

SAMUEL JOSEPH

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EDUCATION

- **Stanford University, Stanford, CA.**
 - MS/PhD in Electrical Engineering, September 2016–
 - Advisor: Prof. Sachin Katti
- **Indian Institute of Technology Madras, Chennai, India.**
 - B.Tech. in Electrical Engineering, 2012-16
 - CGPA: 9.96/10
 - **President of India Prize** for the highest CGPA among the graduating undergraduate batch of 2016
- **Kendriya Vidyalaya Adoor, Kerala, India.**
 - CBSE Class XII, 2012
 - Percentage: 98.6%; **3rd highest in India**

SCHOLASTIC ACHIEVEMENTS

- President of India Prize for the best academic record amongst the graduating B.Tech and Dual Degree students at IIT Madras
- OP Jindal Engineering and Management Scholarship (OPJEMS) 2015 for academic and leadership excellence
- Secured the highest grade of ‘S’ in all EE courses at IITM
- All India Rank 3 in the Central Board of Secondary Education (CBSE) Class XII Examination 2012 among 815,749 students
- Special invitee of the Prime Minister of India to witness the 2013 Republic Day Parade for being a topper in CBSE Class XII Examination
- All India Rank 2 in the National Cyber Olympiad 2011
- Rank 8 in the Kerala Engineering Entrance Examination 2012

PUBLICATIONS

- Manikanta Kotaru, Alexander Anemogiannis, **Samuel Joseph**, Sachin Katti, “Demo: Position Tracking for Virtual Reality Using Commodity WiFi”, to appear in *Mobicom 2017*.
- Arjun Nadh, **Joseph Samuel**, Ankit Sharma, S. Aniruddhan, R. K. Ganti, "A Taylor Series Approximation of Self-Interference Channel in Full-Duplex Radios," in *IEEE Transactions on Wireless Communications*, April 2017.
- Akshay Gulati, Sourbh Bhadane, **Joseph Samuel**, Harishankar Ramachandran, R. David Koilpillai, “IITMSAT: Innovative Packet Protocol and Concept of Operations”, *AIAA Conference on Small Satellites*, August 2016.
- Jagdish Mevada, **Joseph Samuel**, Sourbh Bhadane, Akshay K. Gulati, R.D. Koilpillai, “Design and Implementation of a Robust Downlink Communication System for Nanosatellites”, in *IEEE International Conference on Space Science and Communication (IconSpace) 2015*, pp.164-169, 10-12 Aug 2015.
- Akshay K. Gulati, Shubham Chavan, **Joseph Samuel**, et al., “IITMSAT Communications System – A LeanSat Design Approach”, in *3rd IAA Conference on University Satellite Missions*, 30 Nov – 5 Dec 2015.

TEACHING EXPERIENCE

- Teaching Assistant for EE 107 – Embedded Networked Systems – at Stanford in Fall 2016
 - Mentored students in various projects and assignments
 - Co-designed assignments and examinations

COURSEWORK

Stanford: Machine Learning (CS 229), Convolutional Neural Networks for Visual Recognition (CS 231N), Biochips and Medical Imaging (EE 225), Medical Imaging Systems I (EE 369A), Medical Imaging Systems II (EE 369B)

IIT Madras: Networks and Systems, Analog and Digital Signal Processing, Communication Systems, Digital Communication Systems, Error Control Coding, Estimation Theory, Modern Coding Theory, Advanced Topics in Signal Processing, Introduction to Wireless and Cellular Communications, Optimization Methods in Signal Processing and Communications, Complex Variables and Transform Techniques, Probability, Statistics and Stochastic Processes, Applied Linear Algebra I for EE

JTG Summer School 2016¹: Millimeter-wave Communication Networks (Prof. Upamanyu Madhow, UCSB), Polar Coding (Prof. Erdal Arıkan, Bilkent University, Ankara, Turkey)

RESEARCH PROJECTS

- **Real-time WiFi-based Tracking for VR Headsets using Neural Networks**
 - Course Project in CS 231n – Convolutional Neural Networks for Visual Recognition
 - Replaced proven signal processing algorithms to track WiFi devices with neural networks
 - Explored various architectures such as fully-connected, convolutional and long short-term memory networks
 - Achieved three order of magnitude lower latency compared to conventional signal processing algorithms
- **Demo of WiFi-based Tracking for VR Headsets**
 - Using WiFi instead of vision-based systems provides multiple advantages for VR and AR applications – low cost, infrastructure-free and enabling of a whole home VR experience
 - An end-to-end WiFi-based tracking system was built on Microsoft HoloLens
 - Demoed at Mobile World Congress 2017
- **Diabetic Retinopathy Identification and Severity Classification using Classical Machine Learning Techniques**
 - Course Project in CS 229 – Machine Learning
 - Diabetic Retinopathy (DR) is a serious disease which causes visual impairment in 75 people daily
 - Early detection can lead to timely treatment and prevention
 - Implemented a machine learning model that could detect DR and classify its severity from retinal fundus images
 - Achieved about 70% accuracy with just signal processing and conventional machine learning algorithms, without resorting to neural networks
- **Implementation, Evaluation and Applications of Linearization-based Self-Interference Cancellation for Full-Duplex Radios**
 - Undergraduate thesis project; Advisor: *Prof. Radha Krishna Ganti*
 - Linearization based self-interference cancellation reduces the complexity of full-duplex radios

¹ Joint Telematics Group Summer School– <http://www.ece.iisc.ernet.in/~jtg/2016/>

- Implemented a real-time system that performs linearization-based self-interference cancellation on the National Instruments PXIe platform with LabVIEW front-end
- A potential application of full-duplex radios in adjacent channel interference (ACI) cancellation for LTE base stations was demonstrated
- Showed that full-duplex techniques can give more than 40 dB of ACI cancellation
- The proposed technique uses only commercial off-the-shelf components and hence is cost-effective as opposed to the current expensive solution of using high-Q filters
- **Robust Downlink Communication System for IITMSAT**
 - Guide: *Prof. R. David Koilpillai*
 - IITMSAT is a student satellite project at IIT Madras
 - Designed a robust physical layer protocol tailor-made for the high downlink data requirements of IITMSAT
 - Developed a novel algorithm to do signal acquisition which gives robust performance at low SNRs
 - Implemented Doppler estimation and correction, timing synchronization, least squares channel estimation, soft-output Viterbi equalizer and Viterbi convolutional decoder in the SDR combination of GNU Radio, Perseus SDR and USRP
 - The designed system gave a performance which is only 1 dB away from theory
- **Activity Recognition Using Wireless Signals**
 - Guide: *Prof. Sachin Katti*
 - Demonstrated the possibility of recognizing various human activities by analyzing the wireless signals backscattered during the activity
 - The proposed method does not require any dedicated wireless equipment, is device-free and can detect multiple activities at the same time
 - Developed methods to extract Doppler information and corresponding spectrogram from Channel State Information (CSI) data
 - Implemented methods to focus on particular parts of the environment by partitioning the backscatterers using Angle of Arrival (AoA) and Time of Flight (ToF)
- **Study of Filter Bank Multicarrier (FBMC) Modulation**
 - Course Project in *Introduction to Wireless and Cellular Communications (EE5141)*; Instructor: *Prof. K. Giridhar*
 - Analyzed the three types of FBMC techniques – Cosine Modulated Multitone, Staggered Multitone and Filtered Multitone
 - Implemented end-to-end transmitter and receiver chains
 - Explored the reduction in out-of-band spectral emissions gained by using FBMC as opposed to traditional OFDM
 - Empirically obtained the ambiguity function and ambiguity surface for square root raised cosine pulse

EXTRA-CURRICULAR ACTIVITIES

- Represented Stanford University at ACM International Collegiate Programming Contest (ICPC) Pacific North West Regionals 2016
- Member, IIT Madras Student Satellite (IITMSAT) Team
- Coordinator, How Things Work Quiz (HTW), Shaastra 2014
- Project Representative, Enriching Malayalam Wikipedia, National Service Scheme, IIT Madras