

(Last, First, Middle):		<b>Nagarajan, Radhakrishnan</b>	
<b>Curriculum Vitae</b>			
NAME <b>Radhakrishnan Nagarajan</b>		POSITION TITLE Assistant Professor	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	Graduation Date	FIELD OF STUDY
University of Madras, India	B.S.	1992	Mathematics
Indian Institute of Science, India	M.E. (Int.)	1998	Biomedical Engineering
University of Arkansas at Little Rock	Ph.D.	2001	Biomedical Engineering
University of Arkansas for Medical Sciences	Post-Doctoral Fellow	2001-2003	Bioinformatics/Systems Biology

**Contact** Department of Biostatistics

University of Arkansas for Medical Sciences

College of Public Health Bldg, Rm: 3234, Little Rock, AR 72205, USA

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Phone: (501) 526 6734

**VISA Status:** Permanent Resident USA.

**A. Professional Experience**

2003-2005: Research Instructor, Institute on Aging, University of Arkansas for Medical Sciences.

Areas of Research: Bioinformatics and Systems Biology

2005-2006: Research Assistant Professor, Institute on Aging, University of Arkansas for Medical Sciences

Areas of Research: Bioinformatics and Systems Biology

2006-Present: Assistant Professor, Biostatistics, University of Arkansas for Medical Sciences

Areas of Research: Medical Informatics and Systems Biology

Member of Bioinformatics Steering and Admissions Committee for the joint Bioinformatics Program.

Adjunct Faculty, Dept. Computer Science, University of Arkansas at Little Rock.

**B. Extramural Research Support**

**COMPLETED**

**American Federation for Aging Research (AFAR):** Modeling Changes in Myoblast Progenitors with Age

**Role: Principal Investigator**, Mechanism: **Junior Faculty Grant (2005 Aug. - 2006 Aug)**, Direct Cost: \$55000

Description: Investigate the heterogeneity, functional relationships and altered differentiation potential of crucial myogenic (Myogenin, Myf-5, MyoD1), adipogenic (C/EBP $\alpha$ , CHOP10, FoxC2, PPAR $\gamma$ ), Wnt pathway related genes (Lrp5, Wnt5a) as a function of age using clonal analysis in conjunction with suitable statistical and computational techniques. Our findings confirmed aberrant expression of adipogenic markers in addition to myogenic markers in orchestrating aged myogenic progenitor differentiation.

**National Library of Medicine (NLM/NIH):** CloNET: Modeling Genetic Networks from Clonal Expression Profiles

**Role: Principal Investigator**, Mechanism: **R03 (2005 Sept. - 2008 Sept)** Direct cost: \$100,000

Description: There has been recent interest in understanding how genes work in concert as a system as opposed to independent entities. The focus is on developing a battery of machine learning algorithms to model functional relationships, causal/network structure from clonal gene expression profiles. Enhance statistical approaches and algorithms for the discovery of causal relationships from heterogeneous data. Subsequently, these algorithms will be made available publicly in the form of a software package (NATbox) developed in the open-source language R. The package (NATbox) will be subsequently used (i) to investigate similar paradigms, (ii) as teaching tool in graduate and undergraduate courses (iii) encourage seamless transition between mathematical and biological disciplines. NATbox was recently presented at (Rocky 08) Rocky Mountain Bioinformatics Conference. A modified version of the toolbox with computationally efficient parallelization routines was presented at the

Mid-South Computational Biology and Bioinformatics Society (MCBIOS, 2009). A web-page of NATbox (under construction) can be found at [http://bioinformatics.ualr.edu/~shweta/natboxWiki/index.php/Main\\_Page](http://bioinformatics.ualr.edu/~shweta/natboxWiki/index.php/Main_Page).

## **ONGOING**

### **National Science Foundation (Advances in Biological Informatics) (July 2009 – July 2012)**

**Role: Principal Investigator** (Collaborative proposal/multiple PI initiative)

A Web-Based Method to Model and Predict Neurodevelopment across Mammalian Species.

Predicting neurodevelopmental events across species using machine learning approaches.

### **National Center for Research Resources (NCRR/NIH), Clinical and Translational Science Award (CTSA)**

#### **(July 2009 – July 2012)**

**Role: Informatics Personnel** (10% support) PI: Lowery

Social network analysis

## **C. Current Research**

### **Independent Research**

- (i) Systems Biology: Inferring causal relationships and network structure from heterogeneous data.
- (ii) Machine Learning applications in Medical Informatics and Clinical Decision Support.
- (iii) Bioinformatics Software development.

### **Collaborative Research**

- (i) Neuroinformatics, Social Network Analysis and Dynamical Systems

## **D. Professional Services**

- Steering and Admissions Committee for the joint Bioinformatics Program, University of Arkansas for Medical Sciences (2006-onwards).
- Undergraduate faculty mentor for the INBRE (IDeA Networks of Biomedical Research Excellence ) summer outreach program.
- Program Committee Member for 2nd International Conference on Agents and Artificial Intelligence (ICAART 2010), Jan, 22-24, Valencia, Spain.
- Program Committee Member for BIOINFORMATICS 2010 (BIOSTEC), Jan, 20-23, Valencia, Spain.
- Program Committee Member for (Tracks: Bioinformatics and Data Mining), International Conference on Machine Learning and Applications, ICMLA 09, Dec. 13-15, 2009, Miami, FL.
- Program Committee Member, IEEE International Conference on Bioinformatics and Biomedicine (BIBM 09), Washington DC, Nov. 1-4, 2009.
- Program Committee Member, IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS), Minneapolis, May. 17-21, 2009.
- Program Committee Member for IEEE Conference on Evolutionary Computation (Tracks: Evolutionary Computation in Bioinformatics and Computational Biology) , CEC 2009, May 18-21, 2009, Trondheim, Norway.
- Program Committee Member for (Tracks: Bioinformatics and Signal Processing), IEEE International Symposium on Signal Processing and Information Technology, ISSPIT 08, Dec16-19, 2008, Sarajevo/Bosnia.
- Program Committee Member for (Tracks: Bioinformatics and Data Mining), International Conference on Machine Learning and Applications, ICMLA 08, Dec. 11-13, 2008, San Diego/CA.
- Program Committee Member for (Tracks: Bioinformatics and Data Mining), International Conference on Machine Learning and Applications, ICMLA 07, Dec. 13-15, 2007, Cincinnati/Ohio.
- Program Committee Member for 1st Workshop on Data Mining in Functional Genomics in Conjunction with IEEE International Conference on Bioinformatics and Biomedicine. Philadelphia, PA, USA, Nov. 5-7, 2008

**Grant Reviewer**

Ad-hoc member of the Special Emphasis Panel/Scientific Review Group, National Institutes of Health, 2009.  
Ad-hoc Reviewer for Israel Science Foundation, The Israel Academy of Science and Humanities, 2002.

**Member of Doctoral Dissertation Committees:**

Chuan Li Zhang. Dept. Computer Science, University of Arkansas at Little Rock.  
Shweta Chavan. Joint Bioinformatics Program, University of Arkansas at Little Rock.  
Michael Bauer. Joint Bioinformatics Program, University of Arkansas at Little Rock.  
Lab Rotation Students: Shweta Chavan (2007), Somdutta Saha (2007), Yuan Lin (2008), Horacio Gomez-Acevedo (2009).

**Editorial Services**

Editorial Board Member for peer-reviewed journal Current Bioinformatics, Bentham Publishers (2008 -onwards).  
Editorial Board Member for peer-reviewed journal Genomic Insights, Libertas Academica (2008 - onwards).  
Ad-hoc Reviewer for Book Series Springer-Verlag issue on Studies in Computational Intelligence. (2007)  
Reviewer for peer-reviewed journal Bioinformatics, Oxford University Press. (- 2009)  
Reviewer for peer-reviewed journal BMC Bioinformatics, Biomed Central/Open Access. (- 2009)  
Reviewer for peer-reviewed journal BMC Systems Biology, Biomed Central/Open Access. (2009)  
Reviewer for peer-reviewed journal Neurocomputing, Elsevier.  
Reviewer for peer-reviewed journal Reproductive Sciences, SAGE publications.  
Reviewer for peer-reviewed journal International Journal of Imaging Systems and Technology, Wiley Interscience.  
Reviewer for peer-reviewed journal IEEE Transactions in Medical Imaging, IEEE Press (2003-2004).  
Reviewer for peer-reviewed journal IEEE Transactions on Knowledge and Data Engineering, IEEE Press (2003-2004).  
Reviewer for peer-reviewed journal IEEE Transactions on Biomedical Engineering, IEEE Press.  
Reviewer for peer-reviewed journal IEEE Engineering in Medicine & Biology, IEEE Press.  
Reviewer for peer-reviewed journal Physica A, Statistical Mechanics and its Applications, Elsevier (2005-2006).  
Reviewer for peer-reviewed journal International Journal of Bifurcation and Chaos, World Scientific (2000-present).  
Reviewer for peer-reviewed journal IEEE Transactions on Information Theory, IEEE Press (2007-2008).  
Reviewer for International Symposium on Circuits and Systems (ISCAS) ISCAS 2001, Sydney, Australia, IEEE Circuits and Systems Society.  
Reviewer for peer-reviewed journal Atmospheric environment, Elsevier Press, (2008-2008).

**E. Professional Affiliations**

Member International Society for Computational Biology (ISCB).  
Member American Medical Informatics Association (AMIA).  
Member of MCBIOS (MidSouth Computational Biology and Bioinformatics Society).  
Senior Member IEEE.

**F. Peer-Reviewed Publications****Book Chapter**

1. **Nagarajan R** [2008] Power-law Signatures and Patchiness in Genechip Oligonucleotide Microarrays, Computational Intelligence in Biomedicine and Bioinformatics: Current Trends and Applications, Chapter XV, Springer-Verlag, pp. 375-398.

2. **Nagarajan, R.** [2007] cDNA Microarrays: A Trouble shooting guide: Experts share their advice on constructing and analyzing cDNA microarrays. **Genome Technology (Invited Magazine Article).**

### Peer-reviewed Publications in Journals

#### Bioinformatics and Computational Biology:

3. **Nagarajan, R** [2009] A note on inferring acyclic network structures using Granger causality tests, International Journal of Biostatistics Vol. 5 : Iss. 1, Article 10.
4. Dupont-Versteegden, E.E. **Nagarajan, R.** Beggs, M.L. Bearden, E.D. Simpson, P.M. Peterson, C.A. Identification of cold-shock protein RBM3 as a possible regulator of skeletal muscle size through expression profiling. [2008] Am. J. Physiology (Reg. Physiology). 295(4). R1263-73.
5. **Nagarajan, R** , Clancy, B [2008] Phylogenetic proximity revealed by neurodevelopmental event timing. Neuroinformatics 6(2), 71-79.
6. **Nagarajan, R**, Upreti, M [2008] Comment on Causality and Pathway search in microarray time series experiment. Bioinformatics 24(7), 1029-1032.
7. **Nagarajan, R** Szczepanski, J, Wanjryb, E. [2008] Interpreting non-random signatures in biomedical signals using Lempel-Ziv complexity, Physica D 237(3) 359-364.
8. Varma, V. Yao-Borengasser, A. Bodles, A.M. Rasouli, N. Phanavanh, B. Nolen, G.T. **Nagarajan, R.** Spencer III, H.J. Lee, M-J. Fried, S.K. McGehee, R.E. Peterson, C.A. and Kern, P.A. [2008] Thrombospondin-1 (TSP1) is an adipokine associated with obesity, adipose inflammation and insulin resistance. Diabetes, 57(2), 432-439.
9. **Nagarajan, R** and Upreti, M [2006] Qualitative Assessment of Gene Expression in Affymetrix Genechip microarrays. Physica A, 373(1), 486-496.
10. **Nagarajan, R** Upreti, M and Govindan, R.B. [2006] Qualitative assessment of cDNA microarrays using detrended fluctuation analysis Physica A, 373(1), 503-510.
11. **Nagarajan, R.** Upreti, M. [2006] Correlation Statistics for Microarray Image Analysis. IEEE/ACM Transactions on Computational Biology and Bioinformatics. 3(3) 232-238.
12. Kavasseri, R.G and **Nagarajan, R** [2006] Synchronization in electrically coupled neural networks. Complex Systems 16(4), 06.
13. **Nagarajan, R** and Upreti, M [2006] Impact of tandem repeats on the scaling of nucleotide sequences International Journal of Bifurcation and Chaos, Vol. 16(10) 3103-3108.
14. **Nagarajan, R.** Aubin, J.E. and Peterson, C.A. [2005] Robust Dependencies and Structures in Stem Cell Differentiation. International Journal of Bifurcation and Chaos, 15(4), 1503-1514.
15. **Nagarajan, R.** Aubin, J.E. and Peterson, C.A. [2004] Modeling Genetic Networks using Clonal Analysis. Journal of Theoretical Biology, 230(3), 259-273.
16. **Nagarajan, R** [2003] Intensity-based Segmentation of Microarray Images. IEEE. Transactions on Medical Imaging, 22(7), 882-889.
17. **Nagarajan, R** and Peterson, C.A. [2002] Identifying Spots in Microarray Images IEEE Transactions on Nanobioscience, 1(2), 78-84.
18. Beggs, M.L. **Nagarajan, R.** Taylor-jones, J. Nolen, G. Macnicol, M. Peterson, C.A. [2004] Alterations in TGF $\beta$  signalling pathways in myogenic progenitor with age. Aging Cell. 3. 353-361.
19. Burton G.R, **Nagarajan, R**, Peterson, C.A. and Mcgehee, R.E. [2004] Microarray Analysis of Differentiation-Specific Gene Expression During 3T3-L1 Adipogenesis. Gene, (329) 167-185.
20. Dennis RA, Trappe TA, Simpson P, Carroll C, Huang BE, **Nagarajan R**, Bearden E, Gurley C, Duff GW, Evans WJ, Kornman K, Peterson CA. [2004] Interleukin-1 polymorphisms are associated with the inflammatory response in human muscle to acute resistance exercise. Journal Physiology 2004 Nov 1:617-26.

21. Burton, G.R. Guan, Y. **Nagarajan, R** and McGehee, R.E, [2002] Microarray Analysis of Gene Expression during Early Adipocyte Differentiation. Gene, 293, 21-31.
22. **Nagarajan, R**, Eswaran, H. Wilson, J.D. Lowery, C. Murphy, P. and Hubert, P. [2003] Analysis of Uterine Contraction – A dynamical approach. Journal of Maternal-Fetal and Neonatal Medicine, 14(1), 8 –21 - Invited Tutorial Review\*
23. **Nagarajan, R** [2002] Quantifying the Regularity of Physiological data with Lempel-Ziv complexity – Certain Issues. IEEE Trans. Biomed. Engg, 49, 1371-1373.
24. **Radhakrishnan, N.** Wilson, J.D. Lowery, C. Eswaran, E. and Murphy, P. [2000] Testing for Nonlinearity of Contraction Segments in Uterine Electromyography. International Journal of Bifurcation and Chaos, 10(12), 2785-2790.
25. **Radhakrishnan N.** Wilson, J.D. Lowery, C. Eswaran, H. and Murphy, P. [1999] A Fast Algorithm to Detect Contraction Segments in Uterine Electromyography. IEEE Engg. Med. Biol, March/April, 89-94.
26. **Radhakrishnan, N** and Gangadhar, B.N. [1998] Estimating Regularity in Epileptic Seizure Time Series Data. IEEE Engg. Med. Biol, May/June, 89-94.

#### Applied Mathematics

27. **Nagarajan, R** [2006] Delay estimation in a two-node acyclic network Physica A 326, 725-737.
28. **Nagarajan, R** [2006] Surrogate testing of volatility series from long-range correlated noise Physica A (article in press, Epub online).
29. **Nagarajan, R** [2006] Is non-Gaussianity sufficient to produce long-range volatile correlations? Physica A, 370, 355-363.
30. **Nagarajan, R** [2006] Surrogate testing of linear feedback processes with non-Gaussian innovations (Physica A, 366, 530-538).
31. **Nagarajan, R** [2006] Reliable scaling exponent estimation of long-range correlated noise in the presence of random spikes Physica A, 366, 1-17.
32. **Nagarajan, R** [2006] Effect of coarse-graining on detrended fluctuation analysis Physica A, 363, 226-236.
33. Kavasseri, R.G and **Nagarajan, R** [2006] A qualitative description of boundary layer wind-speed records. Fluctuation and Noise Letters, 6(2), L201-L213.
34. **Nagarajan, R.** and Kavasseri, R.G. [2005] Minimizing the effect of trends on detrended fluctuation analysis of long-range correlated noise. Physica A, 354, 182-198.
35. **Nagarajan, R** and Govidan R.B. [2005] Appropriateness of correlated first-order autoregressive process (CAR) in modeling daily temperature records Physica A, 364, 271-275.
36. **Nagarajan, R** [2005] Local analysis of dissipative dynamical systems. International Journal of Bifurcation and Chaos, 15(5), 1515-1547 - Invited Tutorial Review\*
37. **Nagarajan, R** and Kavasseri, R.G [2005] Minimizing the effect of sinusoidal trends in detrended fluctuation analysis. International Journal of Bifurcation and Chaos, 15(5), 1767-1773.
38. **Nagarajan, R.** and Kavasseri, R.G. [2005] Minimizing the effects of periodic and quasi-periodic trends on detrended fluctuation analysis. Chaos, Solitons and Fractals, 26, 777-784.
39. **Nagarajan, R** [2003] Surrogate testing by estimating local dispersions in phase space. International Journal of Bifurcation and Chaos, 13(8). 2241-2251
40. Kavasseri, R.G and **Nagarajan, R** [2004] A Multifractal Description of Wind Speed Records. Chaos Solitons and Fractals 24(1), 165-173.
41. Kavasseri, R.G and **Nagarajan, R** [2004] Evidence of crossover phenomena in wind speed variability. IEEE Circuits and Systems I, 51(11), 2255-2262.

42. **Radhakrishnan, N.** Wilson, J.D. and Loizou, P. [2000] An Alternate Partitioning Technique to Quantify the Regularity of Complex Time Series. International Journal of Bifurcation and Chaos, 10(7), 1773-1779.

#### Peer-reviewed Conference Proceedings

1. Chavan, S, Bauer, M. Scutari, M. and **Nagarajan, R\*** [2009] NATbox: A Network Analysis Toolbox in R. BMC Bioinformatics, Proceedings MCBIOS 09, **(in press, Mentor)**.
2. Bouaynaya, N. Schonfeld, D. and **Nagarajan, R** [2009] Analyzing temporal gene expression profiles using time dependent MUSIC algorithm. Proceedings IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS 2009), Minneapolis, May. 17-21, pp. 1-4.
3. **Nagarajan, R**, Upreti, M, Milanova, M. [2008] Identifying non-random signatures from gene expression profiles. Pattern Recognition in Bioinformatics (PRIB 08), Melbourne Australia, Oct. 15-17. Published in Lecture Notes in Computer Science, Springer-Verlag, pp: 299-310.
4. **Nagarajan, R**, Nagarajan, A, Milanova, M. [2007] Information retrieval from a phoneme time series database. 7th IEEE International Symposium on Signal Processing and Information Technology (ISSPIT 07). Dec. 15<sup>th</sup>-18<sup>th</sup>, Cairo, Egypt. Published in Proceedings of the IEEE ISSPIT 2007, pp: 989-994.
5. **Radhakrishnan, N.** Wilson, J.D. and Hawk, R.M. [2000] Detecting Nonlinear Patterns in Physiological signals, International Conference on Information Technology Applications in Biomedicine. ITAB-ITIS 2000, Virginia. Published in Proceedings IEEE EMBS ITAB-ITIS 2000, 365-370.

#### Poster/Abstracts/Presentations:

1. R. Jilka, L. Climer, A. DeLoose, **R. Nagarajan**, C. A. O'Brien, R. S. Weinstein, S. C. Manolagas, Balanced remodeling in response to sustained PTH elevation requires osteoclastic bone resorption, sclerostin suppression, as well as increased angiogenesis. American Society for Bone and Mineral Research, Denver Colorado, Sep. 11-15, 2009.
2. Chavan, S. Bauer, M. Scutari, M. and **Nagarajan, R\*** [2009] Parallelized Network Analysis Toolbox (NATbox), 6<sup>th</sup> Midsouth computational biology and Bioinformatics Conference, MCBIOS VI Annual Rocky Mountain Bioinformatics Conference (MCBIOS VI), Starkville, Mississippi, Feb. 20-21, 2009. **[\*Mentor, Presenter: S. Chavan]**
3. Chavan, S. Scutari, M. and **Nagarajan, R\*** [2008] NATbox: A Network Analysis Toolbox in R, 6<sup>th</sup> Annual Rocky Mountain Bioinformatics Conference (Rocky 08), Aspen, Colorado, Dec. 4-7, 2008. **[\*Mentor, Presenter: S. Chavan]**
4. Clancy, B. **Nagarajan, R.** Darlington, R.B. 3 and Finlay, B.L. [2008] Translating the timing of neurodevelopment across animal models to humans: what works, What doesn't and What's next. 25th International Neurotoxicology Conference. Rochester, New York. Oct. 12-16, 2008.
5. Hanna, E.Y. **Nagarajan, R**, Li, S. Burton, G.R. and McGehee, R.E. [2005] Classification of metastasis and non-metastasis head and neck squamous-cell carcinoma. American Head and Neck Society Annual Meeting, May, 2005, Boca-Raton, Florida.
6. Kavasseri, G and **Nagarajan, R.** [2004] Coherent bursting activity in a gap junction coupled array of bursting Neurons SIAM 2004, Conference on the Life Sciences, Portland Oregon.
11. Trappe, T.A. Simpson, P. Huang, E. **Nagarajan, R.** Bearden, E. Carroll, C. Gurley, C. Kornman, K. Peterson, C. A. IL-1 Polymorphisms are associated with the inflammatory response to resistance exercise, Federation of American Societies for Experimental Biology (FASEB) 2004 April, 2004 Washington, DC.

7. Beggs, M.L. **Nagarajan, R.** Taylor-Jones, J.M. and Peterson, C.A. Age-dependent changes in myogenic progenitor potential revealed by gene-expression profiling, (FASEB) Federation of American Societies for Experimental Biology (FASEB) Conf. Skeletal Muscle and Satellite Cells, July, 2003, Tuscon, Arizona.
8. Eswaran. H. Lowery, C. Wilson, J.D. Murphy, P. and **Radhakrishnan, N** [1999] Recording and Analyzing Uterine Electromyographic Signals Using Abdominal Electrodes Central Association for Obstetrics and Gynecology, 67th Annual Meeting, Oct 25-27. Hawaii.

#### Invited Talks/Presentations:

- (a) Title: Inferring network structure using bayesian structure learning techniques. Joint Statistical Meeting (JSM), Washington DC (Oral Presentation/Topic contributed paper), Aug 1, 2009.
- (b) Title: On Granger Causality and Transcriptional Networks. Invited Webinar presentation, French Association on Artificial Intelligence Study Group, France. (<http://www.afia-france.org/tiki-index.php>), June 18<sup>th</sup>, 2009.
- (c) Title: Systems Biology: Inferring Causal Relationships and Network Structure. University of North Texas, Department of Biology, Denton on June 4<sup>th</sup>, 2009.
- (d) Title: Inferring transcriptional circuitry from gene expression profiles. Texas A & M University, Department of Statistics, College Station on October 10<sup>th</sup> 2007.
- (e) Title: Interpreting Gene Expression Signatures at Arizona State University, Department of Biomedical Informatics, Phoenix on April 24<sup>th</sup> 2006.

#### Other Talks/Presentations

- School of Life Sciences, Jawaharlal Nehru University, New Delhi/India, June 2003.
- Rutgers University, Center for Molecular and Behavioral Neurosciences, Newark, August 2001.
- Brown University, Division of Applied Mathematics, Providence, July 2001.
- University of Texas Health Science Center, Houston, July 2000.