Biographical Sketch: Chris Wiggins

Professional Preparation

Princeton University	Theoretical Physics	PhD 1998
Columbia College	Major: Physics; Minor: Math	B.A. 1993

Appointments

2006-	Associate Professor, Department of Applied Physics and Applied Mathematics, and Center for Computational Biology and Bioinformatics (C2B2), Columbia University
2001-2006	Assistant Professor, Department of Applied Physics and Applied Mathematics, and Center for Computational Biology and Bioinformatics (C2B2), Columbia University
Summer 2001	NSF International Fellow, Hahn-Meitner Institut, Berlin
1998-2001	Assistant Professor/Courant Instructor, Courant Institute, NYU
1998-2001	NSF Mathematical Sciences Foundation Postdoctoral Research Fellow
1998	Visiting Postdoctoral Researcher, Institut Curie, Physico-Chimie Curie, Paris
1993-1998	Graduate student, Princeton University, Department of Physics

Distinctions

2014-	Chief Data Scientist, The New York Times
2011-2014	Selected as mentor for TechStars NYC
2011	Selected among 25 "People to watch in Silicon Alley" (Crains)
2010	Selected among 100 "Silicon Alley Insiders" (Business Insider)
2008	Featured in April 2008 *Scientific American* "Insights" piece: 'At the Edge of Life's Code'
2008	Selected for (invitation-only) Google/Nature Magazine 'SciFoo' interdisciplinary conference
2007	Janette and Armen Avanessians Diversity Award (selected by Columbia SEAS undergraduates)
2007	Selected for (invitation-only) Google/Nature Magazine 'SciFoo' interdisciplinary conference
2001	NSF International Fellow, Hahn-Meitner Institut, Berlin
1998-2001	NSF DMS Postdoctoral Research Fellow, Courant Institute, NYU
1989-1993	I. I. Rabi Scholar, Columbia College
1989	Clark Fellow (one of twenty high school seniors selected for fellowship supporting research in collaboration with faculty at the Univeristy of Texas at Dallas)

Synergistic Activities

1. Co-founded hackNY.org, an experiential learning program pairing computational and quantitative students with NYC startups via a 10-week structured internship program and twice-annual student 'hackathons' (24-hour coding events). Thanks to this effort, represented Columbia in the pages of *Wall Street Journal, New York Times, Crain's Business Daily, CNN, The Brian Lehrer Show*, and numerous other media outlets nationally and internationally.

2. Institute for Data Sciences and Engineering (IDSE) engagement:

   (a) Member of the SEAS committee to respond to the NYCEDC call for a new engineering campus in NYC

   (b) Founding Member of IDSE Executive committee

   (c) Founding Member of IDSE Education committee

   (d) Founding Co-chair of IDSE Entrepreneurship committee

3. Recruitment and development activities for Columbia:

   (a) April 2012 panel during admitted students' weekend

   (b) April 2011 Master Class for admitted undergraduates

   (c) April 2011 co-organized tour of Google and Betaworks with Columbia Admissions

   (d) 2011-2012 member of I. I. Rabi Scholars faculty committee

   (e) June 2010 *Science in the City* lecture during reunion weekend

4. Organized/co-organized workshops and conferences:

   (a) Program Committee: The 2008 SIAM International Conference on Data Mining

   (b) Co-organizer: DIMACS Conference on Networks, January 2007

   (c) Co-organizer: The NSF Boulder Summer School (Biophysics), July 2007

   (d) Track Chair: IEEE EMBC 2006

   (e) Organizer and chair: "The facts of life: data-driven approaches to systems biology" (mini-symposium, APS March Meeting, 2005)

   (f) Co-organizer: "Machine Learning Approaches for Understanding Gene Regulation" (DIMACS workshop, 2005)

   (g) Co-organizer: Eighth Annual Japanese-American Beckman Frontiers of Science Symposium, 2005 (U.S. National Academy of Sciences/JSPS)

5. Developed and distributed (open source, i.e., source code freely available) research algorithms (see bit.ly/wigginslab for collection):

   (a) aneic.github.com

   (b) artstat.sourceforge.net

   (c) cellmap.sourceforge.net

(d) ebfret.github.com
(e) edhmm.github.com
(f) formfunction.sourceforge.net
(g) infodyn.sourceforge.net
(h) infomod.sourceforge.net
(i) mkboost.sourceforge.net
(j) netboost.sf.net
(k) specmark.sourceforge.net
(l) vbfret.sourceforge.net
(m) vbmod.sourceforge.net
(n) github.com/willieneis/PACT

6. Seminars/Colloquia Organized: "Applied Math Lab Seminar," and "Genomics Journal Club" (NYU; 1999-2000); "Colloquium in Applied Mathematics" (Columbia; 2001-2003).

7. Developed new courses and curricula: Biophysical Modeling (Columbia; textbook in development) Mathematical Neuroscience with MATLAB (NYU). Curricular development: assisted development of computational biology PhD via Columbia's C2B2.

8. Invited extended visits at institutes and workshops both nationally and internationally, including:

(a) Kavli Institute for Theoretical Physics, September 2008;
(b) Boulder Center for Theoretical Physics, July 2007;
(c) Stanford iCME, March 2007;
(d) IPAM, UCLA, May 2006;
(e) Kavli Institute for Theoretical Physics, August 2004;
(f) Aspen Center for Physics, August 2003;
(g) Kavli Institute for Theoretical Physics, Spring 2003;
(h) Institute for Theoretical Physics, Spring 2002;
(i) Les Houches, July 2001;
(j) Hahn-Meitner Institut, Berlin 2001 (supported by NSF INT01-07284);
(k) Cargese Institute, July 1998;
(l) Institut Curie, May−October, 1998;
(m) Institute for Theoretical Physics, June 1997.

9. Volunteered to lead/advise undergraduate and high school researchers: Advised ten VIGRE undergraduates in projects involving machine learning/network classification (summer 2003), and information theory/spectral (graph theoretic) approaches to dimensionality reduction (summer 2004), with results published and presented at national and international conferences; advised four high school students in the Intel Science Competition, including a co-author.

10. Served as official undergraduate advisor for the Applied Mathematics major since 2003.

11. Columbia's faculty advisor for student chapter of SIAM (Society for Industrial and Applied Mathematics) seas.columbia.edu/siam and ADI (Application Development Initiative) adicu.com

12. Served on PhD committees at Columbia for students in the following departments:

    (a) APAM,
    (b) Biology
    (c) Biomedical Engineering,
    (d) Department of Biomedical Informatics (in the College of Physicians and Surgeons),
    (e) Chemistry,
    (f) Chemical Engineering,
    (g) Computer Science,
    (h) Materials Science,
    (i) Physics,

    and externally at NYU (computational biology).

Peer-reviewed Publications

All published papers are in peer-reviewed journals or highly competitive, peer-reviewed conference proceedings, or peer-reviewed invited book chapters; competitive statistics are noted where available:
Italics indicate my graduate students, postdocs, or undergraduate research advisees

1. Amy Rebecca Gansell, *Meent, Jan-Willem van de*, *Zairis, Sakellarios*, **Wiggins, Chris H**. Stylistic Clusters and the Syrian/South Syrian Tradition of First-Millennium BCE Levantine Ivory Carving: A Machine Learning Approach. *Journal of Archaeological Science*, 2013.

2. F. Mancini, **Wiggins, C. H.**, M. Marsili, A. M. Walczak. Time-dependent information transmission in a model regulatory circuit. *Phys. Rev. E*, 88:022708, Aug 2013. URL `http://link.aps.org/doi/10.1103/PhysRevE.88.022708`.

3. *van de Meent, Jan-Willem*, *Bronson, Jonathan E*, Frank Wood, Ruben L Gonzalez Jr, **Wiggins, Chris H**. Hierarchically-coupled hidden Markov models for learning kinetic rates from single-molecule data. *JMLR W&CP*, 28(2):361–369, 2013. Accepted to 30th International Conference on Machine Learning (ICML-13).

4. *Dewar, M.*, **Wiggins, C**., F. Wood. Inference in Hidden Markov Models with Explicit State Duration Distributions. *Signal Processing Letters, IEEE*, 19(4):235–238, 2012. ISSN 1070-9908.

5. *Andrew Mugler*, *Boris Grinshpun*, *R. Franks*, **Chris H Wiggins**. Statistical method for revealing form-function relations in biological networks. *Proceedings of the National Academy of Sciences*, 108(2):446, 2011. ISSN 0027-8424. Sole PI; coauthors are PhD student and undergraduate advisees.

6. *Raj, A.*, *Dewar, M.*, G. Palacios, R. Rabadan, **Wiggins, C.H.** Identifying Hosts of Families of Viruses: A Machine Learning Approach. *PloS one*, 6(12):e27631, 2011.

7. *Anil Raj*, **Chris H. Wiggins**. An Information-Theoretic Derivation of Min-Cut Based Clustering. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 32:988–995, 2010. Sole PI; coauthor is my student.

8. *Jonathan Bronson*, *Jake Hofman*, Jingyi Fei, Ruben Gonzalez, **Chris H. Wiggins**. Graphical models for inferring single molecule dynamics. *BMC Bioinformatics*, 11, 2010. ISSN 1471-2105. Sole theorist PI.

9. *Li, X.*, C. Panea, **Wiggins, C.H.**, V. Reinke, C. Leslie. Learning graph-mer motifs that predict gene expression trajectories in development. *PLoS computational biology*, 6(4):137–144, 2010. ISSN 1553-734X.

10. *Mugler, A.*, A.M. Walczak, **Wiggins, C.H.** Information-Optimal Transcriptional Response to Oscillatory Driving. *Physical review letters*, 105(5):58101, 2010. ISSN 1079-7114. Sole PI.

11. A.M. Walczak, *Mugler, A.*, **Wiggins, C.H.** Analytic methods for modeling stochastic regulatory networks. *Arxiv preprint arXiv:1005.2648*, 2010. Sole PI; to appear as a peer-reviewed book chapter.

12. J. Fei, *Jonathan E. Bronson*, *Jake M. Hofman*, R.L. Srinivas, **Chris H. Wiggins**, R.L. Gonzalez. Allosteric collaboration between elongation factor G and the ribosomal L1 stalk directs tRNA movements during translation. *Proceedings of the National Academy of Sciences*, 106(37):15702, 2009. Sole theorist PI.

13. *Andrew Mugler*, *Etay Ziv*, Ilya Nemenman, **Chris H. Wiggins**. Quantifying evolvability in small biological networks. *IET Systems Biology (formerly IEE Proceedings - Systems Biology)*, 3:379, Nov 2009. `0811.2834`, URL `http://arxiv.org/abs/0811.2834`.

14. *Andrew Mugler*, Aleksandra M. Walczak, **Chris H. Wiggins**. Spectral solutions to stochastic models of gene expression with bursts and regulation. *Physical Review E (Statistical, Nonlinear, and Soft Matter Physics)*, 80(4):041921 (pages 19), 2009. Sole PI, URL `http://link.aps.org/abstract/PRE/v80/e041921`.

15. *Jonathan E. Bronson*, Jingyi Fei, *Jake M. Hofman*, Ruben L. Gonzalez, **Chris H. Wiggins**. Learning Rates and States from Biophysical Time Series: A Bayesian Approach to Model Selection and Single-Molecule FRET Data. *Biophysical Journal*, 97(12):3196–3205, 2009. ISSN 0006-3495. Sole theorist PI, URL `http://www.citebase.org/abstract?id=oai:arXiv.org:0907.3156`.

16. Aleksandra M. Walczak, *Andrew Mugler*, **Chris H. Wiggins**. A stochastic spectral analysis of transcriptional regulatory cascades. *Proceedings of the National Academy of Sciences*, April 2009. Sole PI, URL `http://dx.doi.org/10.1073/pnas.0811999106`.

17. Benjamin J. Dubin-Thaler, *Jake M. Hofman*, Harry Xenias, Ingrid Spielman, Anna V. Shneidman, *Lawrence A. David*, Hans-Gunther Dobereiner, **Chris H. Wiggins**, Michael P. Sheetz. Quantification of Cell Edge Velocities and Traction Forces Reveals Distinct Motility Modules during Cell Spreading. *PLoS ONE*, 3(11):e3735, Nov 2008. Sole theorist PI (other theorists are my PhD student Hofman and undergraduate advisee David) in this collaboration with experimentalists.

18. *Andrew Mugler*, *Etay Ziv*, Ilya Nemenman, **Chris H. Wiggins**. Serially-regulated biological networks fully realize a constrained set of functions. *IET Systems Biology (formerly IEE Proceedings - Systems Biology)*, 2(5):203–205, 2008. URL `http://arxiv.org/abs/0805.1776`.

19. *Jake M. Hofman*, **Chris H. Wiggins**. Bayesian Approach to Network Modularity. *Physical Review Letters*, 100(25):258701 (pages 4), 2008. Sole PI, co-author is my PhD student, URL `http://arxiv.org/abs/0709.3512`.

20. A. Crut, D. A. Koster, R. Seidel, **C. H. Wiggins**, N. H. Dekker. Fast dynamics of supercoiled DNA revealed by single-molecule experiments. *Proc Natl Acad Sci U S A.*, 104(29):11957–62., Jul 17 2007. Sole theorist in this collaboration with experimentalists; also selected for the August 1, 2007 *Virtual Journal of Biological Physics Research*; also selected for the August 6, 2007 *Virtual Journal of Nanoscale Science & Technology*.

21. Amy Rebecca Gansell, *Irene K. Tamaru*, Aleks Jakulin, **Chris H. Wiggins**. Predicting Regional Classification of Levantine Ivory Sculptures: A Machine Learning Approach. In *Digital Discovery: Exploring New Frontiers in Human Heritage. CAA 2006. Computer Applications and Quantitative*

Methods in Archaeology. Proceedings of the 34th Conference, Fargo, United States, April 2006. Archaeolingua, 2007. ISBN ISBN 978-963-8046-90-1. Sole PI; co-authors include undergraduate; paper grew out of undergraduate student project in seminar course taught by PI; work featured in *Columbia Magazine*, Winter 2008 edition.

22. Anshul Kundaje, Steve Lianoglou, Xuejing Li, David Quigley, Marta Arias, **Chris H. Wiggins**, Li Zhang, Christina Leslie. Learning regulatory programs that accurately predict differential expression with MEDUSA. *Annals of The New York Academy of Sciences*, 1115:178–202, 2007.

23. T. N. Sims, T. J. Soos, H. S. Xenias, B. Dubin-Thaler, *Jake M. Hofman*, J. C. Waite, T. O. Cameron, V. K. Thomas, R. Varma, **C. H. Wiggins**, M. P. Sheetz, D. R. Littman, M. L. Dustin. Opposing effects of PKCtheta and WASp on symmetry breaking and relocation of the immunological synapse. *Cell.*, 129(4):773–85, May 18 2007. Sole theorist PI (other theorist is my PhD student Hofman) in this collaboration with experimentalists.

24. *Etay Ziv*, Ilya Nemenman, **Chris H. Wiggins**. Optimal Signal Processing in Small Stochastic Biochemical Networks. *PLoS ONE*, 2(10):e1077, Oct 2007.

25. *Lawrence A. David*, **Chris H. Wiggins**. Benchmarking of Dynamic Bayesian Networks Inferred from Stochastic Time-Series Data. *Annals of The New York Academy of Sciences*, 1115(1 Reverse Engineering Biological Networks: Opportunities and Challenges in Computational Methods for Pathway Inference):90–101, 2007. Sole PI; co-author is undergraduate research advisee.

26. A. S. Ada-Nguema, H. Xenias, *Jake M. Hofman*, **Chris H. Wiggins**, M. P. Sheetz, P. J. Keely. The small GTPase R-Ras regulates organization of actin and drives membrane protrusions through the activity of PLC-ϵ. *J Cell Sci.*, page 4364. http://jcs.biologists.org/cgi/content/full/119/20/4364, Apr 1 2006. Sole theorist PI (other theorist is my PhD student Hofman) in this collaboration with experimentalists.

27. Y. Cai, N. Biais, G. Giannone, M. Tanase, G. Jiang, *Jake M. Hofman*, **C. H. Wiggins**, P. Silberzan, A. Buguin, B. Ladoux, M. P. Sheetz. Nonmuscle myosin IIA-dependent force inhibits cell spreading and drives F-actin flow. *Biophys J.*, 91(10):3907–20., Nov 15 2006. Sole theorist PI (other theorist is my PhD student Hofman) in this collaboration with experimentalists.

28. H. G. Dobereiner, B. J. Dubin-Thaler, *Jake M. Hofman*, H. S. Xenias, T. N. Sims, G. Giannone, M. L. Dustin, **C. H. Wiggins**, M. P. Sheetz. Lateral membrane waves constitute a universal dynamic pattern of motile cells. *Phys Rev Lett.*, 97(3):038102., Jul 21 2006. Sole theorist PI (other theorist is my PhD student Hofman) in this collaboration with experimentalists; also selected for the *Virtual Journal of Biological Physics Research.*

29. Daniel A. Koster, **Chris H. Wiggins**, Nynke H. Dekker. Multiple events on single molecules: Unbiased estimation in single-molecule biophysics. *Proc Natl Acad Sci U S A.*, 104:1750–1755, 2006. Sole theorist in this collaboration with experimentalists; also selected for the *Virtual Journal of Biological Physics Research.*

30. A. Kundaje, *M. Middendorf*, M. Shah, **C. H. Wiggins**, Y. Freund, C. Leslie. A classification-based framework for predicting and analyzing gene regulatory response. *BMC Bioinformatics.*, 7 Suppl 1:S5., Mar 20 2006.

31. A. A. Margolin, I. Nemenman, K. Basso, **C. Wiggins**, G. Stolovitzky, Dalla R. Favera, A. Califano. ARACNE: an algorithm for the reconstruction of gene regulatory networks in a mammalian cellular context. *BMC Bioinformatics.*, 7 Suppl 1:S7., Mar 20 2006.

32. Tobias Munk, Oskar Hallatschek, **Chris H. Wiggins**, Erwin Frey. Dynamics of semiflexible polymers in a flow field. *Physical Review E*, 74(4):041911, 2006. Selected for the October 30, 2006 issue of the *Virtual Journal of Nanoscale Science & Technology* ; also selected for the November 1, 2006 issue of the *Virtual Journal of Biological Physics Research.*

33. Anshul Kundaje, *Manuel Middendorf*, Feng Gao, **Chris Wiggins**, Christina Leslie. Combining sequence and time series expression data to learn transcriptional modules. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 2(3):194–202, Jul-Sep 2005.

34. *E. Ziv*, *R. Koytcheff*, *M. Middendorf*, **C. Wiggins**. Systematic identification of statistically significant network measures. *Phys Rev E Stat Nonlin Soft Matter Phys.*, 71(1 Pt 2):016110., Jan 2005. Selected for the January 15, 2005 issue of *Virtual Journal of Biological Physics Research*; Sole PI, co-authors are my PhD students and one undergraduate advisee.

35. *E. Ziv*, *M. Middendorf*, **C. H. Wiggins**. Information-theoretic approach to network modularity. *Physical Review E*, 71(4 Pt 2):046117., Apr 2005. Selected for the April 15, 2005 issue of *Virtual Journal of Biological Physics Research*; Sole PI, co-authors are my PhD students.

36. *M. Middendorf*, *E. Ziv*, **C. H. Wiggins**. Inferring network mechanisms: the Drosophila melanogaster protein interaction network. *Proc Natl Acad Sci U S A.*, 102(9):3192–7., Mar 1 2005. URL `http://www.pnas.org/cgi/content/abstract/102/9/3192`.

37. *Manuel Middendorf*, Anshul Kundaje, **Chris Wiggins**, Yoav Freund, Christina Leslie. Predicting genetic regulatory response using classification: Yeast stress response. *Regulatory Genomics*, 3318:1–13, 2005. Proceedings of the First Annual RECOMB Regulation Workshop 2004.

38. *Manuel Middendorf*, Anshul Kundaje, Mihir Shah, Yoav Freund, **Chris H. Wiggins**, Christina S. Leslie. Motif discovery through predictive modeling of gene regulation. In Satoru Miyano, editor, *Proceedings of Ninth Annual International Conference on Research in Computational Molecular Biology (RECOMB 2005), special "Lecture notes in Bioinformatics" from Springer-Verlag*, volume 3500, pages 538–552. Springer, 2005. 39 papers accepted out of 217 papers submitted.

39. Y. Bohbot-Raviv, W. Z. Zhao, M. Feingold, **C. H. Wiggins**, R. Granek. Relaxation dynamics of semiflexible polymers. *Phys Rev Lett.*, 92(9):098101, Mar 5 2004. Also selected for the *Virtual Journal of Biological Physics Research*.

40. *Manuel Middendorf*, Anshul Kundaje, **Chris Wiggins**, Yoav Freund, Christina Leslie. Predicting Genetic Regulatory Response Using Classification. *Bioinformatics*, 20(suppl. 1):i232–240, 2004. Proceedings of the Twelfth International Conference on Intelligent Systems for Molecular Biology (ISMB 2004); Presented as long paper, 14% acceptance rate.

41. *Manuel Middendorf*, *Etay Ziv*, *Carter Adams*, *Jen Hom*, *Robin Koytcheff*, *Chaya Levovitz*, *Gregory Woods*, Linda Chen, **Chris Wiggins**. Discriminative Topological Features Reveal Biological Network Mechanisms. *BMC Bioinformatics*, 5:181, Nov 22 2004. Sole PI; 5 of co-authors are undergraduates advisees via VIGRE summer research program in collaboration with department of mathematics.

42. **Chris H. Wiggins**, Ilya Nemenman. Process Pathway Inference via Time Series Analysis. *Journal of Experimental Mechanics*, 43:361–370, 2003.

43. **Chris H. Wiggins**, Loic Le Goff. Biopolymer Dynamics. In A. Deutsch, M. Falcke, J. Howard, W. Zimmermann, editors, *Function and Regulation of Cellular Systems: Experiments and Models*. Birkhaeuser-Verlag, 2002. Invited book chapter; collaboration with experimentalist.

44. A. Belmonte, M. J. Shelley, S. T. Eldakar, **C. H. Wiggins**. Dynamic patterns and self-knotting of a driven hanging chain. *Phys Rev Lett.*, 87(11):114301., Sep 10 2001.

45. **Chris H. Wiggins**. Biopolymer mechanics: stability, dynamics, and statistics. *Mathematical Methods in the Applied Sciences*, 24:1325–1335, 2001.

46. **Chris H. Wiggins**. Darboux's Frame and Schrodinger's Equation for Biopolymers. In M. Deville, R. Owens, editors, *Sixteenth IMACS World Congress 2000 on Scientific Computation, Applied Mathematics, and Simulation*. 2000. ISBN 3-9522075-1-9.

47. T. R. Powers, R. E. Goldstein, **Chris H. Wiggins**. Supercoiling Bacterial Filaments. In H. Frauenfelder, G. Hummer, R. Garcia, editors, *Biological Physics: Third International Symposium*, page 271. 1999.

48. Raymond E. Goldstein, Thomas R. Powers, **Chris H. Wiggins**. The Viscous Nonlinear Dynamics of Twist and Writhe. *Physical Review Letters*, 80:5232–5235, 1998.

49. **Chris H. Wiggins**, Raymond E. Goldstein. Flexive and Propulsive Dynamics of Elastica at Low Reynolds numbers. *Physical Review Letters*, 80:3879–3882, 1998.

50. **Chris H. Wiggins**, Daniel X. Riveline, Albrecht Ott, Raymond E. Goldstein. Trapping and Wiggling: Elastohydrodynamics of Driven Microfilaments. *Biophysical journal*, 74(2 Pt 1)(2):1043–1060, Feb 1998.

51. D. Riveline, **Chris H. Wiggins**, A. Ott, Raymond E. Goldstein. Elastohydrodynamic study of actin filaments using fluorescence microscopy. *Physical Review E*, 56:R1330–R1333, 1997.

52. **Chris Wiggins**, M. Spiegelman. Magma Migration and magmatic solitary waves in 3D. *Geophysical Research Lett.*, 22:1289–1292, 1995. Cover figure; research completed while undergraduate (with support of I. I. Rabi Scholars program, Columbia University).

53. E. O'Brien, M. Bennett, V, Cherniatin, C. Y. Chi, A. Chikanian, B. Dolgoshein, S. Kumar, D. Lissauer, S. McCorkle, J. T. Mitchell, S. Nagamiya, V. Polychronakos, K. Pope, W. Sippach, H. Takai, M. Toy, D. Wang, Y. F. Wang, **C. Wiggins**, W. Willis. A Transition Radiation Detector which Features Accurate Tracking and dE/dx Particle Identification. *IEEE Transactions on Nuclear Science*, 40:153–157, 1993. Research completed while undergraduate (with support of I. I. Rabi Scholars program, Columbia University).

Manuscripts Submitted or in Preparation for Peer-reviewed Journals

1. Learning rates and states from ribosome smFRET data using hierarchically-coupled hidden Markov models (with Ruben Gonzalez, Jan-Willem Van de Meent, and Jonathan Bronson)

2. A comparative study on boosting algorithms for motif discovery in yeast (with Xuejing Li and Christina Leslie)

3. Multiple Lac-mediated loops revealed by Bayesian statistics and tethered particle motion (with Martin Linden, Stephanie Johnson, Jan-Willem Van De Meent, and Rob Phillips) (code available via github.com/bmelinden/vbTPM) http://arxiv.org/abs/1402.0894

4. Comprehensive and standardized metrics for the performance evaluation of cell-tracking algorithms (with Willie Neiswanger, Viveka Mayya, and Michael Dustin) (code available via github.com/willieneis/PACT)

5. Statistical Inference for Nanopore Sequencing (with Kevin Emmett, Jacob Rosenstein, Jan-Willem van de Meent, and Ken Shepard)

Additional publications

1. **Chris H. Wiggins** *Get Thee Behind Me, Data?*, 2013 Society for Mathematical Biology September 2013 Newsletter Volume 26, No. 3 http://www.smb.org/publications/newsletter/vol26no3.pdf

2. **Chris H. Wiggins**, *Data science in the natural sciences*, 2012 strata.oreilly.com/2012/11/data-science-natural-sciences.html Essay on the O'Reilly Strata blog

3. **Chris H. Wiggins**, *The Data Science Revolution*, 2012 `http://mathaware.org/mam/2012/essays.html`. Invited essay for Mathematics Awareness Month, April 2012, co-organized by The American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics.

4. *Anil Raj*, **Chris H. Wiggins**, *A non-negative expansion for small Jensen-Shannon Divergences*, 2008 `http://arxiv.org/abs/0810.5117`.

5. **Chris H. Wiggins** *Quantitative Biology: An Introductory Tour*. 2012. Textbook in development,
6. "Ask the experts: Bayes' theorem" *Scientific American*, April 2007, p.108.
7. "Bayes' theorem", *Scientific American Online* 2006 `http://tinyurl.com/y28wlo`.
8. Adam A. Margolin, Ilya Nemenman, **Chris H. Wiggins**, Gustavo Stolovitzky, Andrea Califano. "On the Reconstruction of Interaction Networks with Applications to Transcriptional Regulation", `http://arxiv.org/abs/q-bio/0410036`, 2004 (Manuscript accepted into and presented at competitive *Neural Information Processing Systems* (NIPS) 2004 Computational Biology Workshop).
9. **Chris H. Wiggins**, Alberto Montesi, and Matteo Pasquali. "The stochastic spectral dynamics of bending and tumbling.", `http://arxiv.org/abs/cond-mat/0307551`, 2003.
10. *J. P. Bennett* and **C. H. Wiggins**. "A computational study of mixing microchannel flows.", `http://arxiv.org/abs/cond-mat/0307482`, 2003 (Coauthor is high school student advised for Westinghouse competition).

Advising: Current Students

1. Kevin Emmett: Expected PhD 2015. Applications of classification of viral hosts.
2. Sakellarios Zairis: Expected PhD 2015. Applications of machine learning to population genetics of viral pathogens.
3. Vahe Galstyan: Expected BA 2017. Stochastic models of biochemical reactions. John Jay Scholar, Columbia University

Advising: Previous Students

1. Ricardo Medina: Expected BA 2015. Biophysical modeling and monte carlo simulation in cellular patterning.
2. Xuejing Li: Physics student. PhD 2012. Applications of machine learning for inferring predictive models of transcriptional regulatory networks from high-throughput biological datasets.
3. Akiva Bamberger: MS 2012. Applications of machine learning for image analysis in immunological cell movies and biophysical time series.
4. Willie Neiswanger: BS 2012. Applications of machine learning for image analysis in immunological cell movies and biophysical time series.
5. Pawel Przytycki: BA 2012. Applications of information theory for relating biological network topology to population genetics.
6. Anil Raj: PhD 2011. Applications of machine learning and information theory for the analysis and organization of biological networks.
7. Andrew Mugler: PhD 2010. Applications of information theory for relating topology and function in small biological networks.

8. Jonathan Bronson: PhD 2010. Applications of Bayesian inference to biochemical experiments.
9. Jacob Hofman: PhD Summer 2008. Applications of machine learning in network and image data.
10. Etay Ziv: MD/PhD student; 5 papers authored; first author on 3. Recipient of DOE and DOD (Krell CSGF) Fellowships. PhD 2006. Biological networks. Dissertation selected by unanimous vote of the committee for dean's distinction. Currently completing MD.
11. Jon Landers: Master's awarded 2006. Biological applications of machine learning. Currently employed at Epiq Systems (developing machine learning for text data).
12. Manuel Middendorf: 8 papers authored; first author on 5. PhD awarded 2005. Biological applications of machine learning.
13. Robin Koytcheff: 2 papers authored; BS awarded 2005. Currently NSF Postdoc at Brown after PhD student at Stanford (Math).
14. Lawrence David: 2 papers authored; BS awarded 2005. Currently Harvard Junior Fellow after PhD at MIT (Computational and systems biology).
15. Carter Adams, BA awarded 2005. 1 paper coauthored
16. Jen Hom, BA awarded 2005. 1 paper coauthored
17. Chaya Levovitz, BA awarded 2005. 1 paper coauthored
18. Gregory Woods, BA awarded 2005. 1 paper coauthored

Education Activities: courses taught

- On sabbatical Fall 2013.
- *Dynamical Systems*, Columbia, Spring 2012: This course is based in part on Strogatz's book on nonlinear dynamics, supplemented by methods for analyis of real-world time series data, drawn from a variety of sources and my own research. Official enrollment: 59
- *Junior and Senior Seminar: Problems in Applied Mathematics*, Columbia, 2003-present: This is a core course for the Applied Mathematics major which I have completely redesigned from its pre-2003 incarnation. The prior structure of the seminar, working problems in small groups supplemented with occasional outside lectures, became infeasible with the growth of the Applied Mathematics major 2001-present (enrollment has more than doubled during the four years I have been teaching it, 2003-2007, from 40 students to 85 students, despite the fact that it was dropped as a requirement for the Applied Mathematics minor during that time). The course now begins with lectures by myself, graduate students, postdocs, and other faculty for the first few weeks. The remainder of the course is given to lectures by the seniors to each other and to their junior peers in which they investigate and report on research topics which are likely to constitute their "senior projects" for APMA3900 (a supervised research course) in the second semester of their senior years. The juniors are exposed to a variety of application areas of mathematics, attend and critique the presentations of the seniors, and

begin planning the research they will undertake during or in the summer preceding their senior year. The prior structure gave an additional point of credit for a report on any topic in mathematics; this credit is now given for a concrete proposal, similar in format to a proposal for research funding, outlining the research they hope to conduct in APMA3900. I have also worked closely with CCNMTL to introduce a course wiki, which the students use to share presentation materials and relevant texts, and a "Google group", which the students use for discussion of mathematical topics related to the content of the lectures.

Official enrollments

Spring 2014: 63 (36 seniors, 27 juniors)

Spring 2013: 78 (41 seniors, 37 juniors)

Fall 2011: 72 (28 seniors, 44 juniors)

Fall 2010: 72 (43 seniors, 29 juniors)

Fall 2009: 75 (33 seniors, 42 juniors)

Fall 2008: 71 (36 seniors, 35 juniors)

Fall 2007: 85 (40 seniors, 45 juniors)

Fall 2006: 72 (35 seniors, 37 juniors)

Fall 2005: 68 (24 seniors, 44 juniors)

Fall 2004: 58 (27 seniors, 31 juniors)

Fall 2003: 48 (22 seniors, 26 juniors)

Spring 2003: 40 (13 seniors, 27 juniors).

- *Introduction to Biophysical Modeling*, Columbia, 2001-present: This is an entirely original class of my own design. The content changed slightly during the first years but now is a course in mathematical methods, centering on probability and statistics, applied to modern problems at the interface between biology and mathematics: biological physics at the scale of the cell; systems biology; and machine learning applied to computational biology. I worked closely with the Columbia Center for New Media Teaching and Learning (CCNMTL) to videotape the course in Spring of 2006 both to improve my teaching and to provide the students with videos to review difficult material. CCNMTL also assisted me by soliciting feedback from the students as to how my teaching could be improved, and we worked together to implement these suggestions. With the assistance of energetic students and TAs over the past two years, this material now comprises a book manuscript of approximately 270 pages. Several publishers are interested in publishing this manuscript.

  Students enrolled from a variety of departments, schools, and campuses, including APAM, Physics, Chemistry, Biological Sciences, Biomedical Engineering, and the Department of Biomedical Informatics (in the College of Physicians and Surgeons). Official enrollments (does not include auditors)

  Spring 2011: 16

  Spring 2010: 5

  Spring 2009: not given

  Spring 2008: 12

  Spring 2007: 15

Spring 2006: 14

Spring 2005: 10

Spring 2004: 14

Spring 2003: 12.

- *Supervised research*, Columbia: 2003-present: Since 2003, I have advised 39 students in undergraduate or graduate supervised research courses, including APMA3900, APMA6650, APMA9301, APMAE9900, and G6001 (supervised research for the Department of Biomedical Informatics in the College of Physicians and Surgeons).
- *Mathematical Neuroscience*, NYU, Spring 2001: This was an original course designed in collaboration with David McLaughlin. The course material focused on mechanistic models of single neuron electrophysiology and their relation to experiments on visual processing.
- *Chaos and Dynamical Systems*, NYU, Fall 2000: This was an original course of my own design, drawing on material from the textbook of Steve Strogatz, supplemented by numerical assignments of my own in MATLAB.
- *Ordinary Differential Equation*, NYU, Spring 2000: This was a core course for applied mathematics undergraduates, taught from the textbook of Edwards & Penney.
- *Linear Algebra*, NYU, Fall 1999: This was a core course required for a variety of quantitative majors, taught from the textbook by David Lay.

Invited Presentations by Year since 2001

2014:

March: Gengo.com
February: Princeton (PACM Colloquium)
February: Columbia (President's house data science presentation)
January: MIT (Media Lab)

2013:

October: Simons Foundation (Simons Center for Data Analysis)
October: TEDxColumbiaEngineering
October: Strata/Hadoop World
September: Technical University of Berlin
September: Yahoo! Research
September: New York Times
July: NYCRIN (NYU)
June: Amazon.com
May: Data Driven NYC (Bloomberg Meetup)
April: Columbia (Physics)
March: Columbia (Science and Engineering division of Columbia University Libraries)
March: Google (NYC)
January: Columbia (Z-MBBI)

2012:

October: SXSW Conference
October: Columbia University (Statistics)
October: New York Academy of Sciences (Machine Learning Symposium)
May: APS March Meeting (Invited talk)
May: New York Academy of Sciences
April: Ecole de Physique des Houches (invited worshop on Bridging statistical physics optimization inference and learning)
May: APS March Meeting (Invited talk)
February: Columbia University (C2B2)

2011:

June: Courant Institue (special talk for 75th anniversary celebration)
April: Cuny Graduate Center (CS Colloquium)
April: Google (NYC)
April: New York Academy of Sciences (Machine Learning Symposium)
March: Columbia University (C2B2)
January: Columbia University (recruiting lecture for admitted students)

2010:

October: New York Academy of Sciences (Machine Learning Symposium)
May: NJIT (Applied Mathematics)
March: Columbia University (Alumni lecture)
March: Information Theory and its Applications 2010 (UCSD)
February: Harvard Medical School
February: Courant Insitute (NYU)
February: Princeton (Lewis-Sigler Institute for Integrative Genomics)
February: Trinity College (San Antonio)
February: University of Colorado (Boulder)

2009:

December: Columbia University (Physics)
December: Institute Curie (Section Physico-Chemie Curie)
December: Orsay
December: Institute Curie (Bioinformatics Unit)
October: Cold Spring Harbor Laboratory
October: IDA-CCR (Princeton)
September: Gene Network Sciences (Boston)
August: Institute of Statistical Mathematics (Tokyo)
August: Princeton Center for Theoretical Sciences
August: APS March Meeting (Invited talk)
August: Institute Curie (Reisler Group Seminar)
August: Imperial College London
August: APS March Meeting (Invited talk)
February: Mathematical Bioscience Institute (OSU)
January: Columbia University (Parents Day)

2008:

December: Society for Industrial and Applied Mathematics Annual Meeting
December: Santa Fe Institute Complex Systems Summer School (Beijing)
November: University of Tokyo (Hongo campus)
November: Sapporo University
October: University of Tokyo (Komaba campus)
October: NIH (Computational Biology)
October: NIH All Hands meeting
September: Science Foo Camp (Google/Nature Publishing Group multidisciplinary meeting)
September: Stochastics Summer School (Fudan University Shanghai)
September: BUAA (Beijing)
September: Peking University (Institute for Theoretical Biology)
August: Weill Cornell Medical College (Physiology, Biophysics, and Systems Biology Seminar)
August: Santa Fe Institute Colloquium
August: UCSD Information Theory and Applications Workshop
July: Albert Einstein Medical College (chalk talk)
July: Albert Einstein Medical College (seminar)
July: Courant Institute (NYU)
July: Yahoo (New York)
July: Gene Network Sciences (Boston)
July: University of California Merced
April: Stanford Workshop on Algorithms for Modern Massive Data Sets
March: Carnegie Mellon University (Statistics)
March: Kavli Institute for Theoretical Physics (UCSB)
March: Columbia University (APAM seminar)
February: Duke Systems Biology
January: DIMACS/DyDAn Workshop on Network Models of Biological and Social Contagion
January: Columbia University (C2B2)
January: Columbia University (Nanomedicine Annual Meeting)
January: Canadian Institute for Advanced Research Workshop Confernece on Genetic Networks, Princeton

2007:

December: Temple University (Symposium on the Interface — Systems Biology)
November: Science Foo Camp (Google/Nature Publishing Group multidisciplinary meeting)
November: Mathematics for Biological Networks Conference (Institut Henri Poincare, Paris)
November: Duke Nonlinear Seminar
November: University of Maryland (Center for Bioinformatics and Computational Biology)
November: Institute for Pure and Applied Mathematics (UCLA)
November: Columbia University (APAM seminar)
September: DIMACS Workshop on Networks and Applications
August: Boulder Summer School
July: UCSF (QB3, California Institute for Quantitative Biosciences)
June: Berkeley (Helen Wills Neuroscience Institute)

June: International Workshop and Conference on Network Science
May: Columbia (Physics)
May: Linnaeus Centre for Bioinformatics (Uppsala Sweden)
May: LANL q-bio summer school and conference
May: Siam Dynamical Systems Meeting
May: University of Maryland (Applied Dynamics Seminar)
March: Stanford (Institute for Computational and Mathematical Engineering)
March: NIH All Hands meeting
March: IBM Yorktown Heights
March: Chicago (Computations in Science Seminar)
March: NYU Medical School (Skirball Institute)
February: Gulbenkian Institute (Instituto Gulbenkian de Ciencia)
January: Columbia (Inverse Problems Workshop)

2006:

December: Arnold Sommerfeld Center (Ludwig-Maximilians-Universitat, Munich, Germany)
December: Stanford (Computational Systems Biology Annual Meeting)
December: Harvard Medical School (Dana-Farber Cancer Institute)
October: Columbia University (APAM seminar)
July: Toyota Technological Institute at Chicago
June: Columbia University (Society of Physics Students, Physics Department)
June: Cold Spring Harbor Laboratory
April: Cambridge (DAMTP)
April: Imperial College London
March: Princeton (Biophysics Seminar)
January: UCSB (Kavli Institute for Theoretical Physics)

2005:

December: University of Hawaii (graph partitioning seminar)
December: Columbia University (Nanomedicine Annual Meeting)
November: The Genome Institute of Singapore
November: University of Tokyo
November: National Institute of Advanced Industrial Science and Technology, Computational Biology Research Center (Tokyo)
November: Genopole (France)
October: Carnegie Mellon University
September: NYU Medical School (Skirball Institute)
August: Columbia University (Distributed Network Analysis Seminar)
August: University of Hawaii (Statistics tutorial)
August: University of Hawaii (machine learning seminar)
July: Kitano Systems Biology Institute (Tokyo)
May: Yale (Applied Mathematics)
April: IBM Yorktown Heights
March: Columbia University (APAM seminar)
March: Rutgers (BioMAPS)
February: Nehru University (Delhi)

2004:

November: UCSB (Center for Bioimage Informatics)
November: New Jersey Institute of Technology (Applied Math)
October: Columbia University (C2B2)
October: Columbia University (Chemical Biology Seminar)
October: Lawrence Livermore National Labs
October: NYU (Biomathematics Seminar)
October: California Institute of Technology (Applied Physics)
September: Columbia University (C2B2)
May: Columbia University (Physics)
April: Princeton (Lewis-Sigler Institute for Integrative Genomics)
April: Brandeis
April: Columbia University (APAM)
February: Princeton (Program in Integrative Information

2003:

December: IBM Yorktown Heights (Computational Biology and Medical Informatics)
April: Rockefeller University (Center for Studies in Physics and Biology)
February: NYU (Applied Mathematics Lab Seminar)
January: Duke (Applied Mathematics)
January: Manhattan College (Graduate Biotechnology Program)

2002:

October: Rutgers (BioMAPS)

2001:

November: Columbia University (APAM)
January: NYU (Computational Biology)