

SUSHRUT THORAT

CONTACT INFORMATION

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INTERESTS

Artificial Intelligence, Cognitive Neuroscience & Neural Networks

EDUCATION

Masters in Cognitive Sciences (CNS track) *Ongoing*
CIMEC, University of Trento, Rovereto, Italy

B.Tech. in Engineering Physics *August, 2015*
Indian Institute of Technology - Bombay, Mumbai, India
Cumulative Performance Index (CPI) of 7.64 on a scale of 10.00

PUBLICATIONS

Arithmetic Computing via Rate Coding in Neural Circuits with Spike-triggered Adaptive Synapses ([paper](#))

Co-author: Bipin Rajendran *June 2015*

Conference: International Joint Conference on Neural Networks, Killarney, Ireland

We presented spiking neural circuits with spike-time dependent adaptive synapses capable of the arithmetic operations - addition, subtraction, multiplication and division, as well as other non-linear transformations - exponentiation and logarithm, for time dependent signals in real-time.

WORK EXPERIENCE

Content Developer

Employer: Avanti Fellows, Delhi

Summer 2013

Researched about and developed ConceptTests as required by Avanti's Learning Centre Curriculum. The Curriculum is based on Eric Mazur's *Peer Instruction* model which he successfully employs at Harvard University.

PROJECTS

Implementing a Reverse Dictionary using a Node-Graph Architecture

Collaborator: Varad Choudhari

Ongoing

We are designing a method to process any forward language dictionary to build a reverse dictionary, using a n-level reverse tree search through word definitions. The reverse dictionary takes any input phrase and outputs a set of words with high semantic correlation to the input. We are writing a paper to be submitted at ACL'16.

Predisposition to towards-gravity periodic motion in chicks ([report](#))

Guide: Sang Ah Lee

Autumn 2015

A predisposition to biological motion, in chicks, has been demonstrated. We presented a hypothesis which points to a towards-gravity periodic motion as the fundamental predisposition, of which biological motion is a subset. We ran a short experiment with newborn chicks to test the same. The results look promising but would take a complete experiment to be deemed significant.

Senior Thesis: A Spiking Neural Network as a Quadcopter Flight Controller ([thesis](#))

Guide: Bipin Rajendran

Spring 2015

We developed a model-based control scheme for velocity-waypoint navigation in the presence of wind, noisy and delayed IMU data, for a quadcopter. We built small spiking neural networks with simple spike-triggered adaptive synapses for implementing arithmetic operations. **We wrote a paper explaining these networks, which has been published in the proceedings of IJCNN'15.** We outlined a method of developing a spiking neural network for quadcopter Control to analyse the gain in computational power and stability provided by spike-based networks.

Non-Linearity in Neural Systems ([presentation](#))

Course: *Non-linear Dynamics*

Autumn 2014

Studied Korn's review papers *Is there chaos in the brain?*, which presented a summary of the field of chaotic systems and discussed the indications and usefulness of chaos in the human brain. Studied the Hodgkin-Huxley Neuron model, and carried out a non-linear analysis of the same to describe the existence of action potentials, and the system's behavior in a variety of conditions.

Junior Thesis: On Quantum Computation ([report](#))([presentation](#))

Guides: *Tathagat Avatar Tulsi and Suddhasatta Mahapatra*

Autumn 2013

Read the first two parts of the book *Quantum Computation and Quantum Information* by Nielsen and Chuang. Wrote a report on, and presented the basics of Quantum Computation viz. Quantum Circuits and Quantum Algorithms, and their applications.

Gesture Lock ([report](#))

Guide: *Pradeep Sarin*

Autumn 2013

Designed and implemented a Gesture Lock using a matrix of Light Dependent Resistors in conjunction with an Arduino microcontroller to sense fluctuations in light intensity and thereby analyse a gesture and verify it with a predefined pattern. Designed a unique method of distributing feedback from one ambient ldr circuit to multiple input ldr circuits. Designed a 9-to-4 bit encoder as required for optimisation of the hardware. Demonstrated the prototype and wrote a report.

SCHOLASTIC ACHIEVEMENTS

- Awarded the *KVPY scholarship* (2010), awarded to 150 promising young researchers throughout India, by the *Dept. of Science & Technology, Govt. of India*.
- *Winner* at the *Annual All India Web-Design Contest* (2008) hosted by SJIT, Pune (India).
- Awarded the *NTSE scholarship* (2007), awarded to 1000 students throughout India with excellent all-round skills, by the *National Centre for Educational Research and Technology, Govt. of India*.

TECHNICAL SKILLS

Programming: C++, Python, MATLAB, PsychToolbox, OpenSesame

Web-Design: HTML5, CSS3, PHP, JavaScript