

RESEARCH INTEREST My research interests lie primarily in neural networks, pattern recognition, neuromorphic engineering, evolutionary computation and machine learning.

EDUCATION **Ph.D. in Electrical and Electronic Engineering** August 2012 - August 2015
Nanyang Technological University Singapore
Thesis title: Learning spike time codes through supervised and unsupervised structural plasticity. (Submitted)
Supervisor: Arindam Basu

B.E. in Electronics & Telecommunication Engineering July 2008 - May 2012
Jadavpur University Kolkata, West Bengal, India
CGPA: 9.37/10.00

WORK EXPERIENCE **Nanyang Technological University** Singapore
Project Officer July 2012 - till date

Nanyang Technological University Singapore
Research Intern June 2011 - July 2011

Transwitch India Private Limited Delhi, India
Research Intern October 2010 - November 2010

PUBLICATIONS Summary

Journal papers accepted/published: 8 Conference papers accepted/published: 16
Journal papers submitted: 2 Conference papers submitted: 1
Citations (Google Scholar): 266 h-index (Google Scholar): 6

Full list

Published/accepted Journal papers

1. S. Roy and A. Basu, "An Online Unsupervised Structural Plasticity Algorithm for Spiking Neural Networks," *IEEE Transactions on Neural Networks and Learning Systems*, 2015. (Accepted)
2. S. Roy, P. P. San, S. Hussain, L. W. Wei and A. Basu, "Learning Spike time codes through Morphological Learning with Binary Synapses," *IEEE Transactions on Neural Networks and Learning Systems*, 2015 (Accepted).
3. S. Roy, A. Banerjee and A. Basu, "Liquid State Machine with Dendritically Enhanced Readout for Low-Power, Neuromorphic VLSI Implementations," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 8, pp. 681–695, Oct. 2014.
4. S. Roy, S. M. Islam, S. Das, S. Ghosh and A. V. Vasilakos, "A simulated weed colony system with subregional differential evolution for multimodal optimization," *Engineering Optimization, Taylor and Francis*, vol. 45, no. 4, pp. 459–481, 2013.
5. S. Roy, S. M. Islam, S. Das and S. Ghosh, "Multimodal optimization by artificial weed colonies enhanced with localized group search optimizers," *Applied Soft Computing*, vol. 13, no. 1, pp. 27–46, 2013.
6. S. M. Islam, S. Das, S. Ghosh, S. Roy and P. N. Suganthan, "An adaptive differential evolution algorithm with novel mutation and crossover strategies for global numerical optimization," *IEEE Transactions on Systems, Man, and Cybernetics – Part B*, vol. 42, no. 2, pp. 482–500, 2012.

7. S. Ghosh, S. Das, S. Roy, S. M. Islam and P. N. Suganthan, "A Differential Covariance Matrix Adaptation Evolutionary Algorithm for real parameter optimization," *Information Sciences*, vol. 182, no. 1, pp. 199–219, 2012.
8. S. Roy, S. M. Islam, S. Ghosh, S. Das and A. V. Vasilakos, "An adaptive differential evolution algorithm for autonomous deployment and localization of sensor nodes," *Progress In Electromagnetics Research B*, Vol. 29, pp. 289–309, 2011.

Published/accepted Conference papers

1. G. Narasimman, S. Roy, X. Fong, K. Roy, C. C. Hong and A. Basu, "A Low-voltage, Low power STDP Synapse implementation using Domain-Wall Magnets for Spiking Neural Networks," *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2016.
2. S. Korde, S. Roy, E. Yao and A. Basu, "On-chip Machine Learner for Spike Sorting in Implantable Brain Machine Interfaces (BMI)," *IRC Conference on Science, Engineering and Technology*, Singapore, May 2015.
3. A. Banerjee, S. Kar, S. Roy, A. Bhaduri and A. Basu, "A Current-Mode Spiking Neural Classifier with Lumped Dendritic Nonlinearity," *IEEE International Symposium on Circuits and Systems (ISCAS)*, Lisbon, Portugal, May 2015, pp. 714–717.
4. S. Roy, S. Kar and A. Basu, "Architectural exploration for on-chip, online learning in spiking neural networks," in *Proceedings of the 14th International Symposium on Integrated Circuits (ISIC)*, Singapore, Dec. 2014, pp. 128–131.
5. S. Roy, A. Basu and S. Hussain, "Hardware efficient, neuromorphic dendritically enhanced readout for liquid state machines," in *Proceedings of the 2013 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, Rotterdam, The Netherlands, Oct. 2013, pp. 302–305.
6. A. Sen, S. Roy and S. Das, "A Modified Differential Evolution for Symbol Detection in MIMO-OFDM System," in *Proceedings of the 2013 International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Chennai, India, Dec. 2013, pp. 236–247.
7. S. Roy, S. Z. Martinez and C. A. Coello Coello, "Adaptive IIR system identification using JADE," in *Proceedings of the 2012 World Automation Congress (WAC)*, Puerto Vallarta, Mexico, Jun. 2012, pp. 1–6.
8. S. Roy, S. Z. Martinez and C. A. Coello Coello, "A Multi-Objective Evolutionary approach for linear antenna array design and synthesis," in *Proceedings of the 2012 IEEE Congress on Evolutionary Computation (CEC)*, Brisbane, QLD, Jun. 2012, pp. 1–8.
9. S. Roy, S. M. Islam, S. Ghosh and S. Das, "A modified differential evolution for autonomous deployment and localization of sensor nodes," in *Proceedings of the 13th annual conference companion on Genetic and evolutionary computation (GECCO)*, New York, NY, Jul. 2011, pp. 235–236.
10. S. Ghosh, S. Roy, S. Das, A. Abraham and S. M. Islam, "Peak-to-average power ratio reduction in OFDM systems using an adaptive differential evolution algorithm," in *Proceedings of the 2011 IEEE Congress of Evolutionary Computation (CEC)*, New Orleans, LA, Jun. 2011, pp. 1941–1949.
11. S. M. Islam, S. Ghosh, S. Das, A. Abraham and S. Roy, "A Modified Discrete Differential Evolution based TDMA scheduling scheme for many to one communications in wireless sensor networks," in *Proceedings of the 2011 IEEE Congress of Evolutionary Computation (CEC)*, New Orleans, LA, Jun. 2011, pp. 1950–1957.
12. S. Ghosh, S. Roy, S. M. Islam, S. Das and P. N. Suganthan, "A differential covariance matrix adaptation evolutionary algorithm for global optimization," in *Proceedings of the 2011 IEEE Symposium on Differential Evolution (SDE)*, Paris, France, Apr. 2011, pp. 1–8.

13. S. M. Islam, S. Ghosh, S. Roy, S. Zhao, P. N. Suganthan and S. Das, "Synthesis and design of thinned planar concentric circular antenna array - a multi-objective approach," in *Proceedings of the 2nd International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Visakhapatnam, Andhra Pradesh, Dec. 2011, pp. 182–190.
14. S. Ghosh, S. Roy, S. M. Islam, S. Zhao, P. N. Suganthan and S. Das, "Non-uniform circular-shaped antenna array design and synthesis-a multi-objective approach," in *Proceedings of the 2nd International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Visakhapatnam, Andhra Pradesh, Dec. 2011, pp. 223–230.
15. S. Roy, S. M. Islam, S. Ghosh, S. Zhao, P. N. Suganthan and S. Das, "Design of two channel quadrature mirror filter bank: a multi-objective approach," in *Proceedings of the 2nd International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Visakhapatnam, Andhra Pradesh, Dec. 2011, pp. 239–247.
16. S. M. Islam, S. Ghosh, S. Roy and S. Das, "Adaptive Differential Evolution with p-Best Crossover for Continuous Global Optimization," in *Proceedings of the 1st International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Chennai, India, Dec. 2010, pp. 119–128.

Submitted Journal papers

1. A. Banerjee, A. Bhaduri, S. Roy, S. Kar and A. Basu, "Spiking Neural Classifier with Lumped Dendritic Nonlinearity and Binary Synapses: A Current mode VLSI Implementation and Analysis," *IEEE Transactions on Biomedical Circuits and Systems*. (Revised and resubmitted)
2. S. Roy and A. Basu, "An Online Structural Plasticity Rule for Generating Better Reservoirs," *Neural Computation, MIT Press*.

Submitted Conference papers

1. H. Tong, A. Basu and S. Roy, "Online unsupervised structural plasticity algorithm for multi-layer Winner-Take-All with binary synapses," *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2016.

TALKS AND TUTORIALS

Conference Talks

1. "Architectural exploration for on-chip, online learning in spiking neural networks," *International Symposium on Integrated Circuits (ISIC)*, Singapore, Dec. 2014.
2. "Hardware efficient, neuromorphic dendritically enhanced readout for liquid state machines," *IEEE Biomedical Circuits and Systems Conference (BioCAS)*, Rotterdam, The Netherlands, Oct. 2013.
3. "Design of two channel quadrature mirror filter bank: a multi-objective approach," *International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Visakhapatnam, Andhra Pradesh, Dec. 2011.
4. "Adaptive Differential Evolution with p-Best Crossover for Continuous Global Optimization," *International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO)*, Chennai, India, Dec. 2010.

Other Talks

1. "Liquid State Machine with Dendritically Enhanced Readout for Low-power, Neuromorphic implementations," *5th VIRTUS IC Design Workshop*, Jul. 2015.
2. "Liquid State Machine with Dendritically Enhanced Readout," *VALENS Student Seminar series III*, Feb. 2013.
3. "Learning Spike time codes through Morphological Learning with Binary Synapses," *VALENS Student Seminar series VII*, Mar. 2015.

PROFESSIONAL ACTIVITIES

- Reviewer for IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Systems, Man and Cybernetics Part C, Swarm and Evolutionary Computation, SEMCCO and VLSI.
- Member of IEEE from August 2013 and IEEE Young Professionals from November 2014.
- Assisted Dr. Arindam Basu in mentoring the following students:
 1. Swarnima Korde (FYP): On-chip Machine Learner for Spike Sorting in Implantable Brain Machine Interfaces. (2014)
 2. He Tong (URECA and FYP): An online unsupervised structural plasticity algorithm for two layer neural network with binary synapses. (2014)
 3. Jayanti Basu Roy (FYP): Control of Mismatch in VLSI Neurons: A Floating-gate Approach. (2013)

OTHER ASSOCIATIONS

- Global Edukonnnect Pte. Ltd. Singapore
Co-founder March 2014 - till date
 - Co-founded company to provide a platform for students seeking global learning, international exposure and overall personality development.
 - Collaborated with Centre for Continuing Education, Nanyang Technological University and White Leaf Technologies, Singapore in developing unique courses and conducting global immersion programs.
- DARPAN International Film Festival Singapore
Logistics Director and Organizing Committee Member July 2013 - till date
 - Serving as a Logistics Director of the largest Bengali film festival of South-East Asia.
 - Collaborated with multiple media and government agencies from India and Singapore such as Singapore Film Society, Sony Max, Singapore Indian Chamber of Commerce and Industry, etc.

FELLOWSHIPS, AWARDS AND DISTINCTIONS

1. Convergent Science Network of Biomimetic and Biohybrid Systems (CSN) fellowship for CappoCaccia Neuromorphic Workshop, 27th April - 10th May, 2015
2. Excellence award by Allahabad Bank, Kolkata for outstanding undergraduate academic performance, 2010.
3. National Merit Scholarship Award by Government of West Bengal for outstanding performance in Higher Secondary Examination, West Bengal, India, 2008.
4. Excellence award by Chinmaya Mission, Kolkata, India for outstanding performance in high school, 2007.
5. Project Grant Award by University Grants Commission, 2010.
6. Ranked 22nd (Engineering Stream) among 1,00,000 (approx.) Examinees in West Bengal Joint Entrance Examination, 2008.
7. Ranked 99th (State Rank) in All India Engineering Entrance Examination (AIEEE), 2008.
8. Ranked 19th among 4,00,000 (approx.) students in Higher Secondary (12th Standard) Examination, West Bengal, India, 2008.

TECHNICAL EXPOSURE

- **Languages:** C, Cuda C, MATLAB, Python, Verilog and HTML.
- **Tools:** CADENCE, Caffe, Xilinx ISE, Simulink and ModelSim.
- **Operating Systems:** Windows, Linux and MAC.

**OTHER
DETAILS**

Languages Known: English, Hindi & Bengali

Address: Centre of Excellence in IC Design (VIRTUS), Nanyang Technological University, 50 Nanyang Avenue, Block S3.2, Level B2, Singapore, 639798

Date of Birth: 20th December, 1989