VA.

[27] "A multiscale method for graph generation," Feb 2013. Invited colloquium at the Dept. of Applied Mathematics, Illinois Institute of Technology, Chicago, IL.

[28] "Generating Realistic Infrastructure Networks With MUSKETEER," Jan 2013. Presentation at the INFORMS Computer Society Biannual conference, Santa Fe, NM.

[29] "Empirically-based Network Epidemiology with MUSKETEER," Oct 2012. Invited presentation to the Department of Health Studies, University of Chicago, Chicago, Illinois.

[30] "Mathematical optimization of antibody injections improves proteciton against seasonal RSV infections," Sept 2012. Presentation to the Division of Viral Products, Food and Drug Administration, Bethesda, Maryland.

[31] "Mathematical optimization of antibody injections improves protection against seasonal RSV infections," June 2012. Full-meeting talk at the NIH MIDAS research network meeting, Atlanta, Georgia.

[32] "Matching antibodies with seasonal RSV infections," May 2012. Poster at the 10th Annual Ecology and Evolution of Infectious Disease Conference, Ann Arbor, Michigan.

[33] "Multiscale Network Generation," Sept 2011. Invited talk at Argonne National Laboratory, Chicago, Illinois.

[34] "Solving Global and Tactical Security Problems on Networks," Sept 2011. Invited talk at Arizona State University, Tempe, Arizona.

[35] "Crime and Terror: Mathematical Exploration and Modeling of Dark Networks," November 2011. Invited colloquium at Applied Mathematics and the Waterloo Institute for Complexity and Innovation, Waterloo, Canada.

[36] "Minimizing collateral damage in network interdiction," Nov 2011. Invited talk at the INFORMS annual meeting, Charlotte, NC.

[37] "The neighbor aided network installation problem: Optimizing network deployment and recovery," Nov 2011. Invited talk at the INFORMS annual meeting, Charlotte, NC.

[38] "Network Science in National Security," Sept 2011. Invited talk at the Sandia National Laboratories, Livermore, California.

[39] "Scheduling the reconstruction of massively-damaged networks," August 2011. Contributed talk at Modeling and Optimization: Theory and Applications (MOPTA), Lehigh University.

[40] "Can we predict the winners of wars?," July 2011. Invited talk at the Santa Fe Institute, Santa Fe, NM.

[41] "Assessing home-grown terrorism using ABM and SNA," July 2011. Invited talk at Homeland Security Analysis Institute, Washington, DC.

[42] "Network interdiction methods for cybersecurity," July 2011. Seminar at the Institute for Systems Research (ISR), University of Maryland.

[43] "Propagation of epidemics on dynamically-adapting networks," May 2011. Contributed talk at SIAM Snowbird Conference on Applications of Dynamical Systems.

[44] "Transnational security cooperation," Jan 2011. Invited talk, Workshop on Mathematics for Counter Terrorism, University of Reading, UK.

[45] "Markovian Network Interdiction," Nov 2010. Invited talk at the University of California, Berkeley.

[46] "Global Network Interdiction and the Four Color Theorem," Oct 2010. Invited talk at the University of Waterloo, Ontario, Canada.

[47] "Who Is Next? Transnational Terrorism and Network Interdiction," Nov 2010. Contributed talk at the INFORMS annual meeting, Austin, TX.

[48] "The structure of cascade-resilient networks," Nov 2010. Invited talk at the INFORMS annual meeting, Austin, TX.

[49] "Tradeoffs in the structure of terrorist networks," Nov 2010. Invited talk at the INFORMS annual meeting, Austin, TX.

[50] "Dark networks and vital infrastructure," Aug 2010. Introductory talk at the Opening Workshop of SAMSI Program on Complex networks, Research Triangle Park, NC.

[51] "Markovian network interdiction and the four color theorem," June 2010. Contributed talk at SIAM Conference on Discrete Mathematics, Austin, TX.

[52] "Monotonicity of SIR Epidemics on Graphs," June 2010. Contributed talk at SIAM Conference on Discrete Mathematics, Austin, TX.

[53] "What can we learn from terrorists about network optimization?," May 2010. Contributed talk at NetSci 2010 conference.

[54] "What can we learn from terrorists about protecting complex networks?," April 2010. Presented at the National Center for Risk and Economic Analysis of Terrorism Events (CREATE) and at the Naval Postgraduate School (NPS).

[55] "Network interdiction: New models and algorithms," December 2009. Invited talk at the University of Tilburg, Netherlands.

[56] "Models of network interdiction," December 2009. Invited talk at the Netherlands Defense Academy.

[57] "Network Interdiction with a Markovian Adversary," Oct. 2009. Contributed talk at INFORMS Annual Meeting, San Diego, CA.

[58] "Mathematical terrorism," September 2009. Invited talk at Lawrence Berkeley National Laboratory.

[59] "Constructing networks for cascade resilience," July 2009. Poster - SIAM Annual meeting, Denver, CO.

[60] "Constructing networks for cascade resilience," June 2009. Talk at the International Workshop on Coping with Crises in Complex Socio-Economic Systems, Zurich.

[61] "Understanding Terrorist Organizations with a Dynamic Model," May 2009. Mini-symposium and introductory talk at SIAM Snowbird Conference on Applications of Dynamical Systems.

[62] "Resilient complex networks," April 2009. Talk at the Risk 2009 conference, Santa Fe, NM.

[63] "Understanding Terrorist Organizations with a Dynamic Model," Mar 2009. Invited talk at the 5th Conference on Mathematical Methods in Counterterrorism.

[64] "Network interdiction of Markovian evaders," 2008. Poster - DIMACS Workshop on Port Security, Piscataway, NJ.

[65] "Interdicting nuclear smuggling with imperfect information," Oct. 2008. Contributed talk at INFORMS Annual Meeting, Washington, DC.

[66] "Optimal interdiction of constrained Markovian evaders," 2008. Poster - SIAM Annual meeting, San Diego, CA.

[67] M. Genkin and A. Gutfraind, "How Do Terrorist Cells Self-Assemble? Insights from an Agent-Based Model," Dec. 2007. Invited talk at the Society for Risk Analysis Annual Conference.

[68] "A mathematical model of terrorist organizations," 2007. Invited Poster - DHS University Network Summit.

[69] A. Gutfraind and A. Kempf, "Reverse-engineering the genetic code using information theory." Poster and Workshop Presentation - Astrobiology and Origins of Life Conference, 2005.

### Major Grants

"NIH R01: Computational modeling of HCV vaccine clinical trials (revision requested)" (co-investigator)

"NIH R01: Computational discovery of effective hepatitis C intervention strategies" 2017 - 2021 US$2M grant (co-investigator US $90,000)

"Multiscale Methods for Generating Infrastructure Networks" 2017 - 2019 NSF grant US$200k (co-investigator)

"NIH U01: Dynamic data-driven decision models for infectious disease control" 2014 - 2019 grant (co-investigator US$80,000)

"NIH R01: Disrupting Vector-borne Disease Transmission in Complex Urban Environments" 2013 - 2017 US$3.1M grant (co-investigator US$123,000)

"Computational Epidemiology and Hepatitis C Virus Clinical Vaccine Trial Design" 2012 - 2014 US$211,000 FDA grant to M. Major PI (co-investigator US$180,000)

"Multiscale Models of HCV infection" 2012 - US$75,000 - University of Illinois seed R&D grant (co-investigator US$35,000)

"DTRA: Robust Network Interdiction Under Uncertainty" 2009 - US$1.09M (co-investigator US$180,000)

### Professional Service

Graduate Advisor: Mughundhan Chandrasekar (Loyola/UIC 2017), Sarah Nutman (U of Penn 2017), Narender Tankasala (Loyola/UIC 2016), Premnath Ramanathan (Loyola/UIC 2016), Jennifer Jesuraj (Loyola/UIC 2016), Rahul Pipalia (Loyola/UIC 2016), Edward Chien (Los Alamos 2010)

Undergraduate Adviser: Adam Burns (UIC 2019-2020), Anjani Maley (UIC 2020), Michael Gallagher (UIC 2018), Desarae Echevarria (Loyola 2015), 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)

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

National Science Foundation - Grant Review Panel (x2): Smart and Connected Health; Methodology, Measurement, and Statistics

Special reviewer: Princeton University Press

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: Colloquium Committee, Center for Nonlinear Studies, Los Alamos Nat Lab

Referee: American Control Conference, American Gastroenterological Association Digestive Disease Week 2014, Annals of Operations Research, American Political Science Review, BMC Infectious Diseases, Decision Analysis, Environment Systems and Decisions, European Physics Letters, European Journal of Operational Research, IEEE Conference on Decision and Control

Referee (cont.): IMA Journal of Management Mathematics, Intl J of Computer Mathematics, Intl J of Computational Science and Engineering, Intl J of Drug Policy, Journal of Mathematical Biology, Journal of the Operational Research Society, Journal of Physics A: Mathematical and Theoretical, Nature Scientific Reports, Naval Research Logistics, Operations Research, Operations Research Letters, Parasites & Vectors, Public Library of Science - ONE, Physics Letters A, Risk Analysis, SIAM Journal on Discrete Mathematics, Social Networks, Social Network Analysis and Mining

Technical Committee Member: Data Science and Advanced Analytics 2019, Knowledge Discovery and Data Minining (KDD) 2021, 2020, 2019 and 2018, International Conference on Computational Social Science (2017), Winter Simulation Conference 2015, SIAM Workshop on Network Science 2015, 2014 International Workshop on Data Mining and Decision Analytics for Public Health and Wellness (DMDA14). CompleNet 2018 CompleNet 2017 CompleNet 2016 CompleNet 2015 CompleNet 2014 CompleNet 2013 CompleNet 2012 (International workshop on complex networks).

Technical Committee Member (cont.): CCNet 2011 (IEEE GlobeCom workshop on complex communications networks), Simplex 2011 (a workshop of ICDCS 2011).

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

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

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

Organizer: *Dynamic Optimization of Clinical Treatments*
session at INFORMS Healthcare 2013 conference, Chicago, IL

Organizer: *Robust Simulation of Networks*
session at INFORMS Computing Society 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*
mini-symposium at SIAM DS2011, Snowbird, UT

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

### Other Service

Club President - Uptake Toastmasters (2016-2017)

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

# Alexander Gutfraind, Ph.D.

## Memberships

INFORMS - Institute for Operations Research and the Management Sciences

SIAM - Society for Industrial and Applied Mathematics (not active)

SRA - Society for Risk Analysis (not active)

Computational Social Science Society of the Americas (2013-2015)

## Technical Skills

Certified Analytics Professional, INFORMS (2015-Present)

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

Programming languages: Java, Python, R, C/C++, Matlab, Bash

Platforms: Windows, Linux, Mac OS X, Android

Technologies: XML, SQL, CYPHER

Languages: English, Hebrew, Russian, Patent writing (4 patents filled)

# Alexander Gutfraind, Ph.D.

## References

**Prof. Harel Dahari (Senior collaborator)**
Director, Program for experimental and theoretical modeling
Loyola University Medical Center
+1-708-216-4682
http://stritch.luc.edu/medicine/people/harel-dahari

**Prof. Marian Major (Postdoc advisor)**
Director, Laboratory of Hepatitis Viruses
Food and Drug Administration
Contact information available upon request

**Prof. Ilya Safro (Senior collaborator)**
Director, Algorithms and computational science lab
Department of Computer Science
Clemson University
+1-864-656-0637
www.cs.clemson.edu/~isafro/

**Prof. Lauren A. Meyers (Postdoc advisor)**
Director, Mathematical epidemiology and evolutionary biology lab
ex-Chair, Department of Statistics and Data Sciences
University of Texas at Austin
+1-512-232-1947
http://www.bio.utexas.edu/research/meyers/

**Prof. Achim Kempf (Master's thesis advisor)**
Director, Physics of information lab
Dept. of Applied Mathematics
University of Waterloo
Waterloo, Ontario, Canada N2L3G1
+1-519-888-4567 x35462
http://www.math.uwaterloo.ca/~akempf/contact.shtml

**Prof. Richard T. Durrett (PhD thesis advisor)**
Dept. of Mathematics
Cornell University (moved to Duke)
+1-919-660-2800
http://www.math.duke.edu/~rtd/

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