

SUSHRUT THORAT

CONTACT INFORMATION

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INTERESTS

Unsupervised Learning, Biological Neural Networks, Personal Identity

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

Implementing a Reverse Dictionary, based on word definitions, using a Node-Graph Architecture ([preprint](#))

Co-author: Varad Choudhari *December, 2016*
Conference: International Conference on Computational Linguistics, Osaka, Japan

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, and performs atleast as well as the state-of-the-art.

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

Principles of information representation in the Human Visual System as compared with Convolutional Neural Networks

Guide: Marius Peelen *Ongoing*

Representations in the CNN layers correlate highly with the visual ventral stream representations, even in the case of stimuli confounding visual features as in Proklova, et.al., 2016. Visual features are rich contributors to semantic representations. This project aims to find out how much the ventral temporal cortex is driven by visual features alone in representing animacy, using a CNN as the lower bound.

The neural basis of cross-modal numerosity perception ([report](#))

Guides: Marco Buiatti and Manuela Piazza *Spring 2016*

The project aims to understand the said neural basis using frequency-tagging EEG. We developed an algorithm for generating the stimuli, which accounts for the variance in the non-numerical factors (item size, sparsity, etc.) which affect number cognition. I also was involved in conducting the pilot experiment on adult subjects.

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.

ATTEND(-ED/-ING) WORKSHOPS

IBRO-SIMONS Computational Neuroscience Imbizo (ISi-CNI)
 Cape Town, South Africa

January, 2017

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

June, 2015

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