UF | UNIVERSITY of FLORIDA

**College of Medicine**
Department of Pediatrics
Division of Pediatric Neurology

PO Box 100296
Gainesville, FL 32610
352-273-8920
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Professor David Sheinberg
Search Committee Chair,
Department of Neuroscience,
Brown University, Providence, RI

March 19, 2012

Re: Application for faculty position in Computational Neuroscience

Dear Dr Sheinberg,

I am herewith submitting my application for consideration for faculty position within the Department of Neuroscience at Brown University. The search committee is seeking candidates who use computational approaches to address fundamental issues in neural information processing with particular emphasis on neurologic and psychiatric disorders. This description is very well aligned with my research expertise and interests. I was extremely pleased with my correspondence with you dated April 18th 2012 and am encouraged to submit my application for this position.

I obtained my PhD in Physics from the University of California, San Diego, with specialization in Computational Neuroscience. My thesis research focused on developing biophysically realistic neuronal network models for avian song learning. My postdoctoral work led to an important discovery for the role for circadian rhythms in the neural dynamics of epileptic brain. In my current position as an Assistant Professor on tenure track at the University of Florida, College of Medicine, Department of Pediatrics, my research is revolved around the phenomenon of neural synchrony and its implications for the normal and diseased brain function.

Teaching is the core of my interest and the reason for my liking of academic career. I am very much interested in integrating teaching into my research. During my current tenure at the UF College of Medicine, I have taken the initiative to design and direct graduate courses on Neural Modeling and Computational Neuroscience, offered through the Department of Biomedical Engineering and Neuroscience respectively. These courses are one of a kind at UF and I have received rave reviews from the students who have registered for this class over the years. I am chair on thesis committee of two students who took my class and presently am on the thesis committee of three students in as diverse areas as Electrical engineering, Physics and Clinical Psychology. I am therefore seeking opportunity in a Department where I can leverage my skills to promote student education and research simultaneously.

I am motivated to submit my application for this position for a number of reasons. As stated above, I am very much interested in seeking opportunity to work in an environment that promotes teaching and research on equal footing. The mission of the Department of Neuroscience "to do excellent teaching and research on the basic functions and diseases of the nervous system" is well aligned with my long-term career objectives. Furthermore, the Department has some of the best and world-renowned theoretical neuroscience researchers on its faculty list and it will be an honor for me to have an opportunity to interact with and learn from these esteemed scientists. Furthermore the Department has strong interactions with the Brown's Institute for Brain Science, a multidisciplinary consortium that promotes experimental and theoretical studies of the brain.

It is for these reasons that I am excited to submit my application for consideration for faculty position. I sincerely look forward to an opportunity to interview for this position in the near future.

Sincerely,

Sachin S. Talathi
Department of Pediatrics, Division of Neurology,
University of Florida, Gainesville, FL, 32610

# SACHIN SUBHASH TALATHI, PH.D

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352.870.0229 (Cell)

## Education

June 2006 Ph.D., Physics, Univ of California, San Diego
Dissertation: "Biophysical modeling of synaptic plasticity and its function in the dynamics of neuronal networks"
Advisor: Henry Abarbanel, Professor

Mar 2004 M.S., Physics, Univ of California, San Diego

June 2001 B.Tech, Engineering Physics, Indian Institute of Technology, Bombay, India (GPA 3.8/4.0)

## Specialized Training

Aug 2007 Neuroinformatics course, Marine Biology Institute, Woods Hole, Massachusetts

Aug 2005 Computational Brain Network Dynamics course, Helmholtz Institute, Potsdam, Germany

Jul 2005 Experimental and Computational Neurodynamics course, Center for Theoretical Biological Physics, Univ of California, San Diego

## Employment History

| | |
|---|---|
| Nov 2010-Present | Joint Faculty, Dept of Neuroscience, Univ of Florida |
| Aug 2010-Present | Affiliate Faculty, Dept of Biomedical Engineering, Univ of Florida |
| July 2010-Present | Assistant Professor, Dept of Pediatrics, Division of Neurology, Univ of Florida |
| Aug 2009-Present | Graduate Faculty, Dept of Biomedical Engineering, Univ of Florida |
| May 2009-Jun 2010 | Assistant Research Scientist, Dept of Biomedical Engineering, Univ of Florida |
| Spring 2009 | Instructor, Dept of Biomedical Engineering, Univ of Florida |
| Sept 2006-April 2009 | Postdoctoral Fellow, Dept of Biomedical Engineering, Univ of Florida |
| Summer 2006 | Instructor, Dept of Physics, Univ of California San Diego |

## Honors and Awards

| | |
|---|---|
| 2012 | Early Career Award, Mathematical Biosciences Institute, Ohio State University (declined) |
| 2009 | Susan S. Spencer Junior Investigator award at the 4th international seizure prediction workshop |
| 2008 | Postdoctoral Fellowship, Epilepsy Foundation of America, $40000 |
| 2007 | Scholarship, Neuroinformatics summer school, Marine Biology Institute, Woods Hole, MA |
| 2005 | Scholarship, Computational Brain Network Dynamics summer school, Helmholtz Institute, Potsdam, Germany |
| 2004 | NSF-graduate trainee award to visit Max Plank Institute for Neurobiology, Munich, Germany |
| 2003-06 | Graduate Research Fellowship, Center for Theoretical Biophysics, Univ of California, San Diego |
| 2000 | Bhibha Majumdar scholarship for outstanding academic performance, Indian Institute for Technology, Bombay, India |

## Research Experience

July 2010- Present Dept of Pediatrics, Univ of Florida

- Influence of circadian factors in the evolution to epilepsy.
- Theoretical study of control strategies for neural synchrony with optical neurostimulation.
- Dynamic clamp experiments for control of neural synchrony
- Support Vector Machine algorithms for seizure detection
- Directionality measures for neural time seried data

Aug 2006–Jun 2010 Biomedical Engineering, Univ of Florida

- Influence of circadian factors in the evolution to epilepsy.
- Application of machine learning algorithms to improve performance of early seizure detection methods in a real time environment.
- Development and testing of non-parametric early seizure detection algorithms for their utility in real time closed loop seizure intervention systems.
- Theoretical investigation of mechanisms involved in neuronal network synchrony mediated through spike timing dependent plasticity of inhibitory synapses.
- Development of mathematical framework for using phase response curves to predict synchrony in pulse coupled oscillator networks.
- Development of model based control strategies for epileptic seizures

Sept 2002-May 2006 Institute for Nonlinear Science, Univ of California San Diego

- Development of neural circuits for pattern recognition
- Development of biophysical models for spike timing dependent plasticity
- Development of un-supervised biophysically realistic dynaical models for song learning in song birds

Jan -Dec 2005 Institute for Nonlinear Science, Univ of California San Diego

- Develop web-interface for financial time series analysis

## Research Support

**Active**

- Department of Pediatrics, Faculty Startup funds (July 2010- May 2014)

**Pending**

- As PI (with P.R. Carney) ($875,000 direct cost)-NIH-R01
  Title: Circadian control of neural excitability in an animal model of temporal lobe epilepsy
- As PI (co-PI: P. Khargonekar, P.R. Carney) ($686,000 direct cost) NSF-Collaborative Research in Computational Neuroscience
  Title: Computational modeling and control of interictal spikes using optogenetic actuation
- As PI (co-PI: P. Khargonekar, P.R. Carney) ($250,000 direct cost) NIH-R21
  Title: Method to characterize brain dynamics response to VNS in intractable epilepsy
- As PI ($100,000 per year) McKnight Brain Research Foundation seed grant for aging research (Feb 2013-Jan 2016)
  Title: Cross frequency coupling as a marker for cognitive deficit in epilepsy
  (pre-proposal submitted in April 2012)

**Past**

- As co-PI (PI: J. Frazier) ($100,000) McKnight Brain Research Foundation seed grant for aging research (Mar 2011-Mar 2012)
  Title: The role of calcium activated potassium channels in geriatric memory dysfunction

- As co-PI (PI: P. Khargonekar) ($80,000) Seed grant for interdisciplinary working groups in computational Biology (Intramural Univ. of Florida Grant) Mar 2010-Mar 2011
  Title: Control of neural synchrony with light activated opsins
- As PI ($40,000) Postdoctoral Fellowship, Epilepsy Foundation of America, Jan 2008-Dec 2008
  Title: Statistical performance analysis of early seizure detection algorithms for their applicability in the development of closed loop seizure intervention systems.

## Teaching Experience

- **Courses Developed**

| | |
|---|---|
| Spring 2009 | Graduate course BME-6938 titled "Neurodynamics/ Mathematical Principles in Neuroscience" offered through the Dept of Biomedical Engineering at Univ of Florida |

- **Courses Taught**

| | |
|---|---|
| Spring 2012 | Director for Neurodynamics, Graduate course in the Dept of Biomedical Engineering at Univ of Florida |
| Fall 2011 | Director for Fundamentals of Computational Neuroscience, Graduate course offered through the Department of Neuroscience at Univ of Florida |
| Spring 2011 | Director for Mathematical Principles in Neuroscience, Graduate course in the Dept of Biomedical Engineering at Univ of Florida |
| Spring 2010 | Director for Neurodynamics, Graduate course in the Dept of Biomedical Engineering at Univ of Florida |
| Fall 2010 | Guest lecturer for graduate course titled Advanced topics in Controls offered by Prof. Khargonekar through the Dept of Electrical and Computer Engineering at the Univ of Florida |
| Spring 2009 | Director for Neurodynamics, Graduate course in the Dept of Biomedical Engineering at Univ of Florida |
| Summer 2006 | Instructor for Physics 1A,B,C lab series class in the Dept of Physics at Univ of California, San Diego |
| Fall 2005 | Guest Lecturer, for graduate course Physics 171/271 titled Biophysics of Neurons and Networks offered by Prof. David Kleinfeld through the Dept of Physics at Univ of California, San Diego |
| Summer 2005 | Instructor for Physics 1A class in the Dept of Physics at Univ of California, San Diego |
| Winter 2002 | Teaching assistant for Physics 2Ab course taught by Professor George Fuller through the Dept of Physics at Univ of California, San Diego |
| Spring 2002 | Teaching assistant for Physics 2A course taught by Professor Hans Paar through the Dept of Physics at Univ of California, San Diego |

## Publications

**Peer-Reviewed Articles (h-index: 10, google scholar)**

(*: Corresponding Author; +: Student; #: Postdoc)

1. Stefanescu R.A., Shivakeshavan R.G., **Talathi S.S.***, Computational models for light activated ion channels (Manuscript in preparation for J. Comp Neurosci)
2. Stanley D.+@, **Talathi S.S.**@, Parekh M.B.#, Mareci T., Ditto W.L., Carney P.R., Local circadian rhythm disruption in temporal lobe epilepsy (Manuscript in preparation for Nature Neurosci, @: Equal contribution)
3. Nandan M.+*, Khargonekar P., **Talathi S.S.**, Fast training of and classificaton by SVMs using approximate extreme points, (Submitted J of Machine Learning Research)
4. Stefanescu R., R.G. Shivakeshavan, **Talathi S.S.*** Computational models for epilepsy (Submitted to Seizure)

5. Boykin E.R.+, Ogle W.O., Khargonekar P.P., **Talathi S.S.***, The applicability of causality measures to time series of neuronal oscillators, J Comp Neurosci (2011) (Epub ahead of print)
6. Sunderam S., **Talathi S.S.** Lyubushin A., Sornette D., Osorio I.*, Challenges for emerging neurostimulation-based therapies for real-time seizure control, Epilepsy& Behav, 22:118-25 (2011)
7. **Talathi S.S.***, Carney P.R., Khargonekar P.P., Control of Neural Synchrony using Channelrhodopsin-2: A Computational Study, J. Computational Neuroscience, 31:87-103, 2011
8. Cadotte A.J.#*, DeMarse T.B., Mareci T.H., **Talathi S.S.,** Hwang DU, Ditto W.L., Ding M., Carney P.R., Granger causality relationships between local field potentials in an animal model of temporal lobe epilepsy., J Neurosci Methods, 189: 121-9 (2010)
9. Nandan M.+, **Talathi S.S.***, Khargonekar P., Carney P.R., Ditto W.L., Support vector machines for seizure detection in an animal model of chronic epilepsy, J Neural Eng, 7:036001 (2010) (* Corresponding Author; Equal Contribution)
10. Fisher N.+, **Talathi S.S.*,** Carney P.R., Ditto W.L., Effect of phase on homeostatic spike rates, Biological Cybernetics, 102:427-40 (2010) (* Corresponding Author; Equal Contribution)
11. **Talathi S.S.*,** Hwang DU, Carney P.R., Ditto W.L., Synchrony with shunting inhibition in a feedforward inhibitory network, J Comp. Neurosci., 28:305-21 (2010)
12. **Talathi S.S.**, Khargonekar P.*, Predicting synchrony in simple neuronal network, *Perspectives in Mathematical System Theory, Control, and Signal Processing*, LNCIS 398: 151-162 (2010)
13. **Talathi S.S.***, Hwang DU, Miliotis A., Ditto W.L., Carney P.R., Predicting synchrony in heterogeneous pulse coupled oscillators, Phys Rev E, 80:021908 (2009)
    (selected for publication by Virtual Journal of Biological Physics Research, Aug 2009)
14. **Talathi S.S.***, Hwang DU, Ditto W., Spano M., Mareci, T., Sepulveda, H., Carney P.R., Circadian control of neural excitability in an animal model of temporal lobe epilepsy, Neuroscience Letters 455:145-149 (2009)
15. Cadotte A.#*, Mareci T., DeMarse T., Parekh, M., Rajagovindan, R., Ditto W., **Talathi S.S**., Hwang DU, Carney P.R., Temporal Lobe Epilepsy: Anatomical and Effective Connectivity, IEEE Trans on Neural Systems & Rehabilitation Engineering, 17:214 (2009)
16. **Talathi S.S.#***, Abarbanel H.D.I., Ditto W., Temporal spike pattern learning, Phys Rev E, 78:031918 (2008)
    (selected for publication by Virtual Journal of Biological Physics Research, Oct 2008)
17. **Talathi S.S.#***, Hwang DU, Spano M., Simonotto J.#, Furman M.D., Myers S.M.+, Winters J.T.+, Ditto W.L., Carney P.R., Non-parametric early seizure detection in rat model of temporal lobe epilepsy, J Neural Eng, 5:85-98 (2008)
18. Abarbanel H.D.I.*, Haas J.#, **Talathi S.S.+**, Synapses and neurons: Basic properties and their use in the recognition of environmental signals, *Lecture notes in supercomputational neuroscience*, Springer-Verlag (2007)
19. **Talathi S.S.#***, Hwang DU., Ditto W., Carney P.R., Early seizure detection in an animal model of temporal lobe epilepsy, AIP Conference Proceedings, 953: 292-307 (2007)
20. **Talathi S.S.#***, Hwang DU, Ditto W., Spike timing dependent plasticity promote synchrony of inhibitory networks in the presence of heterogeneity, J Comp Neurosci, 25:262-281(2008)
21. Abarbanel H.D.I., **Talathi S.S.+***, Neural circuits for interspike interval recognition, Phys Rev Lett, 96:148104 (2006)
22. Abarbanel H.D.I., **Talathi S.S.+***, Gibb L.+, Rabinovich M., Synaptic plasticity with discrete state synapses, Phys Rev E, 72:031914 (2005)
    (selected for publication by Virtual Journal of Biological Physics Research, Oct 2005)
23. Abarbanel H.D.I.*, **Talathi S.S.+**, Gibb L.+, Mindlin G., Rabinovich M., Dynamical model for birdsong learning and control, Phys Rev E, 70:051911 (2004)
    (selected for publication by Virtual Journal of Biological Physics Research, Dec 2004)

24. Abarbanel H.D.I.[*], Gibb L.[+], Mindlin G., Rabinovich M., **Talathi S.S.[+]**, Spike timing and synaptic plasticity in premotor pathway of birdsong, Biological Cybernetics, 91: 159-167 (2004)
25. Abarbanel H.D.I.[*], Gibb L., Mindlin G., **Talathi S.S.[+]**, Mapping neural architectures onto acoustic features of birdsong, J Neurophysiol, 92:96-110 (2004)

**Book-Chapters**

26. Carney P.R.[*], **Talathi S.S.**, Dong-Uk Hwang, Ditto W.L., Circadian regulation of neural excitability in temporal lobe epilepsy, Epilepsy, The Intersection of Neuroscience, Biology, Mathematics, Engineering and Physics (2010)
27. Carney P.R.[*], **Talathi S.S.**, Geyer J., Pediatric sleep issues, Contemporary Sleep Medicine in Pediatrics (2010) (ebook)
28. Fisher N.[+], **Talathi S.S.**, Cadotte A.[#], Carney P.R.[*], Epilepsy Detection and Monitoring, *Quantitative EEG Analysis Methods and Clinical Applications*, Artech House Publishers (2009)
29. Geyer J.[*], Carney P.R., **Talathi S.S.**, Introduction to Sleep and Polysomnography, *Reading EEGs: A Practical Approach*, Lippincott Williams and Wilkins Publishers (2009)
30. Fisher N.[+], **Talathi S.S.**, Cadotte A.[#], Myers S.[+], Ditto W., Geyer J.D., Carney P.R., Seizure detection and advanced monitoring techniques, *Reading EEGs: A Practical Approach*, Lippincott Williams and Wilkins Publishers (2009)

**Non-Peer Reviewed**

31. Stephanescu, R.[#], Shivakeshavan R.[+], **Talathi S.S.[*]**, Computational Models for Epilepsy, arXiv:1201.3022v1 [q.bio QM] (2012)
32. **Talathi S.S.**, Hwang D.U., Miliotis A., Carney P.R., Ditto W.L., Synchrony with shunting inhibition arXiv:0901.3838v2 [q-bio.NC] (2009)
33. Miliotis A., **Talathi S.S.**, Ditto W., Flexible logic from neuronal dynamics, arXiv:0806.0537v1 [q-bio.NC], (2008)
34. **Talathi S.S.**, Hwang DU, Ditto W.L., Spano M.L., Sepulveda H., Mareci T., Carney P.R., Chronobiology of Epilepsy, http://hdl.handle.net/10101/npre.2008.1679.1, (2008)
35. **Talathi S.S**., Carney, P.R., Hwang DU, Ditto W., Early seizure detection in an animal model of temporal lobe epilepsy, American Institute of Physics conference proceedings, 953:292-307 (2007)

## Invited and Conference Talks (*invited)

1. *Invitation to attend the workshop "Towards Mathematical Modeling of Neurological Diseases from Cellular Perspectives" to be held at the Fields Institute in Toronto, May 2012
2. *STDP of inhibitory synapses promote neural synchrony: Theory and Experiments, Department of Neuroscience Seminar, University of Florida, Jan 2012
3. *Circadian rhythms influence on epileptogenesis, 5th International Workshop on Seizure Prediction, Dresden, Germany (declined invitation due to personal reasons)
4. *Computational Modeling in Neuroscience, REU program Seminar, Department of Physics, University of Florida, July 2011
5. *Control of Neural Synchrony, Lessons from Experimental Animal Models, Department of Neuroscience Seminar, University of Florida, Jan 2011
6. *Synchrony in Inhibitory Networks, Korean Institute of Science and Technology, Seoul, S. Korea, Dec 2010
7. *Dynamical principles in Neuroscience, Hot Topics Workshop on Applied Dynamical Systems, National Institute for Mathematical Science, S. Korea, Dec 2010
8. *Control of Neural Synchrony, Dept of Biomedical Engineering, University of Florida, Seminar Series, Nov 2010
9. *Synchrony in Inhibitory Networks, Biocircuits Institute, University of California, San Diego, Nov 2010

10. *Control of Neural Synchrony, Condensed Matter Seminar Series, Dept of Physics, University of Florida, Oct 2010
11. *Neurostimulation therapy for epilepsy-Lessons from an experimental animal model, Pediatrics Grand Rounds, University of Florida, Oct 2010
12. *Control of Neural Synchrony-Lessons from an animal model of chronic epilepsy, Dept of Pediatrics, Univ of Florida, May 2010
13. *Control of Neural Synchrony-Lessons from an animal model of chronic epilepsy, Dept of Bioengineering, George Mason, Mar 2010
14. *Perspectives in computational modeling in neuroscience: from microscopic to macroscopic, Dept of Biomedical Engineering, Univ of Florida, Seminar Series, Aug 2009
15. Circadian control of neural excitability in an animal model of temporal lobe epilepsy; American Academy of Neurology Annual Meeting; Seattle, Apr 2009
16. *Synchrony with shunting inhibition, Computational NeuroEngineering Laboratory Seminar Series, Univ of Florida, Feb 2009
17. *Temporal spike pattern learning in biological systems, Indian Institute of Mathematical Sciences, Madras; Indian Institute of Sciences, Bangalore; Bharatidasan Univ, Trichi; Univ of Pune, India, Nov 2008
18. Loss of balance and circadian phase reversal in an animal model of limbic Epilepsy, Annual Biomedical Engineering Society Meeting, St Louis, MO, Oct 2008
19. *Circadian control of neural excitability during epileptogenesis, Biotechnology High Performance Computing Software Applications Institute, Fort Detrick, Maryland, Sept 2008
20. *Chronobiology of Epilepsy, From Bench to Bedside, Univ of Florida, May 2008
21. Seizure detection in rat model of chronic limbic epilepsy, Data-mining conference, Univ of Florida, Mar 2007
22. Neural circuitry for interspike interval recognition, International Conference on Complex Systems, Boston, July 2006
23. *Functional significance of synaptic plasticity in neuronal networks, Dept of Physics, Indian Institute of Technology, Bombay, India, Jan 2006
24. *Dynamics of learning in song-birds, Max Plank Institute for Neurobiology, Munich, Dec 2004

## Peer-Reviewed Conference Abstracts

1. Kagan Z., Frazier C.J., **Talathi S.S.,** STDP induced synchrony in inhibitory neural networks: Theory and Experiments, Annual Computational Neuroscience Meeting, Atlanta, 2012
2. Ratnadurai R.G., Stefanescu R.A., Khargonekar P.P., Carney P.R., **Talathi S.S.**, Genesis of interictal spikes in CA1: A computational investigation, Annual Computational Neuroscience Meeting, Atlanta, 2012
3. Stefanescu R.A., Ratnadurai R.G., Carney P.R., Khargonekar P.P., **Talathi S.S.**, Computational models for light activated ion channels, Annual Computational Neuroscience Meeting, Atlanta, 2012
4. Stanley D.A., **Talathi S.S.**, Ni X., Huang L., Lai Y.C., Ditto W.L., Carney P.R., Circadian rhythms of gamma oscillations following status epilepticus: Implications for cognition, Annual American Epilepsy Society Meeting, Baltimore, Dec 2011
5. Stanley D.A., Parekh M.B., Carney P.R., Ditto W.L., Mareci T.R., **Talathi S.S.**, Fimbria loss and its effects on circadian rhythms in epilepsy, Annual Society for Neuroscience Meeting, Washington, Nov 2011
6. Ratnadurai S., Carney P.R., Khargonekar P.P., **Talathi S.S.**, Model parameter estimation for Channelrhodopsin-2 light gated ion channels, Annual Computational Neuroscience Meeting, Stockholm, Sweden, July 2011
7. Boykin E., Carney P.R., Ogle W., Khargonekar P.P., **Talathi S.S.**, The applicability of effective connectivity measures to time series of neuronal oscillators, Annual Computational Neuroscience Meeting, Stockhold, Sweden, July 2011

8. Stanley D., Ditto W., Carney P.R., Parekh M., Mareci T., **Talathi S.S.**, Phase shift in hippocampal circadian rhythm during latent period of epileptic rats, Annual Computational Neuroscience Meeting, Stockholm, Sweden, July 2011
9. **Talathi S.S.**, Zhou J., Cordiner D., Carney P.R., Circadian Rhythm of Core Body Temperature in an Animal Model of Chronic Epilepsy, Annual American Epilepsy Society Meeting, San Antonio, Dec (2010) (recognized in top 10 percentile of best posters)
10. **Talathi S.S.**, Carney P.R., Khargonekar P., Control of Neural Synchrony Using Channelrhodopsin-2: A Computational Study, Annual Society for Neuroscience Meeting, San Diego, Nov (2010)
11. **Talathi S.S.**, Ratnadurai S., Kantorovich S., Carney P.R., Khargonekar P., Control of neural synchrony with light activated opsins , Annual Computational Neuroscience Meeting, San Antonio, TX, July (2010)
12. **Talathi S.S.**, Ratnadurai S., Carney P.R., Khargonekar P.,Synchronization induced by signal propagation delays in inhibitory networks, Annual Computational Neuroscience Meeting, San Antonio, TX, July (2010)
13. **Talathi S.S.**, Zhau J., Ditto W., Carney P.R., Circadian rhythm of core body temperature in an animal model of chronic epilepsy, Annual American Academy of Neurology Meeting, Toronto, April (2010)
14. Zhou J., **Talathi S.S.**, Cadotte A., Liu Z., Holmes G., Carney P.R., The effects of hippocampal CA1 single neuron firing properties on interictal spike patterns during seizure onset in an animal model of temporal lobe epilepsy, Investigators Workshop, Annual American Epilepsy Society Meeting, Boston, Dec (2009)
15. **Talathi S.S.**, Nandan M., Ditto W., Khargonekar P., Carney P.R., Support vector machine algorithms for early seizure detection in an animal model of temporal lobe epilepsy, Annual American Epilepsy Society Meeting, Boston, Dec (2009)
16. Cadotte A., **Talathi S.S.**, Zhou J., Myers S., Hwang D., Ditto W., Carney P.R., Analysis of hippocampal interdependencies for early seizure detection, Annual American Epilepsy Society Meeting, Boston, Dec (2009)
17. Myers S., **Talathi S.S.**, Carney P.R., Determining the firing rate of interictal population spikes leading to seizures, Annual American Epilepsy Society Meeting, Boston, Dec (2009)
18. Nandan M., **Talathi S.S.**, Khargonekar P., Ditto W.L., Carney P.R., Support vector machine algorithms for early seizure detection in an animal model of temporal lobe epilepsy, 4th International Workshop on Seizure Prediction, Kansas, MO, 2009
19. **Talathi S.S.**, Hwang DU, Ditto W.L., Carney P.R., Synchrony with shunting inhibition, Annual Computational Neuroscience Meeting, Berlin, Germany, 2009
20. **Talathi S.S.**, Hwang DU, Ditto W., Cadotte A., Carney P.R., Imbalance in hippocampal network synchrony during epileptogenesis, Investigators Workshop, American Epilepsy Society Meeting, Seattle, Dec 2008
21. Hwang DU, **Talathi S.S.**, Winters J., Ditto W., Carney P.R., Controlling firing activity of population spikes during epileptogenesis in an animal model of temporal lobe epilepsy, Annual Biomedical Engineering Society Meeting, St Louis, MO, Oct 2008
22. **Talathi S.S.,** Ditto W., Carney P.R., Chronobiology of Epilepsy in an animal model of limbic Epilepsy, Gordon Conference: Mechanism of Epilepsy and Neuronal Synchronization, Maine, Aug 2008
23. **Talathi S.S.**, Abarbanel H.D.I., Hwang DU, Ditto W., Temporal spike pattern learning, Annual Computational Neuroscience Meeting, Portland, Oregon, July 2008
24. **Talathi S.S.**, Carney, P.R., Hwang DU, Ditto W., Performance evaluation of seizure detection methods in rat model of chronic limbic epilepsy, American Epilepsy Society Meeting, Philedelphia, Dec 2007
25. **Talathi S.S.**, Carney, P.R., Hwang DU, Ditto W., Myers S., Simonotto J., High frequency oscillations in rat model of chronic limbic epilepsy, Annual Computational Neuroscience Meeting, Toronto, Cananda, July 2007

26. **Talathi S.S.**, Hwang DU, Haas J., Synaptic plasticity of inhibitory synapses promote synchrony in mutually coupled network of inhibitory neurons, Annual Computational Neuroscience Meeting, Toronto, Canada, July 2007
27. **Talathi S.S.**, Biological time delay circuits, Workshop on Nonlinear Dynamics of Electronic Systems, Postdam, Germany, Aug 2005
28. **Talathi S.S.**, Gibb L., Dynamical model for learning in songbirds, Center for Theoretical Biophysics, San Diego, Nov 2004

## Patents

**Talathi S.S.,** Ditto W.L., Hwang DU, Spano M., Carney P.R., "Methods and Systems for Detecting Epileptogenesis," (Invention Disclosure UF#-12785, 2008).

## Entrepreneural activity

- Founding Member and Senior R&D Engineer, Chronobionics Inc (2008)
- Consultant, http://marketmetanalysis.com (2005)

## Mentoring Students and Postdoctoral Fellows

**Present**

**Chair:**

- Dr Roxana A. Stephanescu, PhD, Postdoctoral fellow, Department of Pediatrics, University of Florida
  Project: Computational modeling channelrhodopsin-2 kinetics
- Shiva Keshavan Ratnadurai, PhD graduate student in Biomedical Engineering, Univ of Florida
  Project: Burst synchrony in CA1 network
- Manu Nandan, PhD graduate student in Electrical Engineering, Univ of Florida
  Project: Support vector machine algorithms for early seizure detection
  (Joint with Dr Pramod Khargonekar)
- Dave Stanley, Ph.D., graduate student in Biomedical Engineering, Univ of Florida
  Project: Modeling local circadian disturbances in CA1 resulting from status epilepticus brain injury
  (Joint with Dr. Paul Carney)
- Zack Kagan, undergraduate student in electrical engineering
  Project: Dynamic clamp implementation of plasticity induced synchrony in coupled interneurons

**Thesis Committee Member:**

- Subhajit Sengupta, Ph.D., graduate student in Computer Science, Univ of Florida
  Project: Role of synaptic plasticity in computation
  *Dr Arunava Baneerjee
- Talylor Kuhn, Ph.D., graduate student in Clinical and Health Psychology, Univ of Florida
  Project: Early detection of dementia with transitive inference and syllogistic reasoning tasks
  *Dr Russell Bauer
- Ravi Shekhar, Ph.D., graduate student in Electrical and Computer Engineering, Univ of Florida
  Project: Hardware implementation of a generic neuronal network-architecture
  *Dr John Harris
- Austin Brockheimer, Ph.D., graduate student in Electrical and Computer Engineering, Univ of Florida
  Project: Learning and exploiting recurrent patterns in neural data: unsupervised approaches to neural engineering

*Dr Jose Principe

**Past**

- (Committee-Member) Manu Rastogi, Ph.D. (2012), graduate student in Electrical and Computer Engineering, Univ of Florida
  Project: Design optimization of hardware neurons
  *Dr John Harris
- (Chair) Aishwarya Parthasarathy, MS. (2011), in electrical engineering
  Project: Dynamic clamp for control of neural synchrony
- (Chair) Daniel Cordiner, BS (2011), in microbiology
  Project: Forced desynchrony studies in animal model of epilepsy
- (Co-Chair) Dr Edgard Andrade, MS (2011), in Clinical Research for Medicine Faculty, Dept of Pediatrics
  Project: Directionality of seizure propagation in temporal lobe epilepsy
- (Committee Member) Erin Boykin, Ph.D. (2011), in Electrical Engineering, Univ of Florida
  Project: Detecting effective connectivity in neural time series
  Chair *Dr Pramod Khargonekar
- (Co-Chair) Stephen Myers, Ph.D. (2010), in Biomedical Engineering, Univ of Florida
  Project: Closed loop stimulation study for early seizure intervention
  Chair *Dr P.R. Carney
- (Research Mentor) Nicolas Fisher, Ph.D. (2010), in Computer Science, Univ of Florida
  Project: Phase dependent perturbations in the firing rate dynamics of network of cortical excitatory and inhibitory interneurons
  Chair *Dr Anurava Banerjee
- (Research Mentor) Abraham Miliotis, Ph.D. (2008), in Biomedical Engineering, Univ of Florida
  Project: Synchrony in inhibitory networks
  Chair *Dr W.L.Ditto

## Professional Memberships

- Organization for Computational Neuroscience (2011-Present)
- Society for Neuroscience (2010-Present)
- American Institute for Physics (2006-2010)
- American Epilepsy Society (2007-2008)
- Biomedical Engineering Society (2007-2008)

## Service

Journal Referee

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Grant Proposal Referee

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## Introduction

My research in the last five years has primarily focused on characterizing the dynamical principles underlying the emergence of synchrony in neuronal networks of normal and pathological brain. In my research, I have leveraged tools from the field of Computational Neuroscience including biophysically realistic modeling of brain networks, neural data analysis of recorded brain activity and *In vivo* Neurophysiology using animal models of epilepsy as an experimental test bed. I have researched various aspects of neural synchrony phenomenon spanning the gamut: basic mechanisms underlying neural synchrony in inhibitory neural networks [1-4]; identifying signatures of pathological neural synchrony in recorded brain activity [5-8]; impact of neural synchrony on causality measures [9-11] and application of control engineering techniques to control synchrony in neuronal networks [12, 13].

Below I will present brief overview of my continuing and future research objectives as related to three specific areas (1) Neural synchrony implicated in epilepsy and control (2) Neural synchrony implicated in epilepsy and the role for circadian rhythms and (3) Neural synchrony implicated in memory and cognition and its impact on epilepsy

## Research Objectives

**Neural synchrony implicated in epilepsy and control:** In epilepsy neural synchrony is manifested in two primary forms: (a) seizures, which are pathological synchronous discharges in neuronal networks and (b) interictal spikes (IIS), which are abnormal synchrony events observed in-between seizures resulting from synchronous burst firing of neurons. Studies involving long-term EEG monitoring in animal models of chronic limbic epilepsy have found that IIS occur prior to spontaneous seizure activity [14] . Based on these findings it has been speculated that IIS may serve as biomarker for the development of subsequent epilepsy [15]. However evidence from *in vitro* experiments suggests that enhancement of IIS may suppress an impending seizure event, thus suggesting a possible anticonvulsive role for IIS [16]. The development of control strategies to selectively suppress IIS can provide an acid test to study the controversial role of interictal spikes in seizures. My research will therefore focus on developing *computational network models and control algorithms to selectively suppress or eliminate interictal focal epileptiform spikes*. The specific research objectives are outlined below:

1. *Computational analysis of CA1 network mechanisms involved in the generation of interictal spikes:* The CA1 subfield of the hippocampus, a mesial structure of the temporal lobe, is often involved in temporal lobe epilepsy, we will therefore focus on the problem of control of evoked interictal spikes in the CA1 region of a brain injured *in vivo* animal model. The key aim will be to construct a detailed biophysical model for CA1 in order to identify the mechanisms of abnormal burst synchrony implicated in the generation of IIS evoked in CA1 network as a result of afferent stimulation of Schaffer collaterals. This model will then be utilized to derive computationally tractable model for the effect of actuation signals both electrical and optical on the IIS phenomenon.
2. *Develop open loop and closed loop algorithms for control of IIS using optical stimulation.* This will involve the development of suitable stimulation sequences and algorithms, in open loop and closed loop settings, for the minimization of IIS. Here we will leverage the models and understandings derived in task 1.

3. *Proof-of-principle testing of the controllers.* A well-established *in vivo* animal model of epilepsy will be used as an experimental testbed to assess the performance of the controllers developed through tasks 1 and 2.

The scientific merit of the proposed research activities lies in breaking new grounds in control of neural synchrony implicated in a neurological disorder using a multidisciplinary approach leveraging computational neuroscience and control engineering. The tools and algorithms resulting from the proposed research activities can be potentially leveraged to characterize and control pathological neural synchrony implicated in other neurological disorders such as Parkinson's [8] and Schizhophrenia [6,7]. A grant proposal to support funding for the above-proposed research is currently under review at NSF/NIH initiated the Collaborative Research in Computational Neuroscience program.

**Neural synchrony implicated in epilepsy and the role for circadian rhythms:** This research project will focus on the impact of local circadian rhythm disturbances in the hippocampus following acute brain injury in an animal model of epilepsy. While the influence of circadian rhythm on epileptic seizures is known for over a century [17], there is a paucity of research on the effects of circadian rhythm on brain excitability during epileptogenesis.

Epileptogenesis is a process of abnormal changes (at the molecular, cellular and network level) in response to brain injury that leads to spontaneous epileptic seizures [18]. The paucity research on the circadian influence during epileptogenesis stems in part from the fact that in humans, epileptogenesis often spans time periods from several months to years. Since most human circadian studies manipulate sleep-wake cycles to unmask the expression of the endogenous circadian pacemaker, it is not possible to maintain humans under such conditions for such long periods of time. Animal models of epilepsy on the other hand are ideal in this respect due to their shorter epileptogenic time period (2-4 weeks) relative to humans. However, until recently, the lack of a suitable animal model to unmask the expression of endogenous circadian pacemaker was a major hurdle for systematic analysis of effects of circadian timing system on epileptogenesis. The animal model for forced desynchrony [19, 20] provides a unique opportunity to address the role of the circadian timing system in epileptogenesis.

The research objectives of this proposal are to use *an in vivo animal model of forced desynchrony to determine the influence of acute brain injury on the circadian regulation of hippocampal neural activity during epileptogenesis.* Following from our recent work [6, 21] we hypothesize that status epilepticus (SE) inducing acute brain injury triggers recurrent spontaneous epileptic seizures by disturbing the circadian phase of hippocampal neural activity. Further credence to the proposed hypothesis is provided by our recent computational efforts to identify the mechanisms for local circadian disturbances within the hippocampus. Our computational modeling analysis suggests that the damage to the septum is a key driver of local circadian disturbances in the hippocampus [22]. The specific research objectives for the proposed research are outlined below:

1. *To determine the circadian rhythm of hippocampal neural activity in normal brain.* This aim will address the hypothesis that the endogenous circadian pacemaker in the brain regulates hippocampal neural activity. Continuous hippocampal EEG activity will be recorded from CA1 region of healthy adult male Sprague Dawley rats (a) under controlled 24 h light dark (LD) cycle, where the circadian pacemaker is entrained by the light and (b) under controlled 22 h LD cycle, where the circadian pacemaker is no longer entrained by light. Core body temperature (CBT) will be simultaneously measured. The circadian rhythm of hippocampal

neural activity will be primarily quantified by characterizing the circadian time scale temporal dynamics of spontaneous hippocampal EEG spikes, including the high amplitude sharp waves and the interictal spiking activity. We will also characterize the changes in the circadian rhythm of hippocampal rhythmic slow wave theta band (4-8 Hz) activity and the hippocampal fast oscillatory gamma band (20-80 Hz) activity.

2. *To determine the circadian rhythm of hippocampal neural activity following acute SE brain injury.* This aim will test the hypothesis that (a) acute SE brain injuries induce a phase shift in the free running circadian rhythm of hippocampal neural activity and (b) the observed phase shift is correlated with increased probability for the animal to transition to chronic epilepsy. Continuous hippocampal EEG and CBT will be recorded for duration of up to four weeks following SE injury in an animal model of TLE [12], while the animals are maintained either under light controlled environment with 22 h LD cycle or 24 h LD cycle. We expect to observe a stable dissociation of the circadian rhythm of hippocampal neural activity measures with perturbed circadian phase (relative to that observed in the normal brain) following SE in animals maintained in 22 h LD cycle. In addition, we anticipate that in animals in which the circadian phase of hippocampal neural activity is disturbed, the probability for transition to chronic epilepsy is higher as compared to animals in which there is no SE induced phase shift in the circadian phase of hippocampal neural activity.
3. *Refine our computational model to incorporate findings from experiments proposed above.* We will refine our model to incorporate the influence of endogenous circadian rhythm activity on the hippocampal function.

The proposed *in vivo* animal experiments and computer modeling studies are expected to significantly advance our understanding of circadian factors in the progression to epilepsy. Successful outcome of the proposed research activities has the potential for driving the development of realizable clinical applications such as circadian based biomarkers to predict likelihood of future epilepsy and the development of effective treatment protocols such as light therapy and targeted drug delivery around circadian cycles. A grant proposal for funding support for the proposed research was recently submitted to NIH, for which we received rave reviews. The proposal has been revised and is currently under consideration at NIH for R01 funding support.

**Neural synchrony implicated in memory and cognition and its impact on epilepsy:** Cognitive impairment is an important co-morbidity of chronic epilepsy [23-25]. There is an increasing awareness that the expression of cognitive co-morbidity may precede seizures and that this condition is not uniformly resolved even if seizures are fully controlled [26]. While a number of contributing factors e.g., reorganization of neuronal circuitry following brain injury, pathological interictal spikes, anti-epileptic drugs and even seizures themselves are proposed [27], there is yet no scientific consensus on the exact origin of cognitive co-morbidity in epilepsy. Specifically, the impact of precipitating brain injury on cognitive decline remains unknown.

In recent years, analysis of neural oscillations from both scalp EEG recordings and extracellular field recordings using depth electrodes in both human and animal models have demonstrated a pivotal role for cross frequency coupling (CFC) in cognitive processes [28]. Specifically, phase-amplitude cross frequency coupling (PACFC) between the phase of low frequency theta band and amplitude of EEG gamma band has been implicated in cognitive processes including both working memory [29-31] and long-term spatial memory recall [32, 33]. These experimental findings have led credence to the theoretical idea that coordinated theta and gamma brain oscillations are implicated in the neural code [34]. Based on these findings, it has been suggested that PACFC strength may be the most predictive neurophysiological marker for learning and memory yet [28]. Surprisingly, to date no study has focused on the PACFC as a potential neurophysiological marker for early-cognitive decline in diseased brain.

Following from considerations above, we propose that a decrease in the CFC within brain structures, in particular the hippocampus, following acute brain injury that eventually triggers spontaneous epilepsy, is an indicator for cognitive decline and a predictor of future epilepsy. Accordingly, we propose the following specific research objectives:

1. Conduct a longitudinal study during the latent period of epileptogenesis in a self-sustaining status epilepticus (SE) animal model of epilepsy in order to assess changes in the cognitive performance in hippocampal dependent memory tasks.
2. In parallel record hippocampal depth EEG using chronic implant microwire electrodes and extract multivariate CFC measure in order to correlate CFC changes with cognitive performance.
3. Identify the number of SE induced animals that transition to spontaneous epilepsy and conduct retrospective analysis in order to determine whether decrease in CFC strength is a predictor of future epilepsy

The proposed research is significant because, it is a first study of its kind to focus on brain mechanisms of cognitive decline in an epileptogenic brain in terms of cross frequency interactions of hippocampal EEG rhythms. Successful outcome of the proposed study will translate into future investigations focused on therapies aimed at alleviating cognitive decline as a novel path to treating epilepsy. Furthermore, given that cognitive deficits and remodeling of the hippocampal network occur in other neurological pathologies such as Huntington's disease [35] and Alzheimer's disease [36], the findings of present study may bear a more general value outside the field of epilepsy. A pre-proposal application to support funding for this research is recently submitted to the McKnight Foundation.

**Conclusion**

My research interests by its very nature require significant collaboration between data acquisition and analysis, computational modeling and animal experimentations. I believe that my interdisciplinary training in physics and computational neuroscience and postdoctoral experience with *in vivo* animal models of epilepsy gives me a unique perspective to work with experimental data, develop mathematical models suitable to explain the observed phenomenology and in the process procure a sound and rigorous path to the development of new discoveries in brain science.

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I believe that a good teacher is one who is (a) organized, well prepared yet flexible enough to recognize and take advantage of cooperative interactions in the classroom; (b) firm with yet approachable by and accessible to the students in and outside the classroom, and (c) exceedingly knowledgeable yet constantly learning and seeking new knowledge and techniques to bring into the classroom. In this essay I will elaborate on these principles and demonstrate through personal experience how I strive to integrate these principles into my own teaching philosophy.

**Integration of modern technology:** My first teaching assistant job as a graduate student required me to act as an intermediary to senior faculty of physics department wanting to make use of modern technology to facilitate their teaching. I saw first hand the positive impact of the integration of modern technological tools in the process of teaching physics. Not only did the use of technology through web portals streamline the process of mentoring, monitoring and grading a class of over 400 students, the use of interactive media by the faculty in their teaching made learning physics a fun process for the young freshmen students. Since then the use of appropriate technological tools has become the central fabric of any class that I teach. I have come to realize that technology is the best vehicle to involve students in the process of learning. All the courses that I have taught are linked to an active web forum (through Sakai, the online e-learning resource available to all Faculty at UF) where students could register their thoughts about the class, discuss difficulties and express their opinions uncensored without the fear of retribution. In class I have made use of a number of technological tools such as the Internet, video/audio recordings devices, power point, interactive digital software's to enhance the process of learning and assimilation of new knowledge. Students of today are not only expecting the use of technology to aid their learning but are also demanding to learn the use of technology through the medium of the subject they are learning. I thus believe that the infusion of appropriate technological tools to facilitate learning can make a significant difference in the process of education.

**Independent thinking:** My graduate education emphasized the development of critical and independent thinking, interpretation of the data presented, critical discussions (relatively novel concepts for a young student from India, where the culture dictates a close minded and rote learning approach), and the ability and courage to challenge convectional wisdom. My goal is to develop these skill-sets my students. While native American students are more comfortable with this idea, personal experience tells me that it is some what difficult concept for Asian students. I therefore emphasize in my teaching that students should not simply endorse my opinions or duplicate my thinking process, but to engage with and critique those opinions. Even if they come to different conclusions, I want them to see that it is possible to challenge the conventional wisdom, to be passionate about ideas, to stand up for one's point of view as a rationale human being, but still be open to criticism. I thus like students to think of me as a 'facilitator', who encourages exchange of ideas and interaction in the process of learning rather than as a 'instructor', who believes that knowledge can be unilaterally imparted.

**Cooperation:** I believe that the process of teaching and education involves cooperation between students and the mentor. It is my duty, as a mentor and in true sense of word as a "faithful and wise counselor", to motivate students to be curious and eager to learn the subject being taught. I believe that students learn best by building relationships between new information and their existing body of knowledge. Such relationships provide the context that helps the student understand the deeper meaning behind the facts, and cause the information to acquire a degree of relevance. Thus in order to keep the lectures relevant and help students assimilate the new knowledge gained, I endeavor to follow the introduction of any abstract concept in my teaching with concrete real life examples and case studies. Since I strongly believe that students improve their retention ability and expand their skill-set much better by applying their new knowledge to solving non-trivial problems, class assignments that challenge convectional thinking and motivate students to apply the new tools that they learn in the class, form an integral part of any course that I teach. Monitoring their progress through grading is also an integral part of my duty as a mentor. I expect students to be equally involved in the process of education. Their duties include interaction in the class by asking and answering questions, leading discussion sections. It is also their duty to make a fair attempt to complete class assignments without resorting to questionable means and seek guidance if they are struggling.

**Reflection:** I believe that flexible and effective teaching involves reflection and action. As a teacher, I allow space in my pedagogy for students to reflect upon what they've learned; sometimes they write reflective essays summarizing published literature on the subject, sometimes the reflection occurs in less formal ways. But I believe that one can't know what one knows until one has the opportunity to reflect upon his or her experiences. Students often tell me that it was through these reflection opportunities that they came to synthesize and integrate their new skills and knowledge. They are then better able to apply their newly conceived skills across assignments, projects or courses. I routinely tell students that I want them to leave my class with a "toolbox" of skill-sets that they can make use of later in life either in the workplace or in civic environment. By reflecting upon their experiences, they gain the insight for knowing what is in their toolbox as well as how and when to use it effectively.

At a personal level, I believe teaching itself to be a learning activity that involves reflection. I reflect on my teaching evaluation either through student poll or word of mouth interaction with students. I have taken determined steps to modify parts of my course by incorporating suggestions from the students. In one course that I taught, Physics-I series on Newtonian mechanics for freshmen class comprising of about 40 non-physics major students, I realized through my analysis of student performance in the class quizzes that the difficulty of class assignments did not match the difficulty of in class quizzes that I held every week. I took steps to correct this situation and designed the final exam for the class such that it truly reflected the practice questions posed in class assignments. By interacting with students who participated in my course on neural modeling, I have come to learn that students are particularly interested in learning more about mathematical models that mimic real life EEG recordings and have practical implications for diseases such as epilepsy. Taking cue from students I have modified the course material to reflect real world applications beyond the theory and fundamentals, so that students can better appreciate the utility for mathematical modeling in the development of therapy for brain diseases.

In summary, to quote the words from (Menges, Weimer and Associates, 1996), "teaching is a scholarly activity when it is purposeful, reflective, documented and shared for the benefit of the teacher and the students as a whole". My teaching philosophy is my guide to achieve excellence in this scholarly pursuit.

Given my broad teaching and inter-disciplinary research experience, I believe I can teach the following undergraduate Neuroscience courses at Brown NEUR 0010, NEUR 1680 and NEUR 1740. Below I present a list of few elective courses that I would like to offer at advanced undergraduate or graduate level.

1. **Neurodynamics:** Objective is to study the relationship of electrophysiology, nonlinear dynamics and computational properties of neurons. I have designed a curriculum for this course at the Biomedical Engineering Department in the University of Florida and have been teaching this course for the past three years.
2. **Biophysics of Neurons:** Objective is to explore mathematical foundation of modern cellular neurophysiology.
3. **Fundamentals of Computational Neuroscience:** Objective is to provide quantitative basis for describing what nervous systems do, determine how they function and uncover the general principles by which they operate.
4. **Neural signal processing:** Objective is to learn techniques for neuroscience data analysis.

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**Appendix:**

Course evaluation report from students for the graduate course BME 6838 titled "Neurodynamics" that I have taught over last three years at UF.

***Spring 2009 Faculty Evaluation***
***BME 6938- Neurodynamics***
***Talathi***

1.) **What personal qualities or teaching skills of the instructor contributed to the success of the course?**
-The instructor was very enthusiastic and stimulating, which had an effect of increasing the students interest.
-Very knowledgeable and enthusiastic
-Availability and helpfulness

2.) **What could be done to improve the quality of this course?**
-Split the course into 2 sections. Include more practical examples.
-A few more examples could be explained in detail.
-Experience, more engineering applications
-Course could be defined better

3.) **Do you believe this course should be offered? Explain.**
-Yes, because this is the only course in modeling in BME
-Yes. This course is an essential requirement for those planning to enter the stream of modeling in Neuroscience.
-Yes, elective
-Yes. It offers a new perspective to study biology

4.) **Add any other comments.**
-Overall, a very nice and informative course.
-No Poster! Hwk's were graded too difficult

BME 6938 Neurodynamics
Section 7188
TALATHI

1.) What personal qualities or teaching skills of the instructor contributed to the success of the course?
    - Very good lectures. I was always interested & learned so much!
    - Very enthusiastic – It almost seemed you wanted to teach more!
    - Instructor is very enthusiastic for this subject and likes to challenge student's ability to think critically which makes for a good teacher.
    - Very interested in new applications of the course material
    - Enthusiasm for subject helped get through sometimes boring homeworks.

2.) What could be done to improve the quality of this course?
    - The homework could have been more encompassing. The XPP –part was a bit tricky, but the analytic bifurcation analysis was very interesting.
    - If we are busy with a particular task – such as Xppart, it is okay to let us figure it out without reiterating something already covered. Listening and doing a task can be difficult.
    - On the other hand, the instructor is young and assignments are time consuming and don't really stress the concepts he emphasized in lecture.
    - When listing pre-reqs list higher level mathematics requirement.
    - More project-like material earlier in the class. It was fun and increased my interest in the subject.

3.) Do you believe this course should be offered? Explain.
    - This should be taught every year. It is not common to take a course on nonlinear dynamics.
    - Yes! Although small, it is very specialized and relevant to current research in neuron modeling, spikes, etc. Very important class.
    - Yes
    - Yes, very unique way of explaining nervous system physiology. Great course to take to learn to develop models of laboratory systems.
    - Yes
    - Yes. Enjoyed getting to work on models other classes just talk about.

4.) Add any other comments.
    - Hoy!
    - Sachin was a little scattered. I think the class could be improved if he didn't try to cover so much material.
    - More exposure to XPP Auto

| Term: 20111 College: Engineering<br>Department: Biomedical Engineering Course: BME6938 Section: 1434<br>Instructor: Talathi,Sachin S (0985-2167)<br>Responses: 4 out of 6 (66.67%) | | | |
|---|---|---|---|
| Qualities of Instructor which contributed to success of the course. | Qualities of Instructor which hindered success of the course. | Opinions of course, including printed materials. | Additional comments to improve overall quality of the course. |
| Passionate, willing to help students beyond class hours | no | Excellent | Could have given more homeworks |
| Dedication | None | | Try and include more inter-disciplinary applications. |

Term: 20111 College: Engineering
Department: Biomedical Engineering Course: BME6938 Section: 1434
Instructor: Talathi,Sachin S (0985-2167)
Responses: 4 out of 6 (66.67%)

| Qualities of Instructor which contributed to success of the course. | Qualities of Instructor which hindered success of the course. | Opinions of course, including printed materials. | Additional comments to improve overall quality of the course. |
|---|---|---|---|
| I thoroughly enjoyed the professors enthusiasm, quantity of knowledge, and structure of disseminating information. I also appreciated that each lecture typically began with a quick review of the main topics from the previous lecture. Also, the professors willingness to meet with and assist us in office hours and additional meetings was excellent. Also, I learned a valuable lesson when one student asked a question, I believe the question was what is a limit cycle, and when no one knew the answer the professor said is [the person who asked the question] the only one brave enough to ask when they dont understand something? Or something to that effect. From then on I have always asked questions when I am not understanding something in this class and others. | | Very informative course. Printed materials, both textbooks and distributed were excellent. We burned through material in class which followed the texts well and the texts helped make clearer the class info. | This course covers an exceptional amount of material. As such, I do not think 3 hours a week is sufficient. The information could be more efficiently emanated to students if this course was A) block scheduled. Allow the professor and students more than 50 minutes to get into this material. B) Increase credits by at least 1. A lab hour would be excellent. I would have enjoyed a 3 hour lecture one day, to cover the material we covered in class, and then a 1 hour lab each week to learn how to write ODE files and use XPPAut. As the majority of our grade and future use of the tools/concepts learned in this course is in ODE writing and XPPaut use, I think these should be more heavily focused. We need the extensive bachground (both math and conceptual) that we gained from class lectures. However, learning to write ODE code and use XPPaut individually was difficult. Granted, the xppaut I learned I learned well, and the math that goes into the ODE I |

| Any other comments. |
| --- |
| |
| Great Job |