

# Abinash Singh

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## EDUCATION

**Cochin University of Science and Technology (CUSAT)** Sep 2022 – Jul 2026  
*B.Tech in Electronics and Communication Engineering CGPA: 8.5/10* Kochi, India

- **PMSSS Scholar** (Prime Minister Special Scholarship Scheme)
- **Coursework:** Digital Electronics, Microprocessors, Embedded Systems, DSP, VLSI

**Jammu and Kashmir State Board of School Education** 2020  
*Senior Secondary (12th) 83%* Ramban, J&K, India

- Govt. Higher Secondary School, Ramban

*Secondary (10th) 82%* Ramban, J&K, India

- Govt. High School, Chanderkote

## EXPERIENCE

**Centre for Development of Advanced Computing (C-DAC)** Jan. 2026 – Present  
*Intern* Bangalore, India

- Developed **bare-metal firmware for SPI communication on STM32F4**
- Worked on **eBPF-based system monitoring** within the OS stack, gaining experience in Linux kernel tracing and instrumentation
- Built a **filesystem event monitoring system** to capture file creation, deletion, and modification events in real time
- Developed **user-space C++ components** to parse configuration files, apply rule-based filtering, process events and logging

**Linux Foundation** March 2025 – August 2025  
*Linux Kernel Bug Fixing Mentee* Remote

- Submitted **7 bug fixes patches accepted into the Linux kernel mainline**
- Strong debugging skills using **GDB, cscope** and **syzbot**
- Proficient in **Git** workflows and **LKML**-based patch submission and code review

**Defence Research and Development Organisation** May 2025 – July 2025  
*Intern* Advanced Systems Laboratory, Hyderabad

- Designed a **radar range estimation system** using matched filtering for LFM signals
- Implemented a **MATLAB FFT Overlap-Save matched filter** (8K FFT, 10K PRI samples) for efficient processing
- Compared **full FFT vs FFT-OS**, achieving up to **41% BRAM savings** with better scalability
- Deployed on FPGA using **Vivado** and **Xilinx IPs**, meeting real-time constraints (4 kHz PRF, 784  $\mu$ s latency)

**Free/Libre and Open Source Software for Education(FOSSEE)** March 2024 – Jan. 2025  
*Intern* Remote

- Ported **Scilab Signal Processing Toolbox** (replacing liboctave) with **90+ functions(10k+ lines of code)**, improving memory consumption by **50%**
- Refactored **user documentation for 200+ files** using GenAI tools, reducing effort from 4 weeks to 1 week
- Published the toolbox on **ATOMS (Scilab package manager)** for wider adoption

## PROJECTS

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### Matrix Multiplication SoC

- Built a **RISC-V (PicoRV32) SoC** with RAM, UART, GPIO, and a **dummy systolic-array-based matrix multiplier** using native memory interface
- Developed a complete **bare-metal toolchain setup** including linker scripts, startup code, and C/ASM firmware
- Enabled **MMIO-based hardware-software interaction** and validated end-to-end SoC functionality

### Hardware Accelerator

- Designed a **MAERI-based hardware accelerator** for matrix multiplication; mapped **GEMM dataflow** onto reconfigurable interconnect
- Implemented core components (**Controller, Distribution, Multiplier, Reduction Networks**) enabling structured data movement and MAC operations
- Supported  $M \times K \cdot K \times N$  ( $K \leq 8$ ) without folding; validated computation flow via simulation of datapath and controller
- Built on **BSV-based MAERI design** with custom modifications; established a working baseline for dense GEMM and future sparse extensions

## Achievements

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- National FOSSEE Awards 2025 Emerging Talent in Open Source
- Make-a-ton 7.0 "Change Maker" track winner
- Code reCET at CET Trivandrum: First Prize
- **INKRIT 2.0** at MES College Aluva: First Prize
- Magnathon 2.0 IEEE student branch College of Engineering Vadaara: Third Prize
- Top **15 in GDSC CUSAT** data structures and algorithms Learning Series
- Innovation and Design Boot Camp participant (**IEDC Phase II**)

## Certifications & Open Source Contributions

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- Replaced deprecated lib and fixed install scripts in **eSim** for smooth setup on **Ubuntu 22.04/23.04**.
- Contributed sos2cell to **Octave's Signal Processing Library**
- Coursera Deep Learning Specialization . Python Certification
- Systems Programming and Buildroot certification

## SKILLS

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**Languages** : asm, C, C++, Python, Verilog/SystemVerilog

**Systems & Low-Level** : Linux Kernel, eBPF, Device Drivers, Bare-Metal Programming, RISC-V

**Hardware & FPGA** : SoC Design, RTL Design, Systolic Arrays, Vivado, Xilinx IPs

**Tools** : GDB, cscope, syzbot, Git, LKML workflows