Samantha Kleinberg

Assistant Professor
Stevens Institute of Technology
Computer Science

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Research Interests

The common theme in my research is the study of systems with a temporal component. I am interested in the development of algorithms for understanding how complex systems function, and the application of these methods to challenging biomedical datasets.

Education

New York University

Ph.D. Computer Science — May 2010

- Dissertation: "An Algorithmic Enquiry Concerning Causality"
- Committee: Prof. Bud Mishra (advisor), Profs. Ernest Davis, Petter Kolm, Rohit Parikh, and Michael Strevens

M.S. Computer Science — May 2008

B.A. Computer Science and Physics — January 2006

Employment and Research Experience

Stevens Institute of Technology
Assistant Professor, Computer Science — September 2012 - present

Columbia University, Department of Biomedical Informatics
Postdoctoral Research Scientist — September 2010 - August 2012
Mentored by Prof. George Hripcsak and supported by an NSF/CRA Computing Innovation Fellowship (CIFellow).

New York University
Postdoctoral Research Scientist — Summer 2010
Research Assistant, Bioinformatics group — Fall 2006-Spring 2010
Internship, working with Marco Antoniotti — Spring 2005-Summer 2006

Mount Sinai School of Medicine
Internship with Craig Benham, Biomathematics Department — Fall 2000-Spring 2001

Publications

Books

[1] S. Kleinberg. *Why: A Guide to Finding and Using Causes*. O'Reilly Media, 2015.

[2] S. Kleinberg. *Causality, Probability, and Time*. Cambridge University Press, 2012.

Journal articles

[3] N. Heintzman and S. Kleinberg. Using Uncertain Data from Body-Worn Sensors to Gain Insight into Type 1 Diabetes. *Journal of Biomedical Informatics*, 63:259–268, 2016.

[4] J. Claassen, S. A. Rahman, Y. Huang, H. P. Frey, M. Schmidt, D. Albers, C. M. Falo, S. Park, S. Agarwal, E. S. Connolly, and S. Kleinberg. Causal Structure of Brain Physiology after Brain Injury from Subarachnoid Hemorrhage. *PLoS ONE*, 11(4):1–18, 2016.

[5] S. A. Rahman, Y. Huang, J. Claassen, N. Heintzman, and S. Kleinberg. Combining Fourier and Lagged k-Nearest Neighbor Imputation for Biomedical Time Series Data. *Journal of Biomedical Informatics*, 58:198–207, 2015.

[6] J. Claassen, A. Perotte, D. Albers, S. Kleinberg, J. M. Schmidt, B. Tu, N. Badjatia, H. Lantigua, L. J. Hirsch, S. A. Mayer, E. S. Connolly, and G. Hripcsak. Nonconvulsive seizures after subarachnoid hemorrhage: Multimodal detection and outcomes. *Annals of Neurology*, 74:53–64, 2013.

[7] S. Kleinberg and G. Hripcsak. A review of causal inference for biomedical informatics. *Journal of Biomedical Informatics*, 44(6):1102 – 1112, 2011.

[8] A. Mitrofanova, S. Kleinberg, J. Carlton, S. Kasif, and B. Mishra. Predicting Malaria Interactome Classifications from Time-Course Transcriptomic Data along the Intra-Erythrocytic Developmental Cycle. *Artificial Intelligence in Medicine*, 49(3):167–176, 2010. Originally appeared as [21].

[9] S. Kleinberg and B. Mishra. Metamorphosis: the Coming Transformation of Translational Systems Biology. *Queue*, 7(9):40–52, 2009.

[10] S. Kleinberg, K. Casey, and B. Mishra. Systems Biology via Redescription and Ontologies (I): Finding Phase Changes With Applications to Malaria Temporal Data. *Systems and Synthetic Biology*, 1(4):197–205, December 2007. Originally appeared as [23].

Refereed conference papers

[11] M. Mirtchouk, C. Merck, and S. Kleinberg. Automated Estimation of Food Type and Amount Consumed from Body-worn Audio and Motion Sensors. In *UbiComp*, 2016. **Best Paper Honorable Mention**.

[12] C. Merck, C. Maher, M. Mirtchouk, M. Zheng, Y. Huang, and S. Kleinberg. Multimodality Sensing for Eating Recognition. In *Pervasive Health*, 2016.

[13] C. Merck and S. Kleinberg. Causal Explanation under Indeterminism: A Sampling Approach. In *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI)*, 2016.

[14] S. A. Rahman, C. Merck, Y. Huang, and S. Kleinberg. Unintrusive Eating Recognition using Google Glass. In *Pervasive Health*, 2015.

[15] Y. Huang and S. Kleinberg. Fast and Accurate Causal Inference from Time Series Data. In *Proceedings of the 28th annual FLAIRS conference (FLAIRS)*, 2015.

[16] S. Kleinberg and N. Elhadad. Lessons Learned in Replicating Data-Driven Experiments in Multiple Medical Systems and Patient Populations. In *AMIA Annual Symposium Proceedings*, 2013.

[17] S. Kleinberg. Causal Inference with Rare Events in Large-Scale Time-Series Data. In *Proceedings of the 23rd International Joint Conference on Artificial Intelligence (IJCAI)*, 2013.

[18] S. Kleinberg. A Logic for Causal Inference in Time Series with Discrete and Continuous Variables. In *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI)*, 2011.

[19] S. Kleinberg and B. Mishra. The Temporal Logic of Token Causes. In *Proceedings of the 12th International Conference on the Principles of Knowledge Representation and Reasoning (KR)*, 2010.

[20] S. Kleinberg and B. Mishra. The Temporal Logic of Causal Structures. In *Proceedings of the 25th Conference on Uncertainty in Artificial Intelligence (UAI)*, 2009.

[21] A. Mitrofanova, S. Kleinberg, J. Carlton, S. Kasif, and B. Mishra. Systems Biology via Redescription and Ontologies (III): Protein Classification using Malaria Parasite's Temporal Transcriptomic Profiles. In *IEEE International Conference on Bioinformatics & Biomedicine (BIBM)*, 2008.

[22] S. Kleinberg, M. Antoniotti, S. Tadepalli, N. Ramakrishnan, and B. Mishra. Systems Biology via Redescription and Ontologies(II): A Tool for Discovery in Complex Systems. In *Unifying Themes in Complex Systems*, volume VI: Proceedings of the Sixth International Conference on Complex Systems. Springer-Verlag/NECSI, 2008. Significantly revised version of [24].

[23] S. Kleinberg, K. Casey, and B. Mishra. Systems Biology via Redescription and Ontologies: Untangling the Malaria Parasite Life Cycle. In *Life Systems Modeling and Simulation (LSMS)*, 2007.

[24] S. Kleinberg, M. Antoniotti, S. Tadepalli, N. Ramakrishnan, and B. Mishra. Remembrance of Experiments Past: A Redescription Based Tool for Discovery in Complex Systems. In *International Conference on Complex Systems (ICCS)*, 2006.

Refereed workshop papers

[25] S. A. Rahman, Y. Huang, J. Claassen, and S. Kleinberg. Imputation of Missing Values in Time Series with Lagged Correlations. In *IEEE ICDM Workshop on Data Mining in Biomedical Informatics and Healthcare*, 2014.

Chapters in refereed volumes

[26] S. Kleinberg and B. Mishra. Multiple Testing of Causal Hypotheses. In P. M. Illari, F. Russo, and J. Williamson, editors, *Causality in the Sciences*. Oxford University Press, 2011.

Technical reports

[27] S. Kleinberg, P. Kolm, and B. Mishra. Investigating Causal Relationships in Stock Returns with Temporal Logic Based Methods. http://arxiv.org/abs/1006.1791, 2010.

[28] S. Kleinberg, M. Antoniotti, N. Ramakrishnan, and B. Mishra. Modal Logic, Temporal Models and Neural Circuits: What Connects Them. Technical Report TR2007-907, New York University, 2007.

Abstracts and Posters

[29] S. Kleinberg. What Causes a Causal Relationship? Causality in the Sciences of Mind and Brain, 2016.

[30] S. Kleinberg, C. Merck, C. Maher, M. Mirtchouk, M. Zheng, and Y. Huang. Combining Audio and Motion Sensors for Automated Dietary Monitoring. International Conference on Advanced Technologies & Treatments for Diabetes (ATTD), 2016.

[31] S. Kleinberg, C. Merck, S. A. Rahman, and Y. Huang. Real-Time Eating Recognition Using Google Glass to Improve Closed-Loop Glucose Control. International Conference on Advanced Technologies & Treatments for Diabetes (ATTD), 2015.

[32] S. Kleinberg. Replication and the Need for Simulated Data. Philosophy of Science Association Biennial Meeting, Symposium on Heterogeneity in Medicine and Psychiatry, 2014.

[33] S. Kleinberg and N. Heintzman. Causal Inference with Uncertainty Identifies Features of Intense Physical Activity as Significant Predictors of Hyperglycemia in Type 1 Diabetes. International Conference on Advanced Technologies & Treatments for Diabetes (ATTD), 2014.

[34] D. Hutchison and S. Kleinberg. Causal Inference under Uncertainty via Adjustments and SOPDs. Causality and Experimentation in the Sciences, 2013.

[35] S. Kleinberg. Quantifying the Impact of Rare Causes. Evidence and Causality in the Sciences, 2012.

[36] S. Kleinberg and G. Hripcsak. Automated Temporal Causal Inference from EHR Data. AMIA Summit on Translational Bioinformatics, 2012. (Podium abstract).

[37] D. Albers, J. Claassen, A. Perotte, S. Kleinberg, and G. Hripcsak. Using NICU Data to understand Physiology and Identify Damage in Patients with Acute Brain Injury. AMIA Summit on Translational Bioinformatics, 2012.

[38] S. Kleinberg. Temporal Token Causal Explanation. Causality and Explanation in the Sciences, 2011.

[39] S. Kleinberg and G. Hripcsak. Understanding variable representation for causal inference in EHRs. AMIA Summit on Translational Bioinformatics, 2011.

[40] S. Kleinberg. A causal understanding of electronic health records. Causality in the Biomedical and Social Sciences, 2010.

[41] S. Kleinberg and B. Mishra. Multiple Testing of Causal Hypotheses. CAPITS Causality Study Fortnight, 2008.

[42] S. Kleinberg and B. Mishra. Psst: a web-based system for tracking political statements. In *WWW '08: Proceeding of the 17th international conference on World Wide Web*, pages 1143–1144, 2008.

[43] S. Kleinberg, K. Casey, and B. Mishra. Logic in the Time of Malaria: Segmenting Time Course Data to Understand the Plasmodium Falciparum Life Cycle. Asia Pacific Bioinformatics Conference (APBC), 2008.

[44] S. Kleinberg and B. Mishra. CLARITY: Algorithms for Semantic Comparison of Time-course Transcriptomic Data. International Symposium on Computational Biology & Bioinformatics: ISBB 06, 2006.

Funding

NIH R01 LM011826 (PI: Kleinberg) 2016-2020
BIGDATA: Causal Inference in Large-Scale Time Series
Role: PI $1,504,412

JSMF Studying Complex Systems Scholar Award (PI: Kleinberg) 2015-2020
Multiscale Causality Across Time and Space
Role: PI $450,000

NSF CAREER Award (PI: Kleinberg) 2014-2019
CAREER: Learning from Observational Data with Knowledge
Role: PI $529,099

NIH R01 LM011826 (PI: Kleinberg) 2013-2016
BIGDATA: Causal Inference in Large-Scale Time Series with Rare and Latent Events
Role: PI $654,854

NSF/CRA Computing Innovation Fellowship 2010-2012
Role: PI (Postdoctoral fellowship) $273,812.50

NLM Computational Thinking Contract (PI: Elhadad) 2010-2012
Causal inference on narrative and structured temporal data $373,073
Role: Key personnel. Worked on proposal and study design, and was responsible for multiple aims.

NYULMC-Geisinger Seed Grant (Co-PIs: Mishra, Stewart) 2009-2010
Predicting Congestive Heart Failure using Causal Analysis of EHR Data $27,350
Role: Key personnel. Worked on writing proposal, conceiving study, managing grant and carrying out causal analysis and development of predictive tools.

Honors and Awards

2016 Best Paper Honorable Mention, UbiComp

2016 Kavli Fellow, National Academy of Sciences

2015 James S. McDonnell Foundation Studying Complex Systems Scholar Award (7 selected internationally)

2014 NSF CAREER Award

2010 Sandra Bleistein Prize for notable achievement by a woman in applied mathematics or computer science, Courant Institute of Mathematical Sciences

2006-2010 NYU McCracken Fellowship

2006 Max Goldstein Prize for undergraduate creativity in computing, Courant Institute of Mathematical Sciences

2001-2006 NYU Trustees Scholarship

2000 First Place in Rube Goldberg competition at New York Science, Mathematics, and Technology Expo. Awards for project also received from Society of Women Engineers and Metropolitan Engineering Societies Council. Winner of school science fair for Rube Goldberg Machine.

Teaching Experience

Stevens Institute of Technology

Health Informatics (CS 544, created course) Spring 2014-2016

Causal Inference (CS 582, created course) Fall 2012-2016

Introduction to Scientific Computing (CS 105) Spring 2013

New York University

Programming Languages (G22.2110), TA Spring, Summer 2009

Guest Lectures
Statistical methods (Computational Biology, Fall 2009, Spring 2010)
Model checking biology (Bioinformatics, Spring 2008)

Invited Talks

Kavli Frontiers of Science Symposium	November, 2016 (scheduled)
AAAI Fall Symposium on Accelerating Science	November, 2016 (scheduled)
Dexcom	August, 2016
Data Science + FinTech Meetup JC-NY	August, 2016
Statistical Causal Inference and Applications to Genetics Workshop	July, 2016
MLconf NYC	April, 2016
Columbia University, From Data to Solutions IGERT Seminar	March, 2016
Columbia University, DBMI Seminar	January, 2016
Massachusetts Institute of Technology, CSAIL Seminar	December, 2015
Carnegie Mellon University, HCII Seminar	November, 2015
University of Texas, Austin	November, 2015
Georgia Tech, Computational Science & Engineering Seminar	October, 2015
Washington University in St. Louis, CS Department Seminar	October, 2015
Meaningful Use of Complex Medical Data	August, 2015
MLconf NYC	April, 2014
NIPS Machine Learning for Clinical Data Analysis and Healthcare Workshop	December, 2013
Columbia University, From Data to Solutions IGERT Seminar	November, 2013
Johns Hopkins University, CS Department Seminar	November, 2013
University of California, San Diego iDASH Webinar	August, 2013
New Jersey Institute of Technology, CS Department Seminar	April, 2013
Syracuse University, EECS Colloquium	April, 2013
Columbia University, DBMI Seminar	October, 2011
Patients Like Me	January, 2011
Columbia University, Pe'er Lab	June, 2010
IBM Watson, Computational Biology Seminar	April, 2010
Columbia University, Meeting in Biological Networks	November, 2009
CUNY Seminar in Logic and Games	August, 2008

Professional Activities and External Service

Invited Workshop Participant

SciFoo camp, hosted by Google/Nature/O'Reilly	2013
CCC Symposium, Computing and Healthcare: New Opportunities and Directions	2012

Program Committees

Senior Program Committee, IJCAI	2016
Program Committee, AAAI	2016-2017
Program Committee, ACM SIGAI Career Network Conference (CNC)	2015
Program Committee, IEEE ICDM Workshop on Causal Discovery (CD)	2013
Scientific Program Committee, AMIA	2013
Poster Committee, Grace Hopper Celebration	2013

Organizing

Time and Causality in the Sciences (TaCitS) Conference Chair	2017
SIGAI Career Network Conference Co-chair	2016
IJCAI Exhibitions Chair	2016
SIGAI Career Network Conference Treasurer	2015
Workshop on *Causality across disciplines*	2009
NYU Bioinformatics group seminar	2006 - 2009

Patents

Method, System and Computer-Accessible Medium and Software Arrangement for Organization and Analysis of Multiple Sets Of Data (United States Patent 8,090,747 awarded 01/02/2012)

Method, System, And Computer-Accessible Medium For Inferring And/Or Determining Causation In Time Course Data With Temporal Logic (United States Patent 8,762,319 awarded 6/24/2014)

(Pending) Methods, Computer-Accessible Medium And Systems For Facilitating Data Analysis And Reasoning About Token/Singular Causality (PCT Application No. PCT/US11/25574, filed 2/21/2010)

Last updated

September 19, 2016