ILYA NEMENMAN

born January 8, 1975, in Minsk, Belarus
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EDUCATION

Princeton University, Biophysics, PhD 2000
San Francisco State University, Physics, MS 1997
Santa Clara University, Physics/Math, BS 1995
Belarusian State University, Theoretical Physics, 1991 – 1994

APPOINTMENTS

since 2004   Associate Research Scientist, Joint Centers for Systems Biology, Columbia University Medical Center, New York
2001 – 2004   Postdoctoral Scientist, Kavli Institute for Theoretical Physics, University of California, Santa Barbara
2000 – 2001   Postdoctoral Scientist, NEC Research Institute, Division of Physical Sciences, Princeton, New Jersey
1998 – 1999   Research Scientist, Gravity Probe B (GP-B), HEPL, Stanford University
1997 – 1997   Student Researcher, L3 experiment, CERN/PPE, Geneva
1996 – 2000   Graduate Student, Department of Physics, Princeton University. Thesis advisor: Prof. W. Bialek
1995 – 1997   Graduate Student, Department of Physics, San Francisco State University.

TEACHING EXPERIENCE

Fall 2004   Columbia University, Department of Biomedical Informatics, co-instructor, *Compuational Biology I: Functional and Integrative Genomics*
2002   UCSB, Department of Statistics, and NYU, Courant Institute, Bioinformatics group, visiting instructor, lecture series in *Statistical Inference*
1999–2001   Marine Biological Laboratory, Woods Hole, MA, teaching assistant, *Methods in Computational Neuroscience*
1997–1999   Princeton University, Department of Physics, teaching assistant, upper division mechanics; author of the "Demonstrations solutions manual" for undergraduate mechanics laboratory
1995-1996   San Francisco State University, Department of Physics, teaching assistant, undergraduate classical physics laboratory

HONORS AND AWARDS

National Science Foundation Scholar, StatPhys 22, 2004
Neural Information and Coding Workshop Travel Award, 2003
NSF ASI Travel Award, Les Houches School "Physics of Biomolecules and Cells," 2001
Outstanding Teaching Assistant, Department of Physics, Princeton University, 1999
Graduate Student Distinguished Achievement Award, SFSU, 1997
Outstanding Teaching Assistant, Department of Physics, SFSU, 1996
Belarusian State University Honorary Stipend, 1993–1994
Belarusian National High School Physics Olympiad, Winner, 1991

RESEARCH GRANTS

ECS-0425850   NSF, "QSB: Optimal information processing in biological networks", co-PI, $310K, 2004–2007

ECS-0332479   NSF, "SGER: Developing learning theory for genetic network inference", co-PI, $88K, 2003–2005

SYNERGISTIC ACTIVITIES AND MEMBERSHIPS

since 2000   Reviewer for: *Neural Information Processing Systems*, *Neural Computation*, *Physical Reviews*, *Biosystems*, *Pattern Analysis and Applications*

Jul – Sep 2004   Co–organizer of KITP program "Understanding the brain"

Dec 2003   Co–organizer of *NIPS'03* workshop "Estimation of entropy and information of undersampled probability distributions: Theory, algorithms, and applications to the neural code"

since 2000   Organizer of Computational Biology, Biophysics, and Machine Learning seminars at NEC Research Institute, KITP (UCSB), C2B2 (Columbia)

2002 – 2004   Developer and maintainer of a publicly available software for entropy and mutual information estimation in biological data

since 2004   New York Academy of Sciences member

since 1997   American Physical Society member

SUMMARY OF RESEARCH INTERESTS

Quantitative analysis of signal transduction, learning, adaptation, and other information processing in biomolecular and neuronal networks and behaving animals.

SELECTED REFERENCES

William Bialek (Princeton; thesis advisor), Andrea Califano (Columbia), Curtis Callan (Princeton), Randy Gallistel (Rutgers), David Gross (UCSB), Jonathan Miller (Baylor College of Medicine), Bud Mishra (NYU), Alex Silbergleit (Stanford), Rob de Ruyter van Steveninck (Indiana University), Naftali Tishby (Hebrew University), Chris Wiggins (Columbia)

SCIENTIFIC MEETINGS ATTENDED

since 2000   *NIPS* conference and workshops, Denver–Breckenridge, CO, and Vancouver–Whistler, BC, Canada

since 2004   "Computational biology" and "Systems Biology" discussion groups, New York Academy of Sciences

2001 – 2004   KITP, UCSB, programs on "Dynamics of neural networks: From biophysics to behavior", "Bio-molecular networks", "Patterns formation", "Understanding the brain"

Mar 2004   *Computational and Systems Neuroscience*, CSHL

Mar 2003   *Neural Information and Coding* workshop, Snowbird, Utah

Mar 2001   *Frontiers in Physics of Complex Systems* conference, Dead Sea, Israel

Jan 2000   *Computation Neuroscience Workshop*, Ein Gedi, Israel

May 1994   *Quantum Systems: New Trends And Methods*, Minsk, Belarus, 1994

INVITED PRESENTATIONS

Dec 2002 – 2004   *NIPS* conferences and workshops on *Negative Results and Open Problems*, *Universal Learning*, *Entropy Estimation*, *Computational Biology*, Whistler, BC

Mar, Dec 2004   LANL, Theoretical Biology / CNLS

Nov 2004   NEU, Center for Interdisciplinary Research on Complex Systems

Nov 2004   BU, Biomedical Engineering

2001 – 2004   KITP, UCSB, program seminars, Director's blackboard lunch, colloquium

Apr 2004	IPAM, UCLA, Proteomics colloquium
Apr 2004	UCSF, Sloan–Swartz Center for Theoretical Neurobiology
2001 – 2004	NYU, Courant Institute, seminar, colloquium, lecture series
Mar 2004	poster at *Computational and Systems Neuroscience*, CSHL
2002 – 2004	Columbia University, Applied Math, Computational Biology, and Bioinformatics
Mar 2004	IBM Research, Systems Biology and Functional Genomics
2001, 2004	Rockefeller University, Center for Studies in Physics and Biology
Mar 2003	*Neural Information and Coding* workshop, Snowbird, Utah
Nov 2002	CalTech, Complexity Club
Nov 2002	Princeton University, Biophysics group
May 2002	UCSB, Statistics colloquium
1998, 2001	Gravity Probe B, Theory Group
Mar 2001	*Frontiers in physics of complex systems*, Dead Sea, Israel
Jan 2001	MIT, Brain and Cognitive sciences
Nov 2000	New England Complex Systems Institute
Apr, Aug 2000	NEC, Biophysics
Jan 2000	Hebrew University, Machine Learning
Aug 1997	CERN, L3 collaboration seminar
Jul 1994	Belarusian State University, Theoretical Physics

PUBLICATIONS AND PREPRINTS

References to the E-print archive, `www.arXiv.org`, are provided. An up to date publication list can be found at `www.menem.com/~ilya/professional/publications.html`.

1. A. Margolin, N. Banerjee, I. Nemenman, and A. Califano, "Reverse engineering of yeast transcriptional network using the ARACNE algorithm," 2004. Submitted.

2. K. Wang, N. Banerjee, A. Margolin, I. Nemenman, K. Basso, R. Dalla Favera, and A. Califano, "Conditional network analysis identifies candidate regulator genes in human B cells." arXiv: q-bio.MN/0411003, 2004. Submitted.

3. A. Margolin, I. Nemenman, K. Basso, U. Klein, C. Wiggins, G. Stolovitzky, R. Dalla Favera, and A. Califano, "ARACNE: An algorithm for reconstruction of genetic networks in a mammalian cellular context." arXiv: q-bio.MN/0410037, 2004. Submitted.

4. A. Margolin, I. Nemenman, C. Wiggins, G. Stolovitzky, and A. Califano, "On the reconstruction of interaction networks with applications to transcriptional regulation." arXiv: q-bio.MN/0410036, 2004. Submitted.

5. I. Nemenman and N. Tishby, "An axiomatic approach to the theory of information processing in networks," In preparation.

6. I. Nemenman, "Information theory, multivariate dependence, and genetic network inference," Tech. Rep. NSF-KITP-04-54, KITP, UCSB, 2004. arXiv: q-bio/0406015.

7. I. Nemenman, "Fluctuation-dissipation theorem and models of learning," Tech. Rep. NSF-KITP-04-20, KITP, UCSB, 2004. arXiv: q-bio/0402029. Submitted.

8. I. Nemenman, W. Bialek, and R. de Ruyter van Steveninck, "Entropy and information in neural spike trains: Progress on the sampling problem," *Phys. Rev. E*, vol. 69, p. 056111, 2004. arXiv: physics/0306063.

9. A. Silbergleit, I. Mandel, and I. Nemenman, "Potential and field singularity at a surface point charge," *J. Math. Phys.*, vol. 44, no. 10, pp. 4460–4466, 2003. arXiv: math-ph/0306039.

10. C. Wiggins and I. Nemenman, "Process pathway inference via time series analysis," *Experim. Mech.*, vol. 43, no. 3, pp. 361–370, 2003. arXiv: physics/0206031.

11. A. Silbergleit, I. Nemenman, and I. Mandel, "On the interaction of point charges in an arbitrary domain," *Techn. Phys.*, vol. 48, no. 2, pp. 146–151, 2003. arXiv: physics/0105052.

12. T. Holy and I. Nemenman, "On impossibility of learning in a reparameterization covariant

way," Tech. Rep. NSF-KITP-03-123, KITP, UCSB, 2002.

13. I. Nemenman, "Inference of entropies of discrete random variables with unknown cardinalities," Tech. Rep. NSF-ITP-02-52, KITP, UCSB, 2002. arXiv: physics/0207009.

14. I. Nemenman and W. Bialek, "Occam factors and model-independent Bayesian learning of continuous distributions," *Phys. Rev. E*, vol. 65, no. 2, p. 026137, 2002. Also appeared at *NIPS'00*. arXiv: cond-mat/0009165.

15. I. Nemenman, F. Shafee, and W. Bialek, "Entropy and inference, revisited," in *Advances in Neural Information Processing Systems 14* (T. G. Dietterich, S. Becker, and Z. Ghahramani, eds.), (Cambridge, MA), MIT Press, 2002. arXiv: physics/0108025.

16. W. Bialek, I. Nemenman, and N. Tishby, "Predictability, complexity, and learning," *Neur. Comp.*, vol. 13, pp. 2409–2463, 2001. arXiv: physics/0007070.

17. W. Bialek, I. Nemenman, and N. Tishby, "Complexity through nonextensivity," *Physica A*, vol. 302, pp. 89–99, 2001. arXiv: physics/0103076.

18. I. Nemenman, *Information Theory and Learning: A Physical Approach*. PhD thesis, Princeton University, Department of Physics, 2000. arXiv: physics/0009032.

19. R. Adler, I. Nemenman, J. Overduin, and D. Santiago, "On the detectability of quantum space-time foam with gravitational-wave interferometers," *Phys. Lett. B*, vol. 477, pp. 424–428, 2000. arXiv: gr-qc/9909017.

20. I. Nemenman and A. Silbergleit, "Explicit Green's function of a boundary value problem for a sphere and trapped flux analysis in Gravity Probe B experiment," *J. Appl. Phys.*, vol. 86, 1999. arXiv: math-ph/9901006.

21. J. Naud, I. Nemenman, M. Van Raamsdonk, and V. Periwal, "Minimal subtraction and the Callan-Symanzik equation," *Nucl. Phys. B*, vol. 540, 1999. arXiv: hep-th/9802181.

22. I. Kominis and I. Nemenman, "BGO dead crystall correction and shower fitting," Tech. Rep. 2157, CERN: L3, 1997.

23. A. Minkevich and I. Nemenman, "On the influence of the gravitating vacuum on the dynamics of homogeneous isotropic models in gauge theories of gravity," *Class. Quant. Grav.*, vol. 12, pp. 1259–1265, 1995.

24. A. Minkevich and I. Nemenman, "On the influence of gravitating vacuum on dynamics of homogeneous isotropic models in gauge-theories of gravity," *Dokl. Akad. Nauk Belar.*, vol. 39, no. 2, pp. 45–51, 1995. In Russian.