

## Aaron Clauset

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CONTACT INFORMATION	Department of Computer Science University of Colorado at Boulder 430 UCB Boulder CO, 80309-0430 USA	<i>voice:</i> 303-492-6643 <i>fax:</i> 303-492-2844 <i>email:</i> aaron.clauset@colorado.edu <i>web:</i> www.santafe.edu/~aaronc
RESEARCH INTERESTS	Data science, machine learning, simulations; Collective dynamics and complex systems; Complex networks (social, biological, technological); Rare events, power laws and forecasting; Computational social science; Computational biology and biological computation.	
EDUCATION	Ph.D. Computer Science with distinction, University of New Mexico (2002–2006) <ul style="list-style-type: none"><li>• Dissertation: “Structural Inference and the Statistics of Networks”</li><li>• Committee: C. Moore (chair), M. E. J. Newman, S. Forrest, and J. Saia</li></ul> B.S. Physics and Computer Science with honors, Haverford College (1997–2001)	
ACADEMIC POSITIONS	Assistant Professor, Computer Science, <i>University of Colorado</i> , Boulder CO Assistant Professor, Biofrontiers Institute, <i>University of Colorado</i> , Boulder CO Affiliated Faculty, Ecology & Evolutionary Biology, <i>University of Colorado</i> Affiliated Faculty, Applied Mathematics, <i>University of Colorado</i> Omidyar Fellow, <i>Santa Fe Institute</i> , Santa Fe NM Research Assistant, <i>University of New Mexico</i> , Albuquerque NM Research Fellow, <i>University of Pennsylvania</i> , Philadelphia PA	2010 – present 2010 – present 2011 – present 2012 – present 2006 – 2010 2003 – 2006 2000 – 2001
INDUSTRY POSITIONS	Scientific & Technical Consultant, <i>Institute for Defense Analysis</i> , Alexandria VA Corporate Advisory Board, <i>33across LLC</i> , New York NY Scientific & Technical Consultant, <i>33across LLC</i> , New York NY Strategy & Management Consultant, <i>FischerJordan LLC</i> , New York NY Research Consultant, <i>Argonne National Laboratory</i> , Argonne IL Project Scientist, <i>Targacept Inc.</i> , Winston-Salem NC	2010 – present 2008 – present 2007 – present 2005 2005 2001 – 2002
JOURNAL ARTICLES	<b>A. Clauset</b> and R. Woodard, “Estimating the historical and future probabilities of large terrorist events.” Submitted to <i>Annals of Applied Statistics</i> (2012).  <b>A. Clauset</b> and K. S. Gleditsch, “The developmental dynamics of terrorist organizations.” Submitted to <i>American Journal of Political Science</i> (2012). (Preprint, <a href="#">arxiv:0906.3287</a> )  B. H. Good*, Y.-A. de Montjoye and <b>A. Clauset</b> , “The performance of modularity maximization in practical contexts.” <i>Physical Review E</i> <b>81</b> , 046106 (2010). (Preprint at <a href="#">arxiv:0910.0165</a> )  <b>A. Clauset</b> , L. Heger, M. Young and K. S. Gleditsch, “The Strategic Calculus of Terrorism: Substitution and Competition in the Israel-Palestine Conflict.” <i>Cooperation &amp; Conflict</i> <b>46</b> (1), 6–33 (2010).  <b>A. Clauset</b> and F. W. Wiegel, “A generalized aggregation-disintegration model for the frequency of severe terrorist attacks.” <i>Journal of Conflict Resolution</i> <b>54</b> (1), 179-197 (2010). (Preprint at <a href="#">arxiv:0902.0724</a> )  <b>A. Clauset</b> , C. R. Shalizi and M. E. J. Newman, “Power-law distributions in empirical data.” <i>SIAM Review</i> <b>51</b> (4), 661–703 (2009). (Preprint at <a href="#">arxiv:0706.1062</a> )  D. Achlioptas, <b>A. Clauset</b> , D. Kempe and C. Moore, “On the Bias of Traceroute Sampling: Or, Power-law Degree Distributions in Regular Graphs.” <i>Journal of the ACM</i> <b>56</b> (4), article 21,	

28 pages (2009). (Preprint at [arxiv:cond-mat/0503087](https://arxiv.org/abs/cond-mat/0503087))

**A. Clauset** and S. Redner, “Evolutionary Model of Species Body Mass Diversification.” *Physical Review Letters* **102**, 038103 (2009). (Preprint at [arxiv:0808.4014](https://arxiv.org/abs/0808.4014))

**A. Clauset**, D. J. Schwab and S. Redner, “How many species have mass  $M$ ?” *American Naturalist* **173**, 256–263 (2009). (Preprint at [arxiv:0808.3433](https://arxiv.org/abs/0808.3433))

**A. Clauset**, H. G. Tanner, C. T. Abdallah and R. H. Byrne, “Controlling across complex networks – Emerging links between networks and control.” *Annual Reviews in Control* **32**, 183–192 (2008).

**A. Clauset** and D. H. Erwin, “The evolution and distribution of species body size.” *Science* **321**, 399–401 (2008). (Preprint at [arxiv:0901.0251](https://arxiv.org/abs/0901.0251))

**A. Clauset**, C. Moore and M. E. J. Newman, “Hierarchical structure and the prediction of missing links in networks.” *Nature* **453**, 98–101 (2008). (Preprint at [arxiv:0811.0484](https://arxiv.org/abs/0811.0484))

**A. Clauset**, M. Young and K. S. Gleditsch, “On the Frequency of Severe Terrorist Attacks.” *Journal of Conflict Resolution* **51**(1): 58–88 (2007). (Preprint at [arxiv:physics/0606007](https://arxiv.org/abs/physics/0606007))

V. Kalapala, V. Sanwalani, **A. Clauset** and C. Moore, “Scale Invariance in Road Networks.” *Physical Review E* **73** 026130 (2006). (Preprint at [arxiv:physics/0510198](https://arxiv.org/abs/physics/0510198))

J. T. Ayers, **A. Clauset**, J. D. Schmitt, L. P. Dwoskin and P. A. Crooks, “Molecular modeling of mono- and bis-quaternary ammonium salts as ligands at the  $\alpha 4\beta 2$  nicotinic acetylcholine receptor subtype using nonlinear techniques.” *American Association of Pharmaceutical Scientists Journal* **7**(3): E678–85 (2005).

Y. D. Xiao, **A. Clauset**, R. Harris, E. Bayram, P. Santiago II, and J. D. Schmitt, “Supervised Self-Organizing Maps in QSAR I: Robust behavior with underdetermined datasets.” *Journal of Chemical Information and Modeling* **46**(6): 1679 – 1758 (2005).

**A. Clauset**, “Finding local community structure in networks.” *Physical Review E* **72**, 026132 (2005). (Preprint at [arxiv:physics/0503036](https://arxiv.org/abs/physics/0503036))

**A. Clauset** and C. Moore, “Accuracy and Scaling Phenomena in Internet Mapping.” *Physical Review Letters* **94** 018701 (2005). (Preprint at [arxiv:cond-mat/0410059](https://arxiv.org/abs/cond-mat/0410059))

**A. Clauset**, M. E. J. Newman and C. Moore, “Finding community structure in very large networks.” *Physical Review E* **70**, 066111 (2004). (Preprint at [arxiv:cond-mat/0408187](https://arxiv.org/abs/cond-mat/0408187))

E. Bayram, P. Santiago II, R. Harris, Y. D. Xiao, **A. Clauset** and J. D. Schmitt, “Genetic Algorithms and Self-Organizing Maps: A Powerful Combination for Modeling Complex QSAR and QSPR Problems.” *Journal of Computer-Aided Molecular Design* **18** (7-9): 483-493 (2004).

CONFERENCE  
PROCEEDINGS  
(REFEREED)

W. Mason and **A. Clauset**, “Friends FTW! Friendship and competition on *Halo: Reach*.” Submitted to *Knowledge Discovery & Data Mining* (KDD 2012).

N. Eagle, **A. Clauset** and J. Quinn, “Location Segmentation, Inference and Prediction for Anticipatory Computing.” *Proc. 23rd AAAI Conference on Artificial Intelligence* (AAAI 2009).

N. Eagle, J. Quinn and **A. Clauset**, “Methodologies for Continuous Cellular Tower Data Analysis.” *Proc. 7th International Conference on Pervasive Computing* (Pervasive 2009), 342–353.

**A. Clauset** and N. Eagle. “Persistence and periodicity in a dynamic proximity network.” DIMACS Workshop on Computational Methods for Dynamic Interaction Networks (Piscataway), 2007.

**A. Clauset**, C. Moore and M. E. J. Newman, “Structural Inference of Hierarchies in Networks.” *Proc. Workshop on Statistical Network Analysis, 23rd International Conference on Machine Learning (ICML '06)*. E. M. Airoldi et al., Eds., *Lecture Notes in Computer Science* **4503**, 1–13.

D. Achlioptas, **A. Clauset**, D. Kempe and C. Moore, “On the bias of traceroute sampling (or: Why almost every network looks like it has a power law).” *ACM Proc. 37th Symp. on Theory of Computing (STOC 2005)*, 694–703.

OTHER  
PUBLICATIONS

S. Merritt and **A. Clauset**, “Cumulative advantage and the dynamics of team competition.” Working paper (2012).

C. R. Shalizi, A. Z. Jacobs\*, K. L. Klinkner and **A. Clauset**, “Adapting to Non-stationarity with Growing Expert Ensembles.” Preprint, [arxiv:1103.0949](https://arxiv.org/abs/1103.0949) (2011).

**A. Clauset**, M. Young and K. S. Gleditsch, “A Novel Explanation of the Power-Law Form of the Frequency of Severe Terrorist Events: Reply to Saperstein.” *Peace Economics, Peace Science and Public Policy* **16**(1), Article 12 (2010).

**A. Clauset**, “Story-telling, Statistics, And Other Grave Scientific Insults.” *Nature Soapbox Science Blog* (posted 27 October 2010). <http://tinyurl.com/2gx7z51>

**A. Clauset**, “A theoretician ponders what physics has to offer ecology.” *Nature* **465**, 139 (2010).

N. Eagle, **A. Clauset**, A. Pentland and D. Lazer, “Multi-dimensional Edge Inference: Response to Comment by Dr. Adams.” *Proc. of the National Academy of Science USA* **107**(9), E31 (2010).

**A. Clauset** and C. Moore, “How Do Networks Become Navigable?” Preprint, [arxiv:cond-mat/0309415](https://arxiv.org/abs/cond-mat/0309415) (2003).

\* indicates an undergraduate coauthor

GRANTS  
(PI OR CO-PI)

“Statistical Inference for Detecting Structures and Anomalies in Networks.”  
PI, with Cris Moore (New Mexico and SFI) and Mark Newman (Michigan)  
DARPA; \$2,924,396; 2012 – 2015

“Measuring the structure of research university networks.”  
PI  
Kauffman Foundation; \$33,000; 2012 – 2012

“Statistical Inference and Machine Learning for Complex Networks.”  
Co-PI, with Cris Moore (New Mexico and SFI) and Mark Newman (Michigan)  
McDonnell Foundation; \$417,576; 2008 – 2012

INVITED TALKS  
(RECENT)

- “Machine Learning, Statistical Inference and Neuroscience” workshop, HHMI / Janelia Farm Research Campus, Chevy Chase MD, 6–9 May 2012
- Physics of Socio-Economic Systems Division, “Focus Session on Models of War, Conflicts and Revolutions,” German Physics Society Spring Meeting, Berlin Germany, 25–30 March 2012
- SomaLogic, Inc., Boulder CO, 2 February 2012
- “A Complexity Event,” United States Agency for International Development (USAID), Washington DC, 12 October 2011

- Northwestern Institute on Complex Systems Seminar Series, Evanston IL, 5 October 2011
- Computer Science Seminar, Sandia Nat. Lab., Sandia CA, 14 September 2011
- International Workshop on Coping with Crises in Complex Socio-Economic Systems, ETH, Zürich Switzerland, 20–25 June 2011
- Arizona State University School of Human Evolution and Social Change Colloquium, Tempe AZ, 28 April 2011
- “Evidence-based Research on Conflict and Policy” Panel, International Studies Association (ISA) Annual Meeting, Montreal Canada, 18 March 2011
- Applications of Network Theory Conference, Nordic Institute for Theoretical Physics, Stockholm Sweden, 7–9 April 2011
- “Frontiers of Data Analysis: Foreign Policy as a Complex System” Working Group, Santa Fe Institute, Santa Fe NM, 23–25 February 2011
- Workshop on Networks Across Disciplines: Theory and Applications, NIPS 2010, Whistler Canada, 10 December 2010
- Robustness of Complex Networks Workshop, Delft University of Technology, The Netherlands, 15–16 November 2010
- Evolutionary Modeling Seminar Series, Washington State U., Pullman WA, 4 November 2010
- SAMSI Program on Complex Networks, U. North Carolina, Chapel Hill NC, 1 September 2010
- Research and Analysis of Tail Phenom. Symp., Yahoo! Research, San Francisco, 20 August 2010
- Seeing Conflict In A New Light, joint SFI and New America Foundation (NAF) Workshop, Washington DC, 19 May 2010
- Center for Nonlinear Dynamics, Los Alamos National Lab., Los Alamos NM, 27 April 2010

SEMINARS  
(RECENT)

- Applied Mathematics Dept. Colloquium, Boulder CO, 30 September 2011
- Institute of Cognitive Science Colloquium, University of Colorado, Boulder CO, 4 March 2011
- Ecology and Evo. Biology Dept. Seminar, University of Colorado, Boulder CO, 9 February 2011
- Computer Science Dept. Colloquium, University of Colorado, Boulder CO, 27 January 2011

HONORS &  
AWARDS  
(SELECTED)

Santa Fe Institute Public Lecture Series ( <a href="http://bit.ly/I6t9gf">http://bit.ly/I6t9gf</a> )	2010
Boulder School for Condensed Matter and Material Physics	2007
Graduation Speaker, U. New Mexico School of Engineering Convocation	2006
Outstanding Graduate Student Award, U. New Mexico School of Engineering	2006
Santa Fe Institute Complex Systems Summer School (CSSS)	2003

TEACHING &  
ADVISING

**Doctoral Students**

• Nora Connor (PhD, Computer Science and IQBiology, Colorado)	current
• Nicole Beckage (PhD, Psychology, Colorado; co-advised, Prof. Colunga)	current
• Nicholas Dronen (PhD, Computer Science, Colorado)	current
• Abigail Jacobs (PhD, Computer Science, Colorado)	current
• Sears Merritt (PhD, Computer Science, Colorado)	current
• Lauren Shoemaker (PhD, Eco. & Evol. Biology, Colorado; co-advised, Prof. Melbourne)	current
• Yogesh Virkar (PhD, Computer Science, Colorado)	current

**Masters Students**

• Yogesh Virkar (MS, Computer Science, Colorado)	2011 – 2012
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**Undergraduate Students**

• Christopher Aicher (BS Applied Math., Colorado; research assistant)	2011–2012
• Kenneth Sheedlo (BS Comp. Sci., Colorado; Discovery Learning Apprentice)	2011–2012
• Andrew Zizzi (BS Aerospace, Colorado; Discovery Learning Apprentice)	2011–2012
• Kristen Hargett (BS Applied Math., Colorado; research assistant)	2011
• Zachary Newman (BS Math., Colorado; McNair Scholar & UROP)	Summer 2011
• Abigail Jacobs (BS Math., Northwestern; REU)	Summer 2010

- Amy Wesolowski (BS Math., C.o. Atlantic; REU; now pursuing PhD at CMU) Summer 2010
- Andrew Mauboussin (High school fellow at SFI) Summer 2009
- Benjamin Good (BS Physics, Swarthmore; REU; now pursuing PhD at Harvard) 2008–2010

#### University Courses (\* indicates a new course)

- Colorado CSCI 5454 Spring 2011, 2012, 2013  
Design and Analysis of Algorithms
- Colorado CSCI 7000\* Fall 2010, 2011, 2013  
Inference, Models and Simulation for Complex Systems

#### Summer Schools

- Faculty, Santa Fe Institute Short Course on Exploring Complexity, Washington DC 2012
- Faculty, Santa Fe Institute Short Course on Exploring Complexity, Albuquerque NM 2011
- Faculty, Santa Fe Institute Research Workshop on Frontiers in Complex Systems, Beijing 2009
- Faculty, Santa Fe Institute Complex Systems Summer School, Beijing 2008
- Faculty, Santa Fe Institute Complex Systems Summer School, Santa Fe 2007–2008

EDITORIAL WORK • *Journal of Complex Networks* (Associate Editor) 2012 –

#### REFeree WORK

- **Applied Math and Statistics:** Annals of Applied Statistics, SIAM ICDM Workshop on Analysis of Dynamic Networks (2009), Statistical Analysis and Data Mining
- **Biology:** Bioinformatics, BMC Bioinformatics, Evolutionary Biology, Global Ecology and Biogeography, IET Systems Biology, Journal of Animal Ecology, Journal of Theoretical Biology, Marine Ecology Progress Series, PLoS Biology, PLoS Computational Biology, Trends in Ecology & Evolution
- **Computer Science:** Computer Science Reviews (CSR), Foundations and Trends in Machine Learning, IEEE GLOBECOM (2010), IEEE International Conference on Robotics and Automation (2006), ACM Journal of Experimental Algorithmics (JEA), Journal of Statistical Analysis and Data Mining, ACM Trans. on Knowledge Discovery from Data (TKDD), IEEE Trans. on Knowledge and Data Engineering (TKDE), ACM Trans. on the Web (TWEB), RANDOM (2007), SIMPLEX (2010), SODA (2006, 2007), SDM Workshop on Analysis of Dynamic Networks (2009), NIPS Workshop on Analyzing Graphs (2008), Workshop on Experimental Algorithms (2006), ACM SIGKDD Workshop on Social Network Mining and Analysis (2008, 2009), WSDM (2010), WWW (2010–2012)
- **General:** Nature, Nature Methods, PLoS ONE, PNAS, Science
- **Physics:** European Physical Journal B, Europhysics Letters, Journal of Statistical Mechanics, New Journal of Physics, Physica A, Physical Review E, Physical Review Letters
- **Political Science:** American Journal of Political Science, British Journal of Political Science, Defense & Peace Economics, Journal of Conflict Resolution, Journal of Peace Research
- **Others:** Advances in Complex Systems, Computational Linguistics, Journal of Chemical Information and Modeling, Networks and Spatial Economics

#### PROFESSIONAL SERVICE

##### Workshops

- *The Mathematics of Terrorism*  
Joint with MITRE, Santa Fe NM, Aug. 31–Sept. 2, 2009. Organized with B. Tivnan (MITRE).
- *Statistical Inference for Complex Networks*  
Santa Fe NM, Dec. 3–5 2008. Organized with C. Moore (New Mexico, SFI).
- *Navigability and Complex Networks*  
Joint with UCSD's Cooperative Association for Internet Data Analysis (CAIDA), Santa Fe NM, Aug. 4–6, 2008. Organized with D. Krioukov (UCSD) and kc claffy (UCSD).
- *Is There a Physics of Society?*  
Santa Fe NM, Jan. 10–12, 2008. Organized with M. Girvan (Maryland).

## Conferences

- 2<sup>nd</sup> Computer Science at UNM Student Research Conference, Conference Chair, Albuquerque NM, March 3, 2006.
- 1<sup>st</sup> Computer Science at UNM Student Research Conference, Conference Chair, Albuquerque NM, March 4, 2005.

## Program Committees

- World Wide Web Conference (WWW) 2012, Lyon, France, 16–20 April 2012.
- World Wide Web Conference (WWW) 2011, Hyderabad, India, 28 March–1 April 2011.
- CompleNet 2010, Rio de Janeiro Brazil, 13–15 October 2010.
- SIMPLEX 2010, Genoa Italy, 21 June 2010.
- World Wide Web Conference (WWW) 2010, Raleigh NC, 21 April 2010.
- 3<sup>rd</sup> ACM International Conference on Web Search and Data Mining (WSDM) 2010, New York NY, 4–6 February 2010.
- 3<sup>rd</sup> Workshop on Social Network Mining and Analysis (part of ACM SIGKDD 2009), Paris France, 28 June–1 July 2009
- CompleNet 2009, Catania Italy, 12–13 May 2009.
- Workshop on Analysis of Dynamic Networks (part of SIAM International Conf. on Data Mining), Sparks, Nevada, 30 April–2 May 2009.
- Workshop on Analyzing Graphs: Theory and Applications (part of NIPS 2008), Whistler, Canada, 12 December 2008.
- 2<sup>nd</sup> Workshop on Social Network Mining and Analysis (part of ACM SIGKDD 2008), Las Vegas NV, 24–27 August 2008
- 5<sup>th</sup> International Workshop on Experimental Algorithms, Menorca Spain, 24–27 May 2006

## Institutional Committees

- Colorado, Integrated Quantitative Biology (IQBio) Mentoring Committee 2011 – present
- Colorado, Colorado Biofrontiers Institute, Task Force 2010 – present
- Colorado, Computer Science Graduate Committee 2010 – present
- Santa Fe Institute, Colloquium Committee 2007 – 2009
- UNM Computer Science Faculty Search Committee 2005 – 2006

## Professional Society Positions

- President, UNM Computer Science Grad. Student Assoc. (CSGSA) 2004 – 2005
- Vice President, UNM Computer Science Grad. Student Assoc. (CSGSA) 2003 – 2004

## Professional Societies

American Physical Society (APS), Association of Computing Machinery (ACM), Ecological Society of America (ESA), Geological Society of America (GSA), Midwest Political Science Association (MPSA), Peace Science Society (PSS), American Society of Naturalists (ASN), Society for Industrial and Applied Mathematics (SIAM)

## SYNERGISTIC ACTIVITIES

- Science blogger at *Structure+Strangeness* 2005 – present
  - <http://structureandstrangeness.com/>
  - 340 entries and >500,000 page hits (January 2005 – December 2011)
- Wikipedia contributor (various science and mathematics articles) 2006 – present
- Public release (open source; typically GPL) of working algorithms 2004 – present
  - Rare event forecasting tool kit (2012)
  - Terrorist organization simulation code (2011)
  - Modularity landscape mapping software package (2010)
  - Hierarchical random graph and missing-link prediction software package (2008)
  - Species mass macroevolution simulation code (2008)
  - Power-law distributions tool kit (2007)
  - Local-modularity network clustering algorithm (2005)

– Fast-modularity network clustering algorithm (2004)