Neeraj **Gudipati**

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EDUCATION

Aug. 2013 - June 2017 B.Tech (Electronics and Communication Engineering) IIIT Guwahati **CPI - 8.39/10.0**

SCHOLARSHIPS AND ACHIEVEMENTS

- Awarded the **Best Hardware Hack** at **Hack Harvard 2018** for the project **Magnetalk**.
- Selected to work as a fellow at **Srujana Innovation center**, Hyderabad. A collaborative program between **Camera Culture Group** and **L V Prasad Eye Institute**.
- Awarded Certificate of Appreciation for finishing in the top 3 at the **National Robotics competition IIT Kharagpur 2015**.
- Received **INSPIRE Fellowship** by Department of Science and Technology, Government of India for pursuing a prospective BS-MS course at Indian Institute of Science Education and Research **IISER Pune** for the year **2013**.
- Among the top **1%** of the students in Andhra Pradesh State Higher Secondary Examination held in **2013**.

RESEARCH EXPERIENCE

FLUID INTERFACES GROUP

MIT Media Lab
Cambridge, MA

Collaborator
2018 - Ongoing

PAL (Personal Activity Learner) - Food:

PAL-Food: is a wearable system that can automatically tell us the number of calories we consume and burn throughout the day. It could aid in helping us face ourselves, control obesity, diabetes and stress eating.
Advisor:Ms. Mina Khan (PhD Student) and Dr.Pattie Maes (Professor in Media Arts and Science MIT Media Lab)

- **PAL- On device real-time food detection:** Using optimized machine learning models for on-device food detection on resource constrained hardware.
- **Chewing detection using miniature magnets:** Coupling magnets and MEMS to track the change in the magnetic flux due to the movement of the jaw and detect the chewing and eating activity of a person.
- **Epidermal Glucose sensor:** Epidermal electrodes immobilized with Glucose oxidase for the detection of Glucose are being fabricated using microfabrication techniques and transfer printing.
- **Audio Augmented Voice calling:** An Audio Augmented voice calling interface was developed using Bose AR Audio glasses and smartphone.

Wearable Paper Plastic Microchip for cortisol detection

- A flexible wristband is being developed with an in-built microfluidic channel to absorb and channel the sweat on to the paper chip. The paper chip is immobilized with cortisol antibody, to capture cortisol in sweat and the impedance changes based on the concentration.

SHAFIEE LAB, HMS

Harvard Medical School
Boston, MA

Graduate Researcher
2017 - Ongoing

Automated Clinical Innovations

As a pre-doctoral fellow, exploring and developing prototypes to integrate biology and medicine with engineering to develop innovative tools and solve un-met clinical problems and bring in easy accessibility into daily life. Some of the main projects I am part of are as follows:
Advisor: Dr.Hadi Shafiee (Assistant Professor of Medicine, Harvard Medical School-BWH)

- Smartphone-based device for point-of-care ovulation testing and developing wearables for hacking women's health.
- Smartphone-based system for measuring sperm viability, DNA fragmentation, and hyaluronic binding assay score.
- Smartphone-based Near-Infrared Imaging for Virus detection.
- Microfluidic bubble based virus detection and mapping concentration levels.
- Studying the effects of environmental pollution on fertility.

ABB INCRC

ABB Corporate Research Center India
Bangalore, India

Research Internship
May '16 - Jul '16

The Symphony Of Augmented Reality And Internet of Things:

Advisor: **Anitha Varghese,Senior Scientist** (IoTSP Group), **ABB INCRC** , for developing prototypes for futuristic electrical power plants connecting dots by bridging Augmented Reality and Internet of Things.

- Developed a prototype application based on augmented reality enabling a trainee to triangulate the exact location of a faulty component in an electrical power plant by just using AR visual cues
- Object Recognition pipeline, and a real-time Bluetooth interfacing platform was set to collect data from intelligent electronic devices helping the trainee listen to the device health and troubleshoot them.

TCS R&D — Research Internship
Tata Consultancy Services Research and Development, (Previously CMC R&D) — Jun '15 - Jul '15
Hyderabad, India

- Developed a model-based vision system that accurately gives 3-D representation of teeth and jaw for diagnosis and treatment purposes in dentistry.
- Implemented shape from shading algorithm for recovering the 3-D shape of jaw and tooth through the analysis of the brightness variation in a single image of the jaw.
- Custom PCB sensor boards were fabricated for data collection and monitoring of a sterilizer.

VLSI DESIGN LAB, IITG — Internship
VLSI Design Lab, Department of Electronics and Electrical Engineering, IIT Guwahati — May '15 - Jun '15
Guwahati, India

Design and Implementation of a Blind Assistance system using FPGA

- Developed a low-cost FPGA based vision system for assisting blind people in their movement by giving them modulated haptic and audio feedback. The system is targeted in aiding the blind people for their movement and detecting obstacles in their path. The project was funded by Department of Science and Technology Govt. of India.

PUBLICATIONS

Potluri Vaishnavi, Kathiresan Preethi, Kandula Hemanth, Thirumalaraju Prudhvi,Kanakasabapathy Manoj, Kota Sai Pavan Sandeep, Yarravarapu Divyank, Gudipati Neeraj, Soundarrajan Anand, Baskar Karthik, Gupta Raghav, C. Petrozza John, Shafiee Hadi. (in press). *An inexpensive smartphone-based device for point-of-care ovulation testing*. Lab on a Chip. [Cover, to be Highlighted in Lab-Chip]

Irene Dimitriadis, Charles L. Bormann, Manoj Kumar Kanaksabapathy, Prudhvi Thirumalaraju, Vinish Yogesh, Neeraj Gudipati, Vignesh Natarajan, John C. Petrozza, Hadi Shafiee. ***Automated smartphone-based system for measuring sperm viability, DNA fragmentation, and hyaluronic binding assay score.*** (Under Review) PlOS One.

PUBLICATIONS IN PROGRESS

PAL-Food: Real-time tracking of user's activities food consumption and eating habits to show the personalized correlations bewteen user's calories intake, activities and physiological states.

Automated smartphone based cell-morphology system for low-resolution images.

PROJECTS

PHYSIA: — Ongoing

- Physia is a mobile application that myself and two MIT students have cofounded and are being Mentored by MIT Martin Trust Center. The goal of the application is to help make physical therapy accessible to everyone by leveraging cutting-edge research methods and the availability of smartphones to empower a large part of the global population.
- Physia works by collecting motion data (IMU) using a smartphone and analyzing this data against literature. When we walk abnormally, the IMU signals looked very different than healthy walking. We use this information as a diagnostics metric and recommend relevant excises to recover a healthy gait.

MAGNETALK: HACK HARVARD 2018 — Ongoing

- Magnetalk a wearable interface that allows a user to converse without any voice using facial muscle and vocal cord vibrations and movements.
- User's intention to speak is characterized by the facial muscular movements and these speech articulators are captured by the Magnetalk system using small mini magnets/ magnetic cosmetics hooked on to the facial muscles through feature selection on muscular areas of interest.

CORRELATING MUSIC, MATHS ,AND TEXTILE DESIGN: — Mar '17 - Apr '17

- A specific weaving community back in India was studied to understand how cognition can be correlated in music, maths and textile design and show that our experiences shape our cognition and creativity.
- The weaving punchcard patterns were translated into musical notes using machine learning and were able to show textiles' strong affinity with a song in the characteristic of patterns they both share.
- The pitch nodes were also correlated with the design mathematics.

PERFORMANCE ANALYSIS OF IEEE 802.15.4 IN MULTI-USER ENVIRONMENT: Jan '16 - May'16

- Study of IEEE 802.15.4 LPWAN modulation schemes as a combination of Chirp Spread Spectrum(CSS) and Frequency Hoping Spread Spectrum(FHSS).
- Modeling the SNR and SIR based on the multiple access interference in a CSS/FHSS system and studying the interference from other communication protocols.

SIGN LANGUAGE COGNITION AND ITS COMPUTATIONAL UNDERSTANDING: Mar '15 - Apr '15

- Analyzed the Grammar behind sign language and semantics. A hierarchical tree-based structure was built to understand signs and convert them to sentences.

STUDY OF ROTATIONAL QUATERNIONS TO ANALYZE HAND MOVEMENTS USING GYRO SENSORS: Mar '15 - Apr '15

- Using Gyro sensors attached to hand and an Aurdino board to process data, studied Quaternion Computation
- Developed a Matlab code for handling 3D rotation matrices and their representations. Conversion from and to all the data formats. The use of computationally light quaternions for gesture control.

CORDIC ALGORITHMS AND FPGA-GPU COMMUNICATION: Jan '16 - Apr '16

- Study of various modes of **CORDIC Algorithm** and its implementation in matlab and ARM assembly Language. Assembly based implementation of digital signal processing systems.
- Implemented **FPGA-GPU** communication via PCI bus for efficient cycle utilization and faster signal processing.

SKILLS

Programming Languages (Familiar): C, C++, Python, ARM Assembly, Verilog, C# , Java
Machine Learning and Computer Vision: Openc CV, sci-kit, Dlib, tensorflow, tflite, OpenVino toolkit, Movidius
Interfacing libraries/softwares: Matlab, LabView,LaTeX Unity, Vuforia SDK, Xilinx Vivado, OpenCV, D3.js, HSPICE, NI Multisim, HFSS Ansys, Solidworks, Android, EAGLE
Hardware: Circuit Design Eagle, Laser cutting, 3D Printing (Ultimaker and FormLabs)
Microfabrication: Processes: Photomask layout and write, spin coating, photolithography, sputtering, wet etching
Wet-lab: Electron microscopy (fix, embed, stain, section), pipette, weight, Sterilize, filtrate, prepare media, cell culture

RESEARCH INTERESTS

Multidisciplinary Systems Development and Implementation, Human Computer Interaction, Bodyhacking, Transhumanism, Augmented Reality, Virtual Reality, Bioengineering, Sensor Networks Development, Point of care technologies, Artificial Intelligence, Healthcare, Cognitive Science.

POSITIONS OF RESPONSIBILITY

Aug '16 -	Overall Placement Coordinator
Jan '16 - Mar '16	Organizing Team Head, Sponsorship, Yuvaan '16, annual techno-cultural and sports festival of IIIT Guwahati
Jan '16 - Mar '16	Student Volunteer for Organinzing "The Mind Matters: Language, Cognition and Other Correlations" (interdisciplinary workshop on cognition)" 2016
Jun '14 - Apr '15	Secretary, Robotics Club
Nov'17	Volunteer, MIT India Conference 2018

RELEVANT COURSES

CS101 : Computer Programming
CS104: Computer Organization
CS231 : Operating Systems
EC371 :Microwave Engineering
EC381 : Embedded Systems
EC455 : Wireless Sensor Network
EC101 :Digital Design
EC301: Analog Integrated Circuits
EC243 : Digital Signal Processing
EC380 : Control Systems
EC354 : Communication Networks and Systems
EC454 :Cognition, Language and Culture I, II
CS103 : Data Structures
EC241 : Signals & Systems
EC351 : Digital Communication
EC361 : VLSI Design
EC441 : Image Processing

EXTRA-CURRICULAR ACTIVITIES

Attended **Industrial Conclave** organised as a part of **Techniche 2014**, IIT Guwahati.
Active member of the **IIIT Guwahati Quiz club**.
Participated in **Udgam Entrepreneurship Summit 2014** organised at **IIT Guwahati**
Attended **The Mind Matters**, an Interdisciplinary Workshop on Cognitive Science conducted at IIIT Guwahati **2016**.
Participated in **Assistive Technologies Hackathon, MIT** working in a team to solve problems for the disabled.