

Mohit Agarwal

PhD Student
Electrical and Computer Engineering
Georgia Institute of Technology

www.agmohit.com
Email: magarwal37@gatech.edu
Phone: +1-404-953-8538

Research Interests Brain-Computer Interfaces, Signal Processing, Machine Learning, Deep Learning, Artificial Intelligence and Wireless Communications

Education



Georgia Institute of Technology
MS/PhD in Electrical and Computer Engineering
Advisor: Prof. Raghupathy Sivakumar
GPA: 4.0/4.0 (Expected Graduation: Dec 2019)

Aug'14 - Present



Indian Institute of Technology Kanpur
B.Tech in Electrical Engineering
GPA: 8.7/10.0

July'10 - May'14

Publications **Mohit Agarwal** and Raghupathy Sivakumar, "Characters vs. Words - Observations on Command Design for Brain-Computer Interfaces", Poster, International Conference on Mobile Systems, Applications and Services (MobiSys), Niagara Falls, NY, USA, June 2017

Mohit Agarwal and Raghupathy Sivakumar, "THINK: Toward Practical General-Purpose Brain-Computer Communication", 2nd ACM Workshop on Hot Topics in Wireless (HotWireless), 2015

Atul Kumar Sinha, **Mohit Agarwal** and Ajit K. Chaturvedi, "Multi-Level SINR Thresholding for Reduced Complexity MIMO Detection" in National Conference on Communications, 2013

Onur Ozdemir, Lakshmi N. Theagarajan, **Mohit Agarwal**, T. Wimalajeewa and Pramod K. Varshney, "An MCMC Approach to Multisensor Linear Modulation Classification", WCNC 2017

Mohit Agarwal and Raghupathy Sivakumar. "Don't charge for a day: Lightweight wakeup command detection for always-on BCI wearables" to be submitted, ACM CHI 2019

Jun Zou, **Mohit Agarwal**, Yashas Saidutta, Faramarz Fekri and Raghupathy Sivakumar, "EEG Sequence Recognition using Deep Learning and Hidden Markov Models for BCI" to be submitted

Provisional Patents **Mohit Agarwal** and Raghupathy Sivakumar. *Cogito Ergo Sum*: Using Brain Waves to Perform Personalization based on What Users *Think*. US Provisional Patent Application 62/565349. 2017

Awards and Achievements

- **Semi-Finalist** of Qualcomm Innovation Fellowship 2018, USA
- Ranked **2nd** in worldwide Melanoma Detection Challenge (2016) organized by ISBI
- Ranked in the **Top 0.1%** (amongst 475,000 students) in IIT-JEE 2010
- Selected in the **Top 1%** (amongst 40,000 students) in National Physics Olympiad 2010
- Recipient of **MCM Scholarship** for continued excellent academic performance (2010-2014)

Technical Skills

C/C++, Java, Python, MATLAB/R, Android Development, Web (HTML/CSS/d3.js), \LaTeX
Network Simulation Tools: ns2, Netlogo, iperf and Wireshark
Deep Learning Frameworks: Tensorflow, Caffe, Torch and Keras

Internships



Wireless Technologies and SW Engineering

Summer'18

Wireless Software Development Project

Under Firouz Behnamfar and Velu Elangovan at Apple (USA)

- Worked on the development of a system-level discrete event simulator (in C++) to characterize and optimize a radio-access technology (undisclosed, and developed in-house)



Lawrence
Livermore
National
Laboratory

High Dimensional Spectral Sampling Methods

Summer'17

Machine Learning and Data Analysis Research Project

Under J. J. Thiagarajan at Lawrence Livermore National Labs (USA)

- Automated the Pair-Correlation Function (PCF) estimation for arbitrary point clouds (which traditionally either require manual tuning for estimation, or takes several days for MD simulation)
- Building a unified spectral synthesis framework to generate Point Sets for any distribution by interpolating in Pair-Correlation Space using GANs



Video Action Classification using Deep Stateful Networks

Summer'16

Deep Learning Research Project

Under the guidance of Rob Liston and Dan Tan at Cisco Systems, Inc. (USA)

- Designed deep neural nets using LSTMs in Tensorflow, for action recognition in video clips
- Performed experiments to leverage temporal coherence in sequence of video frames
- Quantified the comparison between stateful and stateless models in UCF-101 dataset



Automatic Modulation Classification in WSNs

Summer'13

Wireless Communication Research Project

Under the guidance of Prof. Pramod Varshney at Syracuse University (USA)

- Developed algorithm for automatic identification of digital modulation in wireless communication in the presence of noisy environment having unknown channel parameters using Bayesian model
- Proposed *Collapsed Gibbs sampling* based approach for channel parameter estimation
- Performs well even in higher-order QAMs and reduces the local minima effect in high SNR regime

Research Experience

Brainwaves based Personalization in Recommendation Systems

Aug'17 - Present

BCI Research Project under Prof. Sivakumar as a part of Doctoral Research Work

- Conceptualize, research, and develop a fully functional BCI system to directly tap the thought-based feedback in a non-intrusive and passive manner over the recommended items

Democratizing Brain-Computer Communication

Aug'16 - Present

BCI Research Project under Prof. Sivakumar as a part of Doctoral Research Work

- Research, design and develop an automatic learning framework that application developers can leverage to build applications effectively without any explicit knowledge in many related domains
- Framework learns the statistical pattern of brain waves and their correlation with mental thoughts using Deep-Neural Networks (e.g. CNNs, RNNs) and hybrid HMM models for sequence detection

THINK: Turning Thoughts into Action

Jan'15 - July'15

BCI Research Project under Prof. Sivakumar as a part of Master's Thesis

- Developed THINK, a general purpose platform to communicate by mere imagination
- Explored signal processing and detection of *mu-waves*, specifically in non-invasive domain (EEG)
- Achieved counter-intuitive results for system accuracy (81.2%), think rate and form-factor

Academic Projects	VisualAIDS: An Interactive visualization of HIV/AIDS data Oct'17 - Nov'17	
	<i>Information Visualization Project</i> (Information Visualization: Prof. Alex Endert)	
	<ul style="list-style-type: none"> An interactive visualization designed in d3.js to investigate and explore HIV/AIDS data for various countries over time. More information at www.agmohit.com/VisualAIDS/ 	
	Modelling the Rehearsal Effect of Humans Oct'16 - Nov'16	
	<i>Neuroscience and Machine Learning Project</i> (Computation and Brain: Prof. Santosh Vempala)	
	<ul style="list-style-type: none"> Demonstrated the notion of forgetting and rehearsal in humans in the realm of neural networks Successfully simulated Ebbinghaus forgetting curve and learning curve, and explored various rehearsal properties by building a Recurrent Neural Net in Tensorflow 	
	Skin Lesion Analysis towards Melanoma Detection Mar'16 - Apr'16	
	<i>Deep Learning Project</i> (Deep Learning: Prof. Zsolt Kira)	
	<ul style="list-style-type: none"> Automated skin cancer detection by proposing Deep Learning architectures based on CNNs for skin lesion segmentation, feature extraction and classification Won 2nd prize for the classification (81.3%) and feature extraction in ISBI 2016 Challenge 	
	OCR based Mathematical Equation Recovery Mar'15 - Apr'15	
	<i>Machine Learning Project</i> (Statistical Signal Processing: Prof. Mark Davenport)	
	<ul style="list-style-type: none"> Developed a mathematical equation recognition system, capable of converting scanned mathematical equations to machine readable format along with its L^AT_EX code and solution Achieved 98.92% accuracy in case of 60 symbols including operators and greek characters 	
	General Game Playing Agent Jan'13 - Apr'13	
	<i>Artificial Intelligence Project</i> (Artificial Intelligence: Prof. Amitabha Bhattacharaya)	
	<ul style="list-style-type: none"> Developed an artificial gaming agent, capable of playing any game without human intervention Selected amongst top 5 projects, to compete on a global scale in GGP competition in AAAI 	
	NDroidPad: Android Application Dec'12 - Jan'13	
	<i>Smartphone Application Development</i> (Electronics Club, IIT Kanpur)	
	<ul style="list-style-type: none"> Developed an Android application to use smartphone as wireless controller/joystick for Laptop Implemented motion-sensor and multi-touch features, providing Xbox Interface to application Won 1st Prize in Techfest12; The app crossed 1000+ downloads within a week on Google Play 	
Academic Courses	Computer Science	Machine learning, Deep Learning, Artificial Intelligence, Computation and Brain, Applied Cryptography, Mobile Computing, Advanced Programming Techniques, Android Application Development, Information Visualization, Data Structure and Algorithms
	Mathematics	Probability and Statistics, Linear Algebra, R Programming
	Telecom/SP	Information and Coding Theory, Random Processes, Digital Communication Networks, Communication Systems, Digital Signal Processing, Statistical Signal Processing, Advanced Digital Communications, Wireless Communications and Networks, Convex Optimization in SP/COM
References	Available on request	
Other Interests	Graphic and UI designing, Financial Technology	