RISHIKESH NARAYANAN

Associate Professor
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ACADEMIC RECORD

Doctor of Philosophy in the Faculty of Engineering from the Indian Institute of Science, Bangalore, Karnataka, India, in March 2002.

Thesis title : A computational model for the development of simple-cell receptive fields spanning the regimes before and after eye-opening
Thesis advisor : Prof. Y. V. Venkatesh

Master of Science (Engineering), *by research*, in the Faculty of Engineering from the Indian Institute of Science, Bangalore, Karnataka, India, in December 1997.

Thesis title : Neural architectures for active contour modelling and for pulse-encoded shape recognition
Thesis advisor : Prof. Y. V. Venkatesh

Bachelor of Engineering in Electronics and Communication Engineering (*first class with distinction*) from the Mepco Schlenk Engineering College, Sivakasi, affiliated to the Madurai Kamaraj University, Madurai, Tamil Nadu, India, in April 1995.

RESEARCH CAREER

Jul. 2015 – : Associate Professor, Molecular Biophysics Unit, Indian Institute of Science, Bangalore, India.

Jul. 2009 – Jul. 2015 : Assistant Professor, Molecular Biophysics Unit, Indian Institute of Science, Bangalore, India.

Jun. 2008 – Aug. 2008 : Summer researcher, Marine Biological Laboratory, Woods Hole, MA, USA.

Jan. 2005 – Jul. 2009 : Postdoctoral Fellow, Center for Learning and Memory, The University of Texas at Austin, Austin, TX, USA. **Advisor**: Prof. Daniel Johnston.

Feb. 2002 – Dec. 2004 : Postdoctoral Fellow, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bangalore, India. **Advisor**: Prof. Sumantra Chattarji.

Jun. 1997 – Dec. 2001 : Research Scholar (PhD), Department of Electrical Engineering, Indian Institute of Science, Bangalore, India.

Aug. 1995 – Jun. 1997 : Research Scholar (MS), Department of Electrical Engineering, Indian Institute of Science, Bangalore, India.

GRANTS, FELLOWSHIPS, AWARDS AND DISTINCTIONS

- Senior fellow, DBT-Wellcome Trust India Alliance (2017–);
- Shanti Swarup Bhatnagar Prize in Biological Sciences, 2016;
- Grant from DST, India through the Cognitive Science Initiative (2013–2016);
- Grant jointly from DBT, India and NIH, USA, through the US-India brain research collaborative partnership program, with Prof. Daniel Johnston, UT Austin (2011–2013, extended to May 2016);
- HFSP career development award, Human Frontier Science Program Organization (HFSPO), France (Jan. 2010 – Dec. 2012, extended to Dec. 2013);
- HFSP cross-disciplinary fellowship, Human Frontier Science Program Organization (HFSPO), France (Sep. 2005 – Aug. 2008);
- Attended course on "Methods in Computational Neuroscience" conducted by the Marine Biological Laboratory, Woods Hole, Massachussetts, USA, 3–31 August 2003.
- Postdoctoral fellowship, Department of Biotechnology (DBT), India (Aug. 2002 – Jul. 2004);
- Ranked seventh at the Madurai Kamaraj University (BE, 1995); and
- Gold medalist (ranked first) from the Mepco Schlenk Engineering College (BE, 1995).

RESEARCH ADVISORY ROLE

- Postdoctoral research advisor, Dr. Rahul Kumar Rathour
  Period: August 2014 to January 2016
- Postdoctoral research advisor, Dr. Sufyan Ashhad
  Period: January 2016 to July 2016
- Postdoctoral research advisor, Dr. Manisha Sinha
  Period: August 2016 to February 2018

Unless otherwise stated, the following list contains names of students who registered for their respective degrees at the Indian Institute of Science, Bangalore.

- Ph.D. thesis advisor, Dr. Rahul Kumar Rathour
  Thesis title: Emergence and homeostasis of functional maps in hippocampal neurons
  Period: August 2009 to July 2014
  Recipient of the Prof. B. H. Iyer Medal for best Ph.D. thesis in the Molecular Biophysics Unit (2014–2015).
- Ph.D. (Integrated) thesis advisor, Dr. Sufyan Ashhad
  Thesis title: Physiological interactions between neuronal active conductances and inositol trisphosphate receptors in neurons and astrocytes
  Period: May 2010 to December 2015

- Ph.D. thesis advisor, Dr. Manisha Sinha
  Thesis title: Subthreshold conductances regulate theta-frequency local field potentials and spike phase
  Period: August 2011 to July 2016

- Ph.D. (Integrated) thesis advisor, Dr. Anindita Das
  Thesis title: Theta-band spectral selectivity and gamma-range coincidence detection in spike initiation dynamics of hippocampal pyramidal neurons
  Period: May 2011 to July 2017

- Ph.D. thesis advisor, Ms. Poonam Mishra
  Period: August 2013 to present (ongoing)

- Ph.D. thesis advisor, Ms. Reshma Basak
  Period: August 2014 to present (ongoing)

- Ph.D. thesis advisor, Ms. Pavithraa Seenivasan
  Period: August 2015 to present (ongoing)

- Ph.D. (Integrated) thesis advisor, Mr. Divyansh Mittal
  Period: May 2016 to present (ongoing)

- Ph.D. thesis advisor, Ms. Hansika Chhabra
  Period: August 2017 to present (ongoing)

- Ph.D. thesis advisor, Ms. Rituparna Roy
  Period: August 2018 to present (ongoing)

- M.Tech. final year project advisor, Ms. Neha Dhupia (Student at University of Rajasthan)
  Report title: lmpact of dendritic morphology on impedance and resonance properties of hippocampal pyramidal neurons
  Period: May–June 2013 and October 2013 to April 2014

- M.S. (Research) project advisor, Ms. Abha Jain
  Report title: Are neurons that exhibit efficient synchrony transfer necessarily coincidence detectors?
  Period: April 2017 to April 2018

- B.S. (Research) final year project advisor, Ms. Sunandha Srikanth
  Report title: Intrinsic plasticity during state-dependent calcium homeostasis in hippocampal neurons
  Period: January 2014 to April 2015

- B.S. (Research) final year project advisor, Ms. Abha Jain
  Report title: Determination of the operating mode of neurons with good synchrony transfer characteristics
  Period: January 2016 to April 2017

The following list contains the names of short-term researchers in the laboratory.

- Ms. Arunima Banerjee (Research trainee)
  Period: July 2018 (ongoing)
- Mr. Subhash Chandran (Research trainee)
  Period: August 2017 to July 2018
- Ms. Neha Soman (Research trainee)
  Period: August 2016 to July 2018
- Ms. Chinmayee LM (Research trainee)
  Period: March 2015 to August 2016
- Ms. Reshma Basak (Research trainee)
  Period: July 2013 to July 2014
- Dr. Arun Anirudhan (INSA visiting fellow)
  Period: June 2013 to December 2013
- Ms. Poonam Mishra (Research trainee)
  Period: February 2013 to July 2013
- Mr. Suraj Honnuraiah (Research trainee)
  Period: January 2011 to August 2012

TEACHING

- Instructor, course on "Molecular basis of signal propagation and synaptic transmission in neurons" taught jointly with Prof. S. K. Sikdar at the Indian Institute of Science, Bangalore, for four semesters: January–April of 2010; August–December of 2010–2012.
- Instructor, course on "Cellular Neurophysiology" taught jointly with Prof. S. K. Sikdar at the Indian Institute of Science, Bangalore, for four semesters: August–December of 2013–2016.
- Instructor, course on "Molecular and Cellular Neurophysiology" taught jointly with Prof. S. K. Sikdar at the Indian Institute of Science, Bangalore, August–December of 2017.
- Instructor, course on "Theoretical and computational neuroscience" taught jointly with Prof. Arun Sripati at the Indian Institute of Science, Bangalore, for seven semesters: January–April of 2011–2012, January–April of 2014–2018.
- Instructor, lecture modules in course on "Introduction to neuroscience" taught at the Indian Institute of Science, Bangalore, for two semesters: August–December of 2010–2011.

LIST OF PUBLICATIONS

I. Research Articles in Peer-Reviewed Journals

1. Reshma Basak and **Rishikesh Narayanan**, Active dendrites regulate the spatiotemporal spread of signaling microdomains, *PLoS Computational Biology*, 14(11): e1006485, November 2018.

2. Poonam Mishra and **Rishikesh Narayanan**, Disparate forms of heterogeneities and interactions among them drive channel decorrelation in the dentate gyrus: Degeneracy and dominance, *Hippocampus*, In Press, September 2018.

3. Reshma Basak and **Rishikesh Narayanan**, Spatially dispersed synapses yield sharply-tuned place cell responses through dendritic spike initiation, *The Journal of Physiology (London)*, 596(17): 4173–4205, September 2018.

4. Divyansh Mittal and **Rishikesh Narayanan**, Degeneracy in the robust expression of spectral selectivity, subthreshold oscillations and intrinsic excitability of entorhinal stellate cells, *Journal of Neurophysiology*, 120(2): 576–600, August 2018.

5. Anindita Das and **Rishikesh Narayanan**, Theta-frequency selectivity in the somatic spike triggered average of rat hippocampal pyramidal neurons is dependent on HCN channels, *Journal of Neurophysiology*, 118(4): 2251–2266, October 2017.

6. Chinmayee L Mukunda and **Rishikesh Narayanan**, Degeneracy in the regulation of short-term plasticity and synaptic filtering by presynaptic mechanisms, *The Journal of Physiology (London)*, 595(8): 2611–2637, April 2017.

7. Sufyan Ashhad and **Rishikesh Narayanan**, Active dendrites regulate the impact of gliotransmission on rat hippocampal pyramidal neurons, *Proceedings of the National Academy of Sciences (USA)*, 113(23): E3280–E3289, June 2016.

8. Rahul Kumar Rathour, Ruchi Malik and **Rishikesh Narayanan**, Transient potassium channels augment degeneracy in hippocampal active dendritic spectral tuning, *Scientific Reports*, 6, 24678: 1–14, April 2016.

9. Sunandha Srikanth and **Rishikesh Narayanan**, Variability in state-dependent plasticity of intrinsic properties during cell-autonomous self-regulation of calcium homeostasis in hippocampal model neurons, *eNeuro*, 2(4), e0053-15.2015: 1–24, August 2015.

10. Anindita Das and **Rishikesh Narayanan**, Active dendrites mediate stratified gamma-range coincidence detection in hippocampal model neurons, *The Journal of Physiology (London)*, 593(16): 3549–3576, August 2015.

11. Manisha Sinha and **Rishikesh Narayanan**, HCN channels enhance spike phase coherence and regulate the phase of spikes and LFPs in the theta-frequency range, *Proceedings of the National Academy of Sciences (USA)*, 112(17): E2207–E2216, April 2015.

12. Sufyan Ashhad, Daniel Johnston and **Rishikesh Narayanan**, Activation of $InsP_3$ receptors is sufficient for inducing graded intrinsic plasticity in rat hippocampal pyramidal neurons, *Journal of Neurophysiology*, 113(7): 2002–2013, April 2015.

13. Arun Anirudhan and **Rishikesh Narayanan**, Analogous synaptic plasticity profiles emerge from disparate channel combinations, *The Journal of Neuroscience*, 35(11): 4691–4705, March 2015.

14. Neha Dhupia, Rahul Kumar Rathour and **Rishikesh Narayanan**, Dendritic atrophy constricts functional maps in resonance and impedance properties of hippocampal model neurons, *Frontiers in Cellular Neuroscience*, 8, 456: 1–17, January 2015.

15. Poonam Mishra and **Rishikesh Narayanan**, High-conductance states and *A*-type K^+ channels are potential regulators of the conductance-current balance triggered by HCN channels, *Journal of Neurophysiology*, 113(1): 23–43, January 2015.

16. Rahul Kumar Rathour and **Rishikesh Narayanan**, Homeostasis of functional maps in active dendrites emerges in the absence of individual channelostasis, *Proceedings of the National Academy of Sciences (USA)*, 111(17): E1787–E1796, April 2014.

17. Anindita Das and **Rishikesh Narayanan**, Active dendrites regulate spectral selectivity in location-dependent spike initiation dynamics of hippocampal model neurons, *The Journal of Neuroscience*, 34(4): 1195–1211, January 2014.

18. Mohan Raghavan, Bharadwaj Amrutur, **Rishikesh Narayanan** and Sujit Sikdar, Synconset waves and chains: Spiking onsets in synchronous populations predict and are predicted by network structure, *PLoS ONE*, 8(10), e74910:1–17, October 2013.

19. Sufyan Ashhad and **Rishikesh Narayanan**, Quantitative interactions between the *A*-type K^+ current and inositol trisphosphate receptors regulate intraneuronal Ca^{2+} waves and synaptic plasticity, *The Journal of Physiology (London)*, 591 (7): 1645–1669, April 2013.

20. Suraj Honnuraiah and **Rishikesh Narayanan**, A calcium-dependent plasticity rule for HCN channels maintains activity homeostasis and stable synaptic learning, *PLoS ONE*, 8(2), e55590: 1–17, February 2013.

21. Rahul Kumar Rathour and **Rishikesh Narayanan**, Inactivating ion channels augment robustness of subthreshold intrinsic response dynamics to parametric variability in hippocampal model neurons, *The Journal of Physiology (London)*, 590 (22): 5629–5652, November 2012.

22. Rahul Kumar Rathour and **Rishikesh Narayanan**, Influence fields: A quantitative framework for representation and analysis of active dendrites, *Journal of Neurophysiology*, 107(9): 2313–2334, May 2012.

23. **Rishikesh Narayanan**, Kevin Dougherty and Daniel Johnston, Calcium store depletion induces persistent perisomatic increases in the functional density of *h* channels in hippocampal pyramidal neurons, *Neuron*, 68(5): 921–935, December 2010.

24. **Rishikesh Narayanan** and Daniel Johnston, The *h* current is a candidate mechanism for regulating the sliding modification threshold in a BCM-like synaptic learning rule, *Journal of Neurophysiology*, 104(2): 1020–1033, August 2010.

25. **Rishikesh Narayanan** and Sumantra Chattarji, Computational analysis of the impact of chronic stress on intrinsic and synaptic excitability in the hippocampus, *Journal of Neurophysiology*, 103(6): 3070–3083, June 2010.

26. **Rishikesh Narayanan** and Daniel Johnston, The *h* channel mediates location dependence and plasticity of intrinsic phase response in rat hippocampal neurons, *The Journal of Neuroscience*, 28(22): 5846–5860, May 2008.

27. **Rishikesh Narayanan** and Daniel Johnston, Long-term potentiation in rat hippocampal neurons is accompanied by spatially widespread changes in intrinsic oscillatory dynamics and excitability, *Neuron*, 56(6): 1061–1075, December 2007.

28. **Rishikesh Narayanan**, Anusha Narayan and Sumantra Chattarji, A probabilistic framework for region-specific remodeling of dendrites in three-dimensional neuronal reconstructions, *Neural Computation*, 17(1): 75–96, January 2005.

29. **Rishikesh Narayanan** and Y. V. Venkatesh, A computational model for the development of simple-cell receptive fields spanning the regimes before and after eye-opening, *Neurocomputing*, 50: 125–158, January 2003.

30. **Rishikesh Narayanan** and Y. V. Venkatesh, Shape recognition using an invariant pulse code and a hierarchical competitive neural network, *Pattern Recognition*, 34(4): 841–853, April 2001.

31. Y. V. Venkatesh and **Rishikesh Narayanan**, Self-organizing neural networks based on spatial isomorphism for active contour modeling, *Pattern Recognition*, 33(7): 1239–1250, July 2000.

II. Reviews/Previews/Perspectives

1. Sufyan Ashhad and **Rishikesh Narayanan**, Stores, Channels, Glue and Trees: Active Glial and Active Dendritic Physiology, *Molecular Neurobiology*, In press, July 2018.

2. Anindita Das, Rahul Kumar Rathour and **Rishikesh Narayanan**, Strings on a violin: Location dependence of frequency tuning in active dendrites, *Frontiers in Cellular Neuroscience*, 11, 72: 1–8, March 2017.

3. **Rishikesh Narayanan** and Daniel Johnston, Functional maps within a single neuron, *Journal of Neurophysiology*, 108(9), 2343–2351, November 2012.

4. **Rishikesh Narayanan** and Daniel Johnston, The ascent of channels with memory, *Neuron*, 60(5), 735–738, December 2008.

5. Daniel Johnston and **Rishikesh Narayanan**, Active dendrites: Colorful wings of the mysterious butterflies, *Trends in Neurosciences*, 31(6), 309–316, June 2008.

III. Conference Proceedings

1. **Rishikesh Narayanan** and Y. V. Venkatesh, Experiments on three-dimensional wire-frame object recognition, in Proceedings of the International Conference on Neural Information Processing, Vol. 1, 207–210, 21–23 October 1998, Kitakyushu, Japan.

2. **Rishikesh Narayanan** and Y. V. Venkatesh, An invariant pulse-coder for 2-D shape recognition, in Proceedings of the IEEE International Conference on Information, Communications and Signal Processing, Vol. 3, 1552–1556, 9–12 September 1997, Singapore.

3. Y. V. Venkatesh and **Rishikesh Narayanan**, Some applications of active contours using ANN's isomorphic to boundaries, in Proceedings of the IEEE International Conference on Information, Communications and Signal Processing, Vol. 3, 1547–1551, 9–12 September 1997, Singapore.

4. Y. V. Venkatesh and **Rishikesh Narayanan**, Modelling active contours using neural networks isomorphic to boundaries, in Proceedings of the IEEE International Conference on Neural Networks, Vol. 3, 1669–1672, 9–12 June 1997, Houston, TX, USA.

IV. Conference Abstracts

1. Poonam Mishra and **Rishikesh Narayanan**, Activity-dependent long-term intrinsic plasticity in dentate gyrus granule cells, Presented at the Society for Neuroscience Annual Meeting, 3-7 November 2018, San Diego, USA, Program No. 203.14.

2. Manisha Sinha and **Rishikesh Narayanan**, An emergent model of hippocampal sharp wave ripple complexes reveals sublayer-specific stratified disparities, Presented at EMBO Workshop on Dendrites 2018: Dendritic anatomy, molecules and function, 17–20 June 2018, Heraklion, Greece.

3. Manisha Sinha and **Rishikesh Narayanan**, An emergent model of hippocampal sharp wave ripple complexes reveals sublayer-specific stratified disparities, Presented at Society for Neuroscience Annual Meeting, 11–15 November 2017, Washington D.C., USA, Program No. 615.18.

4. Anindita Das and **Rishikesh Narayanan**, Location-dependence of spike triggered average and gamma-range coincidence detection in rat hippocampal pyramidal neuronal dendrites, Gordon Research Seminar/ Conference on Dendrites: Molecules, structure and function, 25–31 March 2017, Lucca (Barga), Italy.

5. Sufyan Ashhad and **Rishikesh Narayanan**, Active dendritic conductances regulate the impact of gliotransmission on rat hippocampal pyramidal neurons, Society for Neuroscience Annual Meeting, 12–16 November 2016, San Diego, USA, Program No. 211.28.

6. Poonam Mishra and **Rishikesh Narayanan**, Degenerate mechanisms mediate decorrelation and pattern separation in the dentate gyrus, Society for Neuroscience Annual Meeting, 12–16 November 2016, San Diego, USA, Program No. 263.08.

7. Sunandha Srikanth and **Rishikesh Narayanan**, Intrinsic plasticity during state-dependent calcium homeostasis in hippocampal model neurons, Society for Neuroscience Annual Meeting, 17–21 October 2015, Chicago, IL, USA, Program No. 672.19.

8. Rahul Kumar Rathour and **Rishikesh Narayanan**, Modulation of intrinsic response dynamics by subthreshold inactivating conductances in rat hippocampal pyramidal neurons, Society for Neuroscience Annual Meeting, 15–19 November 2014, Washington, D.C., USA, Program No. 299.24.

9. Manisha Sinha and **Rishikesh Narayanan**, Subthreshold conductances regulate local field potentials and theta-frequency spike phase preference of hippocampal model neurons, Society for Neuroscience Annual Meeting, 15–19 November 2014, Washington, D.C., USA, Program No. 686.07.

10. Sufyan Ashhad, Daniel Johnston and **Rishikesh Narayanan**, Activation of inositol trisphosphate receptors is sufficient for inducing graded intrinsic plasticity in hippocampal pyramidal neurons, Society for Neuroscience Annual Meeting, 15–19 November 2014, Washington, D.C., USA, Program No. 686.10.

11. Manisha Sinha and **Rishikesh Narayanan**, HCN channels regulate theta-frequency spike phase preference of hippocampal model neurons, Gordon Research Seminar / Conference on Dendrites: Molecules, structure and function, 18–24 May 2013, Les Diablerets, Switzerland.

12. Anindita Das and **Rishikesh Narayanan**, Dendritic voltage-gated ion channels regulate feature selectivity in spiking dynamics of hippocampal model neurons, Gordon Research Seminar / Conference on Dendrites: Molecules, structure and function, 18–24 May 2013, Les Diablerets, Switzerland.

13. Sufyan Ashhad and **Rishikesh Narayanan**, The *A*-type potassium current regulates ER calcium release through inositol trisphosphate receptors in a hippocampal pyramidal cell model, Society for Neuroscience Annual Meeting, 13–17 October 2012, New Orleans, LA, USA, Program No. 340.05.

14. Rahul Rathour and **Rishikesh Narayanan**, Influence fields: A quantitative framework for the representation and analysis of functional maps within a single neuron, Gordon research conference on Dendrites: Molecules, structure and function, 13–18 March 2011, Ventura, CA, USA.

15. **Rishikesh Narayanan** and Daniel Johnston, Intracellular calcium store depletion in rat hippocampal neurons induces long-term increases in the *h* current, Society for Neuroscience Annual Meeting, 15–19 November 2008, Washington, DC, USA, Program No. 240.20.

16. Clifton Rumsey, **Rishikesh Narayanan** and Daniel Johnston, Intraneuronal resonance and frequency response properties of CA1 pyramidal neuron models, Society for Neuroscience Annual Meeting, 3–7 November 2007, San Diego, CA, USA, Program No. 587.12.

17. **Rishikesh Narayanan** and Daniel Johnston, Activity regulates location-dependent oscillatory dynamics in rat hippocampal neurons, Gordon Research Seminar / Conference on Dendrites: Molecules, structure and function, 18–23 March, 2007, Ventura, CA, USA.

18. **Rishikesh Narayanan** and Daniel Johnston, Activity-dependent increase of intrinsic oscillatory frequency in rat hippocampal neurons, Society for Neuroscience Annual Meeting, 14–18 October 2006, Atlanta, GA, USA, Program No. 42.6.

19. **Rishikesh Narayanan**, Darrin H. Brager, Yuan Fan and Daniel Johnston, I_{h} as a candidate mechanism for sliding the BCM modification threshold, Society for Neuroscience Annual Meeting, 12–16 November 2005, Washington, DC, USA, Program No. 737.5.

20. **Rishikesh Narayanan**, Luke R. Johnson, Hannah H. Alphs, Joseph E. LeDoux and Sumantra Chattarji, Biophysical correlates of intrinsic and stress-induced morphological variability in lateral amygdaloid neurons: A computational study, Society for Neuroscience Annual Meeting, 23–27 October 2004, San Diego, CA, USA, Program No. 517.7.

21. **Rishikesh Narayanan**, Anusha Narayan and Sumantra Chattarji, Computational analysis of the effects of chronic stress on hippocampal excitability: From neurons to network, Society for Neuroscience Annual Meeting, 8–12 November 2003, New Orleans, LA, USA, Program No. 192.5.

PROFESSIONAL ACTIVITY

- Member, Society for Neuroscience, USA (2003–).
- Member, Molecular and Cellular Cognition Society, USA (2005–).
- Member, American Physiological Society, USA (2011–).
- Member, Biophysical Society, USA (2016–).
- Reviewer for research articles submitted to the following journals: eLife, eNeuro, European Journal of Neuroscience, Frontiers in Cellular Neuroscience, Journal of Computational Neuroscience, Journal of Mathematical Neuroscience, Journal of Neurochemistry, Journal of Neurophysiology, Journal of Neuroscience, The Journal of Physiology (London), Nature Communications, Neurobiology of Learning and Memory, Neuroscience, PLOS computational biology.

ORGANIZING ROLE IN CONFERENCES/WORKSHOPS

- Co-organizer of summer school on Computational Approaches to Memory and Plasticity, National Centre for Biological Sciences, Bangalore, 1–16 July 2018.
- Member, organizing committee, Workshop on Brain, Computation And Learning, Indian Institute of Science, Bangalore, 8–12 January 2018.
- Co-organizer of summer school on Computational Approaches to Memory and Plasticity, National Centre for Biological Sciences, Bangalore, 19 July–3 August 2017.
- Member, organizing committee, Workshop on Brain, Computation And Learning, Indian Institute of Science, Bangalore, 9–13 January 2017.

- Co-organizer of summer school on Computational Approaches to Memory and Plasticity, National Centre for Biological Sciences, Bangalore, 1–16 July 2016.
- Member, organizing committee, Annual meeting of the Indian Biophysical Society on *Molecules in Living Cells: Mechanistic Basis of Function*, Indian Institute of Science, Bangalore, 8–10 February 2016.
- Co-organizer of summer school on Computational Approaches to Memory and Plasticity, National Centre for Biological Sciences, Bangalore, 27 June–12 July 2015.

INVITED RESEARCH TALKS IN CONFERENCES AND SYMPOSIA

- Talk on "Degeneracy in robust place field encoding" in the *IISc-UCL symposium on neuroscience, machine learning and artificial intelligence*, University College of London, London, U.K., July 8–10, 2018.
- Talk on "Degeneracy in robust spatial encoding" in the *IBRO-APRC school on cognitive neuroscience: The 5th Bangalore Cognitive Workshop*, Indian Institute of Science, Bangalore, June 17–19, 2018.
- Talk on "Degeneracy in the hippocampal formation" in the *One-Day Satellite Symposium on Neuroscience, IBRO-APRC-Associate School of Neuroscience*, Savitribai Phule Pune University, Pune, 26 March 2018.
- Talk on "Degeneracy in the hippocampal formation" in the *No Garland Neuroscience* symposium, Indian Institute of Science Education and Research, Pune, October 13–15, 2017.
- Talk on "Active Dendrites: Implications for local field potentials and neuron-glia interactions" in the *Meeting on Neuroscience Across Scales*, National Centre for Biological Sciences, Bangalore, July 17–19, 2017.
- Talk on "Stores, Channels, Glue and Trees" in the *Third Mini Symposium on Cell Biology*, National Centre for Cell Sciences, Pune, May 23, 2017.
- Talk on "Degeneracy in hippocampal physiology and plasticity" in the *ICTS Summer Program on Dynamics of Complex Systems*, International Centre for Theoretical Sciences (ICTS), Bangalore, May 13, 2017.
- Talk on "Active dendrites and rhythms in the hippocampus" in the *International Symposium on Biological Timing and Health Issues in the 21st Century*, University of Delhi, Delhi, February 21–24, 2017.
- Talk on "Active Dendrites: Implications for neuronal physiology and neuron-glia interactions" in the *The 25th ISFN Annual Meeting and the joint Israel-India Neuroscience symposium*, Eilat, Israel, December 4–6, 2016.
- Talk on "Functional maps within a single neuron: Emergence, homeostasis and implications" in the *EMBO Workshop on Dendritic Anatomy, Molecules and Function*, Foundation for Research and Technology, Hellas, Crete, Greece, June 18–21, 2016.

- Talk on "Degeneracy in hippocampal physiology and plasticity" in the Annual meeting of the Indian Biophysical Society on *Molecules in Living Cells: Mechanistic Basis of Function*, Indian Institute of Science, Bangalore, 8–10 February 2016.

- Talk on "Mapping the resonating wings before the stores were depleted", *The colorful wings of Johnston's butterflies: A symposium to honor Prof. Daniel Johnston*, Northwestern medical school, Chicago, USA, 17 October 2015.

- Talk on "HCN channels, LFPs and STA" as part of a KITP Program on *Neurophysics of Space, Time and Learning*, Kavli Institute for Theoretical Physics, University of California, Santa Barbara, USA, Jan 27–Mar 7, 2014.

- Talk on "Reification of the role of ion channel interactions in neuronal physiology" as part of the *Bangalore-Zurich Workshop on Frontiers in Biology and Medicine*, held at the Indian Institute of Science and the National Centre for Biological Sciences, Bangalore, 3–5 February 2014.

- Talk on "Active dendrites regulate spectral selectivity in spike initiation dynamics of hippocampal model neurons" as part of the *INNNI workshop on Hippocampus: From Synapses to Behaviour*, under the aegis of the International Neuroinformatics Coordinating Facility (INCF), held at Indian Institute of Science Education and Research, Pune, 1–2 December 2013.

- Talk on "Reification of Non-Synaptic Changes in Neuronal Networks" as part of the *International conference on Pattern Recognition Applications and Techniques* held at the Meenakshi College for Women, Chennai, 1–2 March 2013.

- Talk on "Two tales of two active membranes: Influences and interactions" as part of the *International Conference on Recent Advances in Molecular Mechanisms of Neurological Disorders*, under the aegis of the Society for Neurochemistry, India, at the All India Institute of Medical Sciences, New Delhi, 21–23 February, 2013.

- Talk on "Functional maps within a single neuron" as part of the *Winter Conference on Computational Aspects of Neural Engineering* held at the Indian Institute of Science, Bangalore, 20–21 December 2012.

- Talk on "Functional maps within a single neuron" as part of the *International Neuroinformatics Coordinating Facility (INCF) workshop* held at The Institute of Mathematical Sciences, Chennai, 5–7 November 2012.

- Talk on "Two tales of two active membranes: Influences and interactions" as part of the *Edinburgh - Bangalore symposium* held at the Indian Institute of Science, Bangalore, 16–17 January 2012.

INVITED PEDAGOGIAL LECTURES IN SCHOOLS AND WORKSHOPS

- Lectures on "Dendritic computation" and "Degeneracy in neural systems" in the *IFCAM Summer School on Mathematical and Computational Biology*, Indo-French Centre for Applied Mathematics, Indian Institute of Science, Bangalore, July 16–31, 2018.

- Lectures on "Cable Theory", "Ion channels and active dendrites", and "Synaptic plasticity" in summer school on *Computational Approaches to Memory and Plasticity*, National Centre for Biological Sciences, Bangalore, July 1–16, 2018.

- Lecture on "In vitro electrophysiology: Active dendrites and their plasticity" in the *IBRO-APRC-Associate School of Neuroscience*, Savitribai Phule Pune University, Pune, 27–31 March 2018

- Lectures on "Cable Theory", "Dendritic ion channels and intrinsic plasticity", "Single-neuron plasticity models" and "Degeneracy in detailed neuronal models" in summer school on *Computational Approaches to Memory and Plasticity*, National Centre for Biological Sciences, Bangalore, July 19–August 3, 2017.

- Lecture on "Holistic Learning in Biological Neurons" in the *Workshop on Brain, Computation And Learning*, Indian Institute of Science, Bangalore, 9–13 January 2017.

- Lectures on "Passive dendritic computation" and "Active dendritic computation" in the *Second Instructional School on Mathematical and Computational Biology*, National Network for Mathematical and Computational Biology (NNMCB), Indian Institute of Science, Bangalore, 23–31 May 2016.

- Lectures on "Synaptic plasticity", "Dendritic ion channels and intrinsic plasticity", "Single-neuron plasticity models" and "Degeneracy in detailed neuronal models" in summer school on *Computational Approaches to Memory and Plasticity*, National Centre for Biological Sciences, Bangalore, 1–16 July 2016.

- Lectures on "Cable theory" and "Single-neuron plasticity models", *Computational Approaches to Memory and Plasticity*, National Centre for Biological Sciences, Bangalore, 27 June–12 July 2015.

- Lecture on "Functional maps within a single neuron: Homeostasis and plasticity" *Annual BSBE Winter Workshop 2014*, Indian Institute of Technology, Kanpur, 18–20 December, 2014.

- Lectures on "Introduction to dendritic physiology" and "NEURON: Tutorial" as part of the *8th SERB School in Neuroscience* with a focus on brain circuits, Indian Institute of Science Education and Research, Pune, 8–21 December 2014.

- Lecture on "Single-neuron plasticity", *Computational Approaches to Memory and Plasticity*, National Centre for Biological Sciences, Bangalore, 28 June–12 July 2014.

- Lectures on "Functional maps within a single neuron: Principles and plasticity" and "Functional maps within a single neuron: Origins and homeostasis", *First Instructional School on Mathematical and Computational Biology*, Indian Institute of Science Education and Research Mohali (IISERM), Punjab, 15–29 May 2014.

- Lecture on "Neuroscience and engineering techniques: Independent or interdependent?", *National Conference on Computers, Communication and Signal Processing*, Department of Information Technology, SSN College of Engineering, Chennai, 3–5 April 2014.

- Lecture on "Patch-clamp electrophysiology: A biophysical technique with utilities ranging from assessing molecular function to understanding behavioral correlates" as part of a symposium on *Relevance of Physical Science in Biological Research*, Maharani Lakshmi Ammanni College for Women, Bangalore, 18 Feb 2014.
- Lectures on "Dendritic physiology, plasticity and computation" as part of the *7th SERB School in Neuroscience* with a focus on electrophysiology, University of Hyderabad, 9–21 December 2013.
- Lecture on "Patch-clamp electrophysiology: A historical account of utilities ranging from assessing molecular function to understanding behavioral correlates" as part of the *MCB technique symposium 2013* held at the Department of Microbiology and Cell Biology, Indian Institute of Science, Bangalore, 27 April 2013.
- Lectures on "Cellular Neuroscience: Neurons, spikes, synapses and plasticity" as part of the *Winter School on Computational Aspects of Neural Engineering* held at the Indian Institute of Science, Bangalore, 12–19 December 2012.
- Lecture on "The changes within: Intrinsic plasticity and learning theory" as part of the Indo-US Science and Technology Forum's Workshop on *Modeling electrical activity in physiological systems*, held in Agra, 5–9 March 2012.
- Lecture on "The changes within: Intrinsic plasticity, learning and memory" as part of the *5th DST-SERC School in Neuroscience on Learning and Memory*, National Institute of Mental Health and Neurosciences (NIMHANS), 16–29 February 2012.
- Tutorial on "Computational Neuroscience" as part of the *Centenary Conference of the Electrical Engineering department* at the Indian Institute of Science, Bangalore, 14 December 2011.
- Lecture on "The ascent of channels with memory" as part of the Indian Academy Lecture workshop on *Nanotechnology and biosensors: Present and future perspectives* at Dayananda Sagar Institutions, Bangalore, 30 November 2011.
- Lecture on "The ascent of channels with memory", at the Department of Chemical Engineering, Indian Institute of Science, Bangalore, 11 August 2011.
- Lecture on "What is computational neuroscience?" at the Vidya Vikas Institute of Engineering and Technology, Mysore, 18 September 2010.
- Lecture on "Signal processing and the brain's efforts to understand itself: Independent or interdependent?" in a workshop on signal and image processing, at the M.S. Ramaiah Institute of Technology, Bangalore, 19–20 February 2010.
- Lecture on "Hippocampal learning and ion channels" under the aegis of the Association of Physiologists and Pharmacologists of India, at the Kempegowda Institute of Medical Sciences, Bangalore, 29 January 2010.
- Lectures on "Dendritic computation: Introduction and basic principles" and on "Dendritic computation: Plasticity" in *Computational Neuroscience 2009*, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, 14–18 November 2009.