ASHISH UPADHYAY

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Professional Summary

Electrical and Electronics Engineer with 4+ years of Experience **in Hardware & Firmware Algorithm Development, Signal Processing and System Optimization** for Interdepended & Multi-disciplinary Complex Systems, Spanning across multiple Industries (Research, Healthcare, Consumer Electronics And Automation).Proficient in System Design as per user specification & Programming the hardware across multiple Communication protocols (Wired or Wireless), Well versed with intricacy of a **System Solutions, Fault Detection methodologies and Debugging** (both Hardware and Software)& Electrical Theory. With Proactive Research Interest and Expertise in

- Embedded Software Design & Hardware Development
- Analog & Digital Protocol Development
- Scripting(Firmware, Data-Processing, Recording, Analysis)
- Signal Processing(Filter, Buffer, Converter, Amplifier)
- AC-AC, AC-DC & DC-DC Power Converters
- Simulations (Multi-physics model, SPICE models)
- Internet Architectural Protocols (TCP, UDP , WebSocket)
- PCB designing (Schematic Capture & Component sourcing)

Experience

Life Boost Inc. (Tespo), **Michigan, US**
Embedded Engineer NOV 2020 – PRESENT

Develop Embedded Ecosystem for IoT connected Vitamin and Supplement Dispenser, that facilitates, Tracks, Logs and Notifies user about the Regiment, Increasing General Adherence and Compliance of these Supplements.

- Design and Update the Existing system Architecture and facilitate the data generation to create an Ecosystem for User.
- Mass production of said Dispenser, Scripts to Program, Test and Calibrate Each PCB.

New York University, **New York, US**
Research Assistant (Hardware Engineer), Power Lab and Medical Robotics Lab SEPT 2018 – AUG 2020

Both the labs required **Architecture Design ,Protocol/Algorithm Design & APIs Development and Testing** of Custom controllers capable of **peer to peer wireless communication**, from Sensor Arrays to Server. **Code Optimization** for **High speed** Datalogging and Decision-making **DSP Algorithm** for Control. The collected data is being fed into **ML algorithm** via a **Monitoring and Controlling GUI**

- Devising a scheme for Quasi Dynamic Wireless Charging of Vehicles, using best of Power Electronics, IoT and Wireless communication, to increase the battery charging efficiency (by Tx-Rx Pair design and Status Monitoring) & achieved approx. 85%.
- Developing **Software** & writing **Firmware** for Microcontrollers, Wireless **Datalogger** and Signal processing Algorithm in **C, Python** and **MATLAB** to issue command and keep track of the progress while implementing safety features

- Design a Wearable **SoC**, for Covid detection whose grant was **NSF Funded**, Generating Data for Disease marker Analysis
- Designing PCB (Rigid & Flex),Troubleshooting & **Debugging** products using Development tools like **Oscilloscope, N/W Analyzers, Function Generators, JTAGs** & **Logic Analyzer** for Performance Analysis & fixing the issues, by **H/W changes or S/W updates**
- Hardware & Software Integration for **Filtering** and **Digital Signal Processing Algorithm** on low amplitude signals (Such as EMG)

The Feinstein Institute for Medical Research, Northwell Health, **New York, US**
Research Assistant(Wireless System Design), Bioelectronics & Sensing JUN 2019 – MAY 2020

For Two semesters JUN 2019 – AUG 2019 & JAN 2020 – MAY 2020 Performed benchtop and in **vitro/in vivo** experimental studies on **neurological implants** Creating a prototype device that provides **single-channel, constant-current monophasic stimulation** to vagus nerves. While **charging the implant inside the Host's body** (Mice), all working within in a real estate of mm Square

- Designed, Developed and Evaluated state of the art Implantable micro-electronic devices developed for neuro-stimulation and recording. Developed Script to extract data from live animal, and Process Raw Data**(Mathematical Modeling of Response)**
- Encapsulate the Implants in Bio compatible material and make sure the communication and Wireless power are not Affected beyond the predicted Rx Power, Thermal and SAR threshold

Compac Industries India Limited, **New Delhi, India**
Engineer Automation, Research and Development JAN 2018 – AUG 2018

Established an R&D lab at a production center for CNG Dispenser and develop custom solution as per every customer specs. Study the **Contract for Functional Specifications** and come up with the most viable solution for the reported demand or problem

- Engineered **three intrinsically safe Products** for **Data Acquisition & Processing** and dynamic Control from Concept Development to End Product and **Supervised the Research work of R&D department**
- Developed a **central Server for storage of Live Data** & **Dynamic Control of all the installed equipment**, Using TCP/IP, MQTT and WebSocket's protocols (SIP)

Curie Labs (Start Up), **Gurgaon, India**

Engineer R&D and Operations, Start Up AUG 2017 – JAN 2018

Managed the operation of a Commercial space and Read the **Electrical and Thermal Dynamics** of the space live, and design the kill switch to control the HVAC system to conserve the energy based on **Weather forecast based live scheduling**

- Programming the Embedded Systems to talk to PLC for DATA Collection, Analysis & Control, For Power Saving of **HVAC** system
- Running the **Optimization** problem on large amount of collected data (24*7/Minute * Month) to perform scheduling.
- Using **Machine Learning** and Forced Scheduling, **reduced 20% Electrical Consumption** (Sept 2016 vs Sept 2017)

Technical Skills

ELECTRICAL:

P/LT-**Spice** • MATLAB & Simulink • Ansys Maxwell & HFSS • COMSOL • Programmable Logic Controller (PLC)

ELECTRONICS:

FPGA • **PCB Design, ALTIUM** & EAGLE • **Circuit** Design • **Signal Processing & Filtering** • **IoT & Digital** Protocols/Peripherals (USB, SPI, I2C, I2S, UART, PCIe, MODBUS, Analog GPIO, WebSocket, MQTT, TCP/IP, UDP, Wi-Fi , Bluetooth, LORA, Zigbee, Z wave & RF)

PROGRAMMING LANGUAGES:

C & C++ Object Oriented Design • Python • Verilog & VHDL • Arduino & AVR Studios • Real time Operating System**(RTOS)**

WORKING KNOWLEDGE:

Embedded LINUX Development & UNIX • Bash • **GIT** (Version Control)• Windows **Embedded** & C# • HTML, CSS and Java Script •**ML**

Education

New York University, Tandon School of Engineering, New York MAY 2020

Master of Science, Electrical Engineering(Minor Computer Engineering)

ABES Engineering College, APJAKTU, NCR, India JUN 2016

Bachelor of Technology, Electrical and Electronics Engineering

Professional and Academic Projects

Wireless Rehab Module (wearable for Covid-19 detection)

- Hardware & Software Development to Read remote Sensors data & Transmit as JSON Data Structures
- Perform Signal Processing and analysis of the live plot while publishing over WebSocket via WiFi or Bluetooth.
- Develop **RTOS** scheduling and distribute the tasks over **Multi Core Processor** (with Updated Boot loaders)
- One Core to Read and Process all Sensor's reading & handle SPI Flash File Systems Other to **Upload & Fetch API**
- Statistical Analysis of data generated by Sensor Array & Recorded by Datalogger(Including but not limited to plots)

Design of Neuromodulator

- Use MIT 4 Coil system to power up an **implant** of size 15X18X1.4mm both in PCB and Wire wound
- Debug the Hardware to ensure the Modulator (Analog **Current Pump** controlled by timer Interrupts), Sensors (SPI I2C & Analog Scaling) and Communication (UART, RF/NFC) As per the performance Markers
- Ensuring the communication and Wireless power are within the threshold **with Multi-physics Simulation**
- Test design of each PCB for the Stress conditions of Rx Power, Communication Output & EMC Immunity

Wireless High-Power Transfer System (for Moving Vehicle)

- Designing of **Class E Amplifiers**, Class D Amplifiers & **H-Bridge** MOSFET configuration, with operating frequency of 13Mhz (***International Automatic Control Conference ,CACS doi: 10.1109/CACS47674.2019.9024729***)
- Control Circuits Design for Power Management & Conversion, Dynamic Charging, and Isolation

SCADA for CNG dispensing Station over WAN (per ATEX guideline)

- Module to Update & Monitor Data on MODBUS over **RS-485, I2C, SPI**, UART **for 100+ CNG dispenser** already deployed
- Full Duplex Transmission over Web **Wi-Fi** (802.11bgn) and LAN
- Scripting Wireless Networking & **Display Driver Schemes** to update Live changes and increase web Stability with **LTE**
- Code Software Applications to enable remote printing, **Email** or Whats app/**Message** using **SMTP** and free to use **API**, with Vehicle Plate Snap using **Onboard Camera**

MIPS Processor Architecture over FPGA (Xilinx)

- Processor Design capable of MIPS execution, with State Machine Implementation and Register outputs over SSD
- With Script to convert Assembly into Instruction bits
- **Implementation of 5 modules**, PC, Imem, Dmem, ALU, Control and RF, Each with dedicated function
- Design Testbench for System testing by Software Testing each module and comparing the outputs

Real Time Video Processing (Computer Vision)

- To recognize gestures in the form of hand symbols Rock, Paper and Scissor, in **Open CV (Python)** via Webcam and wrote a game play script as per the rules of ROCK PAPER SCISSOR
- The contours formed against pre calibrated background are used to predict gesture (Rock, paper, Scissor or Unrecognized)

Real time Audio Processing on Arm & Xtensa Processors

- Recreation of plucked string, Drum and other membrane-based sound using Interrupt based **Karplus Strong Algo**
- Record Audio Over I2S using MEMS microphone in Stereo configuration (PCM) and Send Amplified raw data via **Bluetooth (44100Hz,32bit sample)** on ESP32 controller