SUSHRUT THORAT

Contact Information

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Interests

Cognitive Neuroscience, Artificial Intelligence, Biological 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 of **7.64** *on a scale of* 10.00 (First Class)

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 employed at Harvard University.

Projects

The neural basis of cross-modal numerosity perception in newborns and adults
Guides: Marco Buiatti and Manuela Piazza *Ongoing*
The project aims to understand the said neural basis using frequency-tagging EEG. I am involved in piloting the general paradigm with adult subjects. We have developed a method which accounts for the variance in the non-numerical factors (item size, sparsity, etc.) in the stimuli which affect number cognition. We will commence the EEG tests shortly.

Implementing a Reverse Dictionary using a Node-Graph Architecture
Collaborator: Varad Choudhari *Spring 2016*
We designed a method to process any forward language dictionary to build a reverse dictionary, using a n-level reverse search on a graph, through word definitions. The reverse dictionary takes any input phrase and outputs a set of words with high semantic correlation to the input. **We submitted a paper describing the approach to ACL'16**.

Senior Thesis: A Spiking Neural Network as a Quadcopter Flight Controller (*report*)
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.

Junior Thesis: On Quantum Computation (*report*, *presentation*)
Guides: Tathagat Avatar Tulsi and Suddhasatta Mahapatra *Autumn 2013*
Wrote a report on, and presented the basics of Quantum Computation viz. Quantum Circuits and Quantum Algorithms, and their applications, primarily based on the first two parts of the book 'Quantum Computation and Quantum Information' by Nielsen and Chuang.

Attended Summer Schools

Computational Approaches to Memory and Plasticity (CAMP) *June, 2015*
NCBS, Bangalore, India

Academic Achievements

- Ranked **721 among 450,000 students** in the Joint Entrance Examination **(JEE, 2011)** conducted towards admission to the IITs.
- 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 SJIIT, 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, MatConvNet), OpenSesame

Web-Design: HTML5, CSS3, PHP, JavaScript

Course Projects

Understanding human visual processing with deep neural networks (*presentation*)
Neural Decoding (James Haxby) *Spring 2016*

Predisposition to towards-gravity periodic motion in chicks (*report*)
Foundations of Cognitive Psychology (Sang Ah Lee) *Autumn 2015*

Non-Linearity in Neural Systems (*presentation*)
Non-linear Dynamics (Anirban Sain) *Autumn 2014*

Gesture Lock (*report*)
Micro-controllers Lab (Pradeep Sarin) *Autumn 2013*