Curriculum Vitae
Aaditya V. Rangan

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- **Academic Affiliations and Professional Experience**
  - 2012-present: Courant Institute, NYU. Associate Professor
  - 2006-2012: Courant Institute, NYU. Assistant Professor
  - 2003-2006: Courant Institute, NYU. Postdoctoral Student
  - 1999-2003: University of California, Berkeley. Graduate Student

- **Education**
  - 2003: Ph.D. in Mathematics, University of California, Berkeley.
  - 1999: B.A. in Mathematics and Physics, Dartmouth College.

- **Research Interests**

  (1) Large-scale scientific modeling of physical, biological and neurobiological phenomena, and the development of efficient numerical methods and related analysis. (2) Large-scale analysis of genomic data, and the development of efficient methods for this analysis.

- **Grants**
  - NSF-NIH seed grant 24-74501-X0096-R9834: $24,696, 2016-2017.
  - NSF grant F7163: $355,580, 2012-2015.
  - NSF grant F6532: $270,000, 2009-2012.
  - Swartz Foundation: $54,000, 2006-2007.

- **Professional Activities**
  - Advised Postdoctoral fellows Y. Sun, D. Zhou, D. Hu and J. Zhang
  - Advised Ph.D. thesis research of M. Patel (M.D. Ph.D. Student)
  - Advised master's thesis research of Arjang Talattof, Brenda Jiminez, Rachid Ounit, Zuo Xi, Andrew Ronan and Sijing Shao, Quentin Chediak.
  - Reviewer for J. Comp. Phys., Comm. Math. Sci., Int. J. Comp. Math., CAMCoS., J. Comp. Neurosci., J. Stat. Phys. Neural. Comput., Neurocomputing, Advances in Computational Mathematics, and Phys. Rev. Lett.
  - Grant Reviewer for DOE and NSF.

- **Publications**
  - M. Patel, A.V. Rangan, *Role of the locus coeruleus in the emergence of power law wake bouts in a model of the brainstem sleep-wake system through early infancy*. J. Theoretical Biology. 426(7): 82-95 (2017).
  - H. Lei, Y. Yu, S. Zhu, A.V. Rangan, *Intrinsic and network mechanisms constrain neural synchrony in the moth antennal lobe*. Frontiers in Physiology, doi: 10.3389/fphys.2016.00080 (2016).

- J. Zhang, A.V. Rangan, *A reduction for spiking integrate-and-fire network dynamics ranging from homogeneity to synchrony*. J. Comput. Neurosci. 38(2):355-404. doi: 10.1007/s10827-014-0543-3 (2015).
- J. Zhang, D. Zhou, D. Cai and A.V. Rangan, *A coarse-grained framework for spiking neuronal networks: between homogeneity and synchrony*. J. Comput. Neurosci. DOI 10.1007/s10827-013-0488-y (2013).
- A.V. Rangan, L.S. Young. *Emergent dynamics in a model of visual cortex.,* J. Comput. Neurosci. 35(2): 155-167 DOI: 10.1007/s10827-013-0445-9 (2013).
- D. Zhou, A.V. Rangan, D.W. McLaughlin and D. Cai, Spatiotemporal dynamics of neuronal population response in the primary visual cortex. Proc. Nat. Acad. Sci. (USA). 110(23): 9517-9522 (2013)
- J. Zhang, K.A. Newhall, D. Zhou and A.V. Rangan, *Distribution of correlated spiking events in a population-based approach for Integrate-and-Fire networks*. J. Comput. Neurosci. 10.1007/s10827-013-0472-6 (2013).
- A.V. Rangan, L.S. Young. *Dynamics of spiking neurons: between homogeneity and synchrony.* J. Comput. Neurosci. 34(3) 433-460 DOI: 10.1007/s10827-012-0429-1 (2013).
- M. Patel, A.V. Rangan, D. Cai. *Coding of odors by temporal binding within a model network of the locust antennal lobe,* Frontiers in Computational Neuroscience. 7(50) DOI: 10.3389/fncom.2013.00050. (2013).
- A.V. Rangan, *A simple filter for detecting low-rank submatrices,* J. Comput. Phys. 231(7): 2682-2690, (2012).
- A.V. Rangan, *Detecting low-rank clusters of vectors via random sampling,* J. Comput. Phys. 231(1): 215-222, (2012).
- D. Hu, D. Cai and A.V. Rangan, *Blood Vessel Adaptation with Fluctuations in Capillary Flow Distribution*. PLoS One. 7(9): e45444 (2012).
- A.V. Rangan, *Functional Roles for Synaptic-Depression within a Model of the Fly Antennal Lobe*, PLoS Comput. Bio. 8(8): e1002622. (2012).
- D. Cai, L. Tao, M.S. Shkarayev, A.V. Rangan, D.W. McLaughlin, G. Kovacic, *The role of fluctuations in coarse-grained descriptions of neuronal networks*. Comm. Math. Sci. 10(1): 307-354 (2012).
- Y. Sun, A.V. Rangan, D. Zhou and D. Cai, *Coarse-grained event tree analysis for quantifying Hodgkin-Huxley neuronal network dynamics*. J. Comput. Neurosci. 32(1): 55-72. (2012).
- A.V. Rangan, *Efficient methods for grouping vectors into low-rank clusters,* J. Comput. Phys. 230(14): 5684-5703, (2011).
- D. Zhou, Y. Sun, A.V. Rangan, D. Cai, *Spectrum of Lyapunov exponents of non-smooth dynamical systems of integrate-and-fire type.*, J. Comput. Neurosci. 28(2): 229-245, (2010).
- Y. Sun, D. Zhou, A.V. Rangan, and D. Cai, *Pseudo-Lyapunov exponents and predictability of Hodgkin-Huxley neuronal network dynamics*, J. Comput. Neurosci. 28(2): 2247-266, (2010).
- M.S. Shkarayev, G. Kovacic, A.V. Rangan, and D. Cai. *Architectural and functional connectivity in scale-free integrate-and-fire networks*, Europhys. Lett. 88, 50001, (2010).
- K.A. Newhall, G. Kovacic, P. Kramer, A.V. Rangan, and D. Cai, *Cascade-Induced Synchrony in Stochastically-Driven Neuronal Networks*, Phys. Rev. E., 82, 041903 (2010).
- K.A. Newhall, G. Kovacic, P.R. Kramer, D. Zhou, A.V. Rangan, and D. Cai, *Dynamics of current-based Poisson driven, integrate-and-fire neuronal networks*, Commun. Math. Sci. 8(2): 541-600, (2010).
- A.V. Rangan, *Diagrammatic expansion of pulse-coupled network dynamics in terms of subnetworks*, Phys. Rev. E. 80(3): 036101, (2009).
- A.V. Rangan, *Diagrammatic expansion of pulse-coupled network dynamics,* Phys. Rev. Lett. 102, 158101, (2009).
- G. Kovacic, A.V. Rangan, L. Tao, and D. Cai, *Fokker-Planck description of conductance-based integrate-and-fire neuronal networks,* Phys. Rev. E, 80:021904, (2009).

- M. Patel, A.V. Rangan, and D. Cai, *A Large-scale Model of Locust Antennal Lobe*, J. Comput. Neurosci. 27(3): 553-567, (2009).
- Y. Sun, D. Zhou, A.V. Rangan, and D. Cai, *Library-based Numerical Reduction of the Hodgkin-Huxley Neuron for Network Simulation*, J. Comput. Neurosci. DOI 10.1007/s10827-009-0151-9, (2009).
- A.V. Rangan, L. Tao, G. Kovacic, and D. Cai, *Large-Scale Computational Modeling of the Primary Visual Cortex*, In K. Josic, M.A. Matias, R. Romo, and J. Rubin, editors, *Coherent Behavior in Neuronal Networks*, volume 3 of *Springer Series in Computational Neuroscience*, Springer-Verlag, 263-296, (2009).
- A.V. Rangan, L. Tao, G. Kovacic, and D. Cai, *Multi-scale Modeling of the Primary Visual Cortex*, IEEE Engineering in Medicine and Biology Magazine, 28(3):19-24, (2009).
- D. Zhou, Y. Sun, A.V. Rangan, and D. Cai, *Network-induced Chaos in integrate-and-fire neuronal ensembles*, Phys. Rev. E. 80(3): 031918 (2008).
- A.V. Rangan, D. Cai and D. McLaughlin, *Quantifying neuronal network dynamics through coarse-grained event trees*, Proc. Nat. Acad. Sci. (USA), 105, 10990 (2008).
- A.V. Rangan, D. Cai and G. Kovacic, *Kinetic theory for neuronal networks with fast and slow excitatory conductances driven by the same spike train*, Phys. Rev. E **77** 041915 (2008)
- A.V. Rangan and D. Cai, *Fast numerical methods for simulating large-scale integrate-and-fire neuronal networks*, J. Comput. Neurosci. 22, 81-100 (2007).
- A.V. Rangan, *Automatic coordinate transformation for two-point boundary value problems*, Commun. Math Sci. 5 (2007).
- A.V. Rangan, D. Cai and L. Tao, *Numerical methods for solving moment equations in kinetic theory of neuronal network dynamics*, J. Comput. Phys. 221, 781-798 (2007).
- A.V. Rangan and D. Cai, *Maximum-entropy closures for kinetic theories of neuronal network dynamics*, Phys. Rev. Lett. 96, 178101 (2006).
- D. Cai, L. Tao, A.V. Rangan and D. McLaughlin, *Kinetic theory for neuronal network dynamics*, Comm. Math. Sci. 4, 97 (2006).
- A.V. Rangan, D. Cai and D. McLaughlin, *Modeling the spatiotemporal cortical activity associated with the line-motion illusion in primary visual cortex*, Proc. Natl. Acad. Sci. (USA), 102, 18793 (2005).
- D. Cai, A.V. Rangan and D. McLaughlin, *Architectural and synaptic mechanisms underlying coherent spontaneous activity in V1*, Proc. Natl. Acad. Sci. (USA), 102**,** 5868 (2005).
- A.V. Rangan, *Adaptive solvers for partial differential and differential-algebraic equations*, Ph.D. Thesis (2003).

- **Seminars and Invited Presentations**
  - *Covariate-corrected 'Biclustering' of Gene-expression and GWAS-data*, Science at the Edge seminar, Michigan State University, Lansing, MI, February 2018.
  - *Covariate-corrected 'Biclustering' of Gene-expression and GWAS-data*, Graduate Student Postdoc Seminar, New York, NY, October 2017.
  - *Covariate-corrected 'Biclustering' of Gene-expression and GWAS-data*, PGC stat-gen call, New York, NY, February 2017.
  - *Biclustering Gene expression and GWAS data,* University of Pennsylvania, Philadelphia, PA, January 2017.
  - *Intrinsic and network mechanisms constrain neural synchrony in the moth antennal lobe*. University of Pennsylvania, Philadelphia, PA, November 2016
  - *Intrinsic and network mechanisms constrain neural synchrony in the moth antennal lobe*. SIAM dynamical systems conference, Boston, MA, July 2016.
  - *Covariate-corrected 'Biclustering' of Gene-expression and GWAS-data*, Mount Sinai Medical School, New York, NY, June 2016.

- *Can an insect teach us how to smell?,* Math for America (MFA), New York, NY, January 2015.
- *Biclustering Gene Expression Data*, Rensellaer Polytechnic University (RPI), Rensellaer, NY, April 2015.
- *Biclustering Gene Expression Data*, Simons Center for Data Analysis (SCDA), New York City, April 2015.
- *Biclustering Gene Expression Data*, Princeton University, Princeton, NJ, March 2015.
- *Biclustering*, Center for Urban Science and Progress (CUSP), New York City, October 2014.
- *Biclustering*, J. Craig Venters Institute, San Diego, July 2014.
- *Modeling neuronal network dynamics*, New York University, New York, October 2013.
- *Emergent dynamics in a model of the visual cortex*, University of Arizona, Tucson, February 2013.
- *Efficient methods for detecting low-rank substructure*, University of Pennsylvania, Philadelphia, February 2013.
- *Emergent dynamics in a model of the visual cortex*, University of Pennsylvania, Philadelphia, February 2013.
- *Functional roles for synaptic depression in the fly antennal lobe*, Rockefeller University, New York, January 2013.
- *Efficient methods for detecting low-rank substructure*, Courant Numerical Analysis Seminar, New York, February 2012.
- *Can classical population-dynamics methods capture the dynamics of cat/monkey visual cortex?* Ph.D. Conference, Bernstein Center, Freiburg, December 2011.
- *Efficient methods for detecting low-rank substructure,* Yale Applied Math Seminar, Connecticut, November 2011.
- *Can classical population-dynamics methods capture the dynamics of cat/monkey visual cortex?* SIAM dynamical systems conference, San Diego, November 2011.
- *Can classical population-dynamics methods capture the dynamics of the visual cortex?* Workshop on "Mean-field methods and multiscale analysis of neuronal populations", Marseille, France, October 2011.
- *Sequences of Coordinated Events within a Model of V1*, Sloan-Swartz 2011 Annual Meeting, Janelia Farms, VA, July 2011.
- *Detecting low-rank submatrices*, Linear Algebra Seminar, University of California at Berkeley, Berkeley, CA, April 2011.
- *A diagrammatic population-dynamics framework for neuronal networks*, Applied Math Seminar, University of California at Berkeley, Berkeley, CA, April 2011.
- *Possible Mechanisms Affecting Olfactory Coding in the Locust and Fly,* Neuroscience Seminar, University of Arizona, AZ, April 2011.
- *Various attempts to use population-dynamics frameworks to understand some neuronal networks,* Faculty Exchange, New York University, NYU, October 2010.
- *Functional roles for synaptic depression in the fly olfactory system,* Conference on Dynamic Olfaction, Brighton, UK, August 2010.
- *Functional roles for synaptic depression in the fly olfactory system,* Seminar, University Paris 5, France, July 2010.
- *Functional roles for synaptic depression in the fly olfactory system,* Seminar, IHES, France, July 2010.
- *Coding and reliability in the fly olfactory system*, Sloan-Swartz Annual Meeting, Harvard University, Boston, August 2009.
- *Diagrammatic representation of pulse-coupled network dynamics*, SIAM Conference on Dynamical Systems at Denver, Colorado, July 2009.
- *Diagrammatic representation of pulse-coupled network dynamics*, SIAM Conference on Dynamical Systems at Snowbird, Salt Lake City, Utah, May 2009.

- *Coding and reliability in the fly olfactory system*, Neuroscience seminar, Columbia University, New York, May 2009.
- *Coding and reliability in the fly olfactory system*, NeuroFriday seminar, Courant Institute of Mathematical Sciences, New York, April 2009.
- *Diagrammatic representation of pulse-coupled network dynamics*, IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, University of Georgia, Athens, March 2009.
- *Diagrammatic representation of pulse-coupled network dynamics*, SIAM Conference on Dynamical Systems, McGill University, Montreal, August 2008.
- *A Brief Introduction to Computational Neuroscience*, Courant Institute CSplash outreach, New York, New York, 2008.
- *Linking architecture and dynamics for a simple neuronal system*, AIMS International Conference on Dynamical Systems, Differential Equations and Applications, University of Texas at Arlington, May 2008.
- *Diagrammatic representation of pulse-coupled network dynamics*, Applied math seminar, Princeton University, May 2008.
- *Modeling the Primary Visual Cortex (V1)*, Northwestern University Colloquium, Chicago Illinois, March 2008.
- *A Brief Introduction to Computational Neuroscience*, RPI Undergraduate Colloquium, Troy, New York, October 2007.
- *Coding and Causality in Cortex*, RPI Applied Math Colloquium, Troy, New York, October 2007.
- *Olfactory Coding and Recognition*, Sloan-Swartz Annual Summer Meeting, San Diego, California, July 2007.
- *Line-motion Illusion*, New Jersey Institute of Technology Math Department Colloquium, March 2007.
- *Numerical Methods for Kinetic Theory of Neuronal Networks*, Courant Bio-Math Seminar, New York, New York, February 2007.
- *Coding in Cortex*, Workshop for Computational Neuroscience, Tucson, Arizona, February 2007.
- *Modeling the Visual Cortex*, Computational Biology Seminar, New York, New York, December 2006.
- *Coding, Correlations and Causality in Cortex*, Courant Applied Math Seminar, New York, New York, November 2006.
- *Mechanisms underlying the Line Motion Illusion*, Boston University Math Seminar, Boston, Massachusetts, October 2006.
- *Numerical Methods for Cortical Modeling*, Applied Math Seminar, Houston, Texas, October 2006.
- *Line-motion Illusions*, Vision Quest: Connecting Spontaneous Neural Activity and Perception, New York Academy of Sciences, June 2006.
- *The line-motion illusion – an insight into cortical function*, Dartmouth Applied Math Seminar, Hanover, New Hampshire, May 2006.
- *Network mechanisms and cortical operating points*, Computational Approaches to Cortical Functions, Banbury Center, New York, April 2006.
- *Modeling the visual cortex*, Duke Applied Math Seminar, Durham, North Carolina, February 2006.
- *Modeling the visual cortex*, Applied Math Seminar, College Station, Texas, February 2006.
- *Spatiotemporal dynamics of the line-motion illusion in primary visual cortex*, Courant Applied Math Seminar, New York, New York, October 2005.
- *Spatiotemporal dynamics of the line-motion illusion in primary visual cortex*, Berkeley Applied Math Seminar, Berkeley, California, September, 2005.

- *Fast numerical algorithms with applications to neural modeling*, (invited lecture series), Peking University, Beijing, China, June 2005.
- *Spontaneous activity in the visual cortex,* SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2005.
- *Kinetic theories of neuronal networks*, SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2005.
- *Coherent spontaneous ongoing activity in cortex*, SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2005.
- *Spatiotemporal dynamics of the line-motion illusion in primary visual cortex*, Courant Bio-math Seminar, New York, New York, April 2005.
- *Modeling the spatiotemporal dynamics of the primary visual cortex*, Courant Applied Math Lab Seminar, New York, New York, February 2005.
- *Spontaneous activity in the visual cortex*, RPI Mathematical Sciences Colloquium, Troy, New York, November 2004.
- *Fast algorithms for neuronal network simulations*, AIMS' Fifth International Conference on Dynamical Systems and Differential Equations, Pomona, California, June 2004.
- *Applications of deferred correction*, RPI applied math days, Troy, New York, November 2003.
- *Modeling the patterned spontaneous activity in the visual cortex*, First SIAM Nonlinear Waves and Coherent Structures, Orlando, Florida, October 2004.
- *Applications of deferred correction to partial differential equations and differential-algebraic equations*, Numerical Analysis Day, Stanford, California, March 2003.