Talha Ahmed

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RISC-V CPU Designer — Hardware Security

Suwon, South Korea talhaahmed@skku.edu +82-10-6464-9007 talha-a-316a68113 talha-ahmed-1

Education

Sungkyunkwan University *Aug 2023 – Aug 2025 (expected)*
MS in Electrical and Computer Engineering

- GPA: 3.67/4.5
- **Coursework:** SoC Architecture, Digital IC, Memory System, Advance Algorithms
- **Research Area:** Secure Computer Architecture, Sparse MatMul Algorithms

UIT University *Aug 2018 – Aug 2022*
BS in Software Engineering

- GPA: 3.1/4.0
- **Research Area:** Computer Architecture, Digital Logic Design

Technologies

Languages: Scala, CHISEL, C, Python, CUDA, Verilog, Assembly

Technologies: Chipyard, Git, Vivado, Linux, RISC-V ISA

Experience

Research Fellow *Sept 2023 – Present*
Computer Architecture and Systems Lab - COMPASS LAB SKKU *Suwon, South Korea*

- Server setup for Firesim with Alveo-U280 FPGA for cloud-based FPGA acceleration.
- Evaluate multiple sparse MatMul algorithms on GPU using CUDA.
- Improving the security and performance by minimizing the overhead for NVMe based storage.

RISC-V CPU Designer *Oct 2022 – Sept 2023*
Internee *July 2022 – Sept 2022*
Intensivate *Berkeley, California (Remote)*

- Integrate memory system IP with the Rocket Chip based server class CPU in CHISEL.
- Design and integrate GPIO in SoC with appropriate cells.
- Verify the integration of SRAM based memory IPs in RTL.
- Added new MMIO modules to Rocket Chip for better understanding the RTL generation flow.

Google Summer of Code 2022 *June 2022 – Sept 2022*
Center for Research in Open Source Software - CROSS *Santa Cruz, California (Remote)*

- Implement the digital design of the latch-based register file.
- Extend OpenRAM memory compiler for register file generation.
- Use open source Skywater PDKs for compilation and fix DRC and LVS issues.

Research Assistant *Sept 2022 – Aug 2023*
Research Intern *Sept 2019 – Sept 2022*
Micro Electronics Research Lab - MERL *Karachi, Pakistan*

- Designed a System on Chip (SoC) Generator in CHISEL HDL.
- Taped out a generated SoC in Google MPW6 Shuttle using Skywater 130nm PDK.
- Designed Timer and SPI device and integrated M extension in NucleusRV core.
- Involved in reverse engineering of Rocket Chip.

Publications

An Experimental Study of Merkle Tree-Based Security Mechanism for Secure SSD Storages Osaka, Japan
Talha Ahmed and Seokin Hong
2025 International Conference on Electronics, Information, and Communication (ICEIC)
10.1109/ICEIC64972.2025.10879627

Achievement

Tape-out: Multi Project Wafer 6 Github: soc-now-mpw6

SoCNow generated SoC is taped out in Google sponsered MPW-6.

Mentorship

Google Summer of Code 2025 - Mentor Project 1 & 2

Project 1 "Running Secure and Vectorized Applications on SoC-Now"
Project 2 "AEGIS - AI-Enhanced Generation of Intelligent Scenarios"

Linux Foundation Mentorship Program 2023 - Mentor Blog

Mentored a RISC-V sponsored project in Linux Foundation.

Google Summer of Code 2022 - Mentee Blog

Project "Register File Generator" under supervision of CROSS - UC Santa Cruz.

Projects

SoC-Now: Open Source Web based RISC-V SoC Generator. *Github: SoC-Now*
Undergrad Thesis

- Developed plug-and-play SoC components (e.g., bus interconnects, devices and RV32imfc core), made configurations parametrized with CHISEL, integrated a web interface for automated SoC generation and emulation.
- Tools Used: Scala, CHISEL, Python

OpenRegFile: Open Source Register File Generator *GSoC'22*

- Extended the OpenRAM memory compiler to automate latch-based register file generation using Skywater 130nm standard cells.
- OpenRegFile produces spice netlists, layouts, and Verilog models, utilizing hierarchical decoders and muxes from SRAM designs.
- Tools Used: Python, OpenRAM, Magic, Netgen

MDU_RV32: Multiplication and Division Unit for RV32 Core. *Github: mdu_rv32*

- Implemented M extension in NucleusRV (a RISC-V based core in CHISEL) along with compliance verification.
- Tools Used: Scala, CHISEL

Workshop and Presentation

RISC-V Summit Europe 2023 Extended Abstract

ChipShop: A Cloud-Based GUI for Accelerating SoC Design

First Firesim and Chipyard User and Developer Workshop at ASPLOS'23 Workshop

ChipShop: A Cloud-Based GUI for Accelerating SoC Design

Workshop on Open Source EDA Technology - WOSET'22 Workshop

SoC-Now: An Open-Source Web based RISC-V SoC Generator
Bitstream Chef
OpenRegFile: Open-Source Register File Generation

RISC-V International Summit 2020 Presentation

Reverse Engineering of Rocket Chip

Extras

Technical Report Writing for Engineers: *Future Learn, University of Sheffield.* Certificate
XOR Linked List Data Structure: Article