



UTKARSH VERMA

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Education

Indian Institute of Information Technology, Design & Manufacturing - Kancheepuram

May 2023

Bachelor of Technology - Electronics and Communications Engineering with Distinction ; CGPA: 9.1/10.0

Chennai, India

- Thesis on “Embedded Hardware Stack Optimisation for Underwater Vehicles”.

Experience

Research Assistant

Jul 2023 – Oct 2023


Biomedical and Electronic Engineering Systems (BEES) Lab, Indian Institute of Science Bangalore 

Bengaluru, India

- Investigated the effects of antigen-antibody interaction, using impedance spectroscopy, to explore possibilities for screening oral cancer through a custom lab-on-chip.
- Wrote programs to swiftly analyse roughly 100 data files, cutting analysis time from over two hours to minutes, eliminating possibilities for human error.
- Performed literature survey on emerging gas sensor technologies and proposed suitable approaches for an electronic nose that screens patients for liver cirrhosis through their breath.

Google Summer of Code Contributor

Jun 2023 – Sep 2023


Real-Time Executive for Multiprocessor Systems 

Remote

- Added support for the Raspberry Pi 4 in the RTEMS real-time operating system through a 64-bit board support package.
- Developed low-level drivers for GPIO and interrupt-driven I/O for UART and the mailbox, conforming to RTEMS' APIs.
- Made the Raspberry Pi 4 usable in RTEMS applications and laid the foundation for GPU utilisation, including HDMI usage.
- Regularly wrote technical [blogs](#) documenting project progress and the challenges encountered to expand the online knowledge base.

Embedded Systems Developer

Jan 2023 – Apr 2023

Aerospace Engineers Private Ltd. 

Salem, India

- Re-designed the electronics architecture to improve the Autonomous Underwater Vehicle (AUV)'s hardware topology. This simplification led to a 40% reduction in size of the hardware stack.
- Oversaw the entire hardware stack and acted as a bridge between the software and electronics teams.
- Developed firmware for the AUV's embedded processor to robustly interface actuators and sensors, and implement controls.
- Implemented an SPI communication link to facilitate reliable data exchange between the controls and autonomy processors.
- Developed a bootstrapper to package AUV dependencies into a headless Linux image, reducing software deployment time from hours to minutes.

Research Intern

Jul 2022 – Oct 2022


GSI Helmholtz Centre for Heavy Ion Research 

Darmstadt, Germany

- Worked on the PANDA Barrel DIRC's readout chain which employed FPGAs called DiRICH boards to acquire time-of-flight (ToF) measurements of particles through a microchannel-plate photomultiplier tube (MCP-PMT) array.
- Developed software to expedite analysis of the huge amounts (2 GiB/test) of acquired data using CERN's ROOT library.
- Performed experiments on a high-voltage (2 kV) operated setup, analysing fast analog signals and addressing their non-idealities.
- Brought a two-fold improvement in the timing precision of the ToF measurements, bringing it down to 70 picosecond.

Junior Embedded Systems Engineer

Dec 2020 – Mar 2021

Dextroware Devices 

Remote, India

- Developed the prototype of a hands-free input device, called Mouseware, for people with upper-limb disabilities.
- Researched and developed a minimum viable product utilising AVR MCUs, gaining experience in RF communications.

Accomplishments

Google Summer of Code: Secured a funded open-source [project](#) based on my proposal for firmware development.

GET_InVolved Fellowship: Got selected for an onsite summer research internship at the GSI particle accelerator facility.

IIT Madras Summer Fellowship: Received a summer fellowship for doing a research project at IIT Madras.

Robocon 2020: Led a team to develop [robots](#) capable of playing robo-rugby which secured 98/100 points at the national level.

Maker Sponsorship: Received sponsorship from DFRobot for my [articles](#) and personal projects on electronics.

Projects

Linux SBC ↔ STM32 MCU Communication Link | *C, Python, SPI, Linux*

Apr 2023

A set of libraries for to allow a Linux SBC to communicate with an STM32 board over SPI.

- Employs a custom protocol with acknowledgement mechanisms to reliably transfer data.
- Polyglot in nature; utilises Python for Linux, and C on the firmware.

Linux Image Bootstapper | *Linux, Shell Scripting*

Feb 2023

A bootstrapping framework to package software and vendor dependencies with the operating system.

- Written in a modular, extensible and portable manner using POSIX-compliant shell-scripting.
- Bootstraps and configures a minimal headless Debian Linux image with the project dependencies.
- Facilitates snapshotting of the entire software stack, allowing for reproducible and hassle-free deployments.

OLED Display Driver for ATmega328 ☒ | *Assembly, I²C, SPI*

Dec 2021

A bare-metal project to play a video on an OLED display by reading data from an SD card.

- Written in pure assembly language; includes drivers for SD card and OLED display through SPI and I²C respectively.
- Prepares a 1 KiB framebuffer in the MCU's flash, populates it with the SD card's frame data, and sends it to the display.
- Achieves a frame rate of roughly 16 FPS, which is respectable for an 8-bit MCU.

8-bit Computer ☒ | *Computer Architecture, Digital Logic, Assembly*

Mar 2021

A programmable 8-bit computer with a 16-byte RAM and 10 Hz clock built using simple logic gates.

- Based on the SAP-1 ALU processor and built around the von Neumann architecture.
- Contains more than ten modules spanning across a total of fourteen breadboards.
- Uses a custom instruction set and is programmable over UART.

Minimal Build System for STM32 HAL ☒ | *C, Makefile, STM32 HAL*

Mar 2023

A project to demonstrate using the STM32 hardware abstraction layer (HAL) without relying on STM's CubeMX IDE.

- Takes care of project compilation, debugging, and flashing the code using OpenOCD.
- Written with a focus on modularity and extensibility, following the UNIX philosophy.
- Allows developers to use their favourite text editor for firmware development, hence, increasing productivity.

dwmblocks-async ☒ | *C, Linux*

Dec 2022

An asynchronous, efficient status bar for the dynamic window manager (DWM) on Linux.

- Generates the status text by executing user-configured commands asynchronously.
- Updates the status based on a periodic interval or through an external trigger implemented using signals.

Fit Routine for PANDA Barrel DIRC ☒ | *C++, ROOT, Statistics*

Oct 2022

A data analysis program to compute timing precision statistics for time-of-flight measurements.

- Operates on huge chunks of experimental data from the data acquisition system and saves results to a file.
- Filters out noise from the 2D histogram data before computing the statistical parameters.
- Developed as an alternative to the former manual and subjective method, with considerable time savings.

Skills

Programming: C/C++, Assembly, Python, Rust, Verilog, Shell Scripting

Tools: KiCAD, EagleCAD, MATLAB, CERN ROOT, Plotly, git, (Neo)Vim

Presentation Tools: LaTeX, Markdown, Google Workspace Suite

Soft Skills: Systems Thinking, Collaborative Brainstorming, Teamwork

Extracurricular Activities

Technical Writing: I write about electronics and programming on my [blog](#) and I also document my projects on [Instructables](#).

Robotics Club: As the club core, I organized workshops, conducted sessions and curated events to culminate the robotics spirit.

Software Development: I develop open-source software in my free time and have multiple projects that the community loves.

Vidhai: I collaborated with Vidhai, a social welfare initiative at IIITDM, and helped create a [website](#) to expand the outreach of educational content for underprivileged children.

Freelancing: I do freelancing projects in software and website development in my free time to help fund personal projects.

MaRS, IIITDM: I led the communications team and researched on long-range communications for their rover.

Google Code-in Contributor: My first experience with open-source software. I contributed to OpenWISP over a three-month period and finished in the Top 10.