Hatim Kanchwala

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Education

Apr. 2019 – Sept. 2022
Aachen, Germany

M. Sc.Electrical Engineering, Information Technology and Computer Engineering
RWTH Aachen University
Final Grade 2,1

- Thesis "Field-Programmable Gate Array based Real-Time Control and Simulation"

July 2014 – May 2018
Bihta (Patna), India

B. Tech.Electrical Engineering
Indian Institute of Technology Patna
Final Grade 7.32 / 10

- Thesis "Hardware Architecture of a Family of Sigma-Point Kalman Filters for Bayesian Estimation"

Experience

Apr. 2021 – Dec. 2021
Aachen, Germany

M. Sc. Thesis "Field-Programmable Gate Array based Real-Time Control and Simulation"
Institute of Energy and Climate Research (IEK-10), Forschungszentrum Juelich GmbH

- Developed design with soft-core microprocessors to rapidly prototype control-loop algorithms for FPGA-based real-time simulators.
- Introduced control and data-logger soft-cores dedicated to running control algorithms at switching frequency and logging simulation data.
- Conceptualised heterogeneous architecture of multiple dedicated soft-core microprocessors, enabling hierarchical control-loop system designs.

Oct. 2020 – Feb. 2021
Remote

Intern
Institute of Energy and Climate Research (IEK-10), Forschungszentrum Juelich GmbH

- Implemented power sytems models using High-Level Synthesis designs for RTL co-simulation and real-time simulation on FPGA.
- Extended HLS models with memory-mapped `AXI4` register interface. Verified hardware models on Virtex-7 VC707 FPGA board using remote debugging.
- Developed Makefile pipeline on Linux for `ORTiS` code generation, Vivado High-Level Synthesis, IP Integrator and FPGA bitstream generation stages.

May 2019 – Sept. 2020
Aachen, Germany

Student Assistant
Institute for Automation of Complex Power Systems, E.ON Energy Research Centre

- Integrated Xilinx FPGA boards into VILLAS co-simulation platform by designing an architecture built on top of Aurora 8B/10B serial protocol.
- Engineered Tcl-Makefile system of scripts to automate design generation and bitstream compilation.
- Developed bare-metal driver programs in C/C++ for FPGA firmware.

May 2018 – Nov. 2018
IIT Patna, India

Senior Research Fellow
"Underwater Target Motion Analysis with Passive Sensors",
Naval Physical & Oceanographic Laboratory (DRDO), Ministry of Defence, Govt of India

- Implemented advanced tracking filters in MATLAB for the Bearings-only Tracking problem.
- Simulated performance of modern filters on real field manoeuvre data from Indian Navy, and prepared comparative study.

Aug. 2017 – May 2018
IIT Patna, India

B. Tech. Thesis "Hardware Architecture of a Family of Sigma-Point Kalman Filters for Bayesian Estimation"

Control and Instrumentation Lab

- Designed and implemented a parallel architecture of Sigma-point Kalman filtering algorithms on FPGA.
- Conceptualised novel parallel routine for Cholesky matrix decomposition; improvement from $O(N^3)$ to $O(N)$ time complexity.
- Optimised resource usage of Cholesky decomposition architecture for double utilisation at same processor count.

May 2017 – Aug. 2017
Google Summer of Code 2017

Student Developer

Free and Open Source Silicon Foundation, "EDSAC Museum on FPGA"

- Built Verilog model of historic EDSAC computer from original but incomplete documentation in collaboration with experts from The National Museum of Computing, UK.
- Designed and implemented modified-UART communication protocol to support external embedded I/O interfaces.

Feb. 2016 – Aug. 2016
Google Summer of Code 2016

Student Developer

Coreboot (Flashrom), "Read/Write Multiple Status Registers and Lock/Unlock Memory on SPI Chips"

- Designed unified abstraction of multiple status registers in SPI Flash-memory chips across diverse chip manufacturers.
- Programmed routines to lock/unlock memory areas, handle configuration bits, and automatically generate memory protection maps.
- Developed CLI to expose new features, and tested infrastructure using Raspberry Pi and Teensy development board.

Skills

Programming Verilog, C/C++, Python, Assembly, Java, Tcl, JavaScript, Shell, HTML/CSS

Software Xilinx Vivado & HLS, MATLAB, Simulink, `git`/GitHub, RSCAD, NI LabVIEW, GNU/Linux, `gdb`, Verilator, `yosys`, LaTeX, `gnuplot`, OpenCV

Hardware Xilinx Virtex & Zynq SoC, Digilent Nexys4 DDR, RTDS NovaCor, Lattice FPGA, Raspberry Pi, Arduino, PIC Microcontroller

Languages

English	*Listening* C2	*Reading* C2	*Speaking* C2	*Writing* C2	*TOEFL* 114 / 120
Deutsch	*Hören* B1	*Lesen* B2	*Sprechen* B1	*Schreiben* B1	
Hindi	native				

Volunteering

June 2021 – Apr. 2022
Aachen, Germany

Volunteer

Faiz al-Mawaid al-Burhaniyah (FMB)

- Co-founded Aachen chapter of FMB and led team of volunteers to provide home-cooked and healthy meals to students in and around Aachen at least once a week.
- Organised meal distribution drives on festive occasions, especially Ramadan.

Apr. 2016 – Apr. 2017
IIT Patna, India

Coordinator

Startup Relations, Entrepreneurship Club

- Served as department leader and offered mentorship to early-stage on-campus startups.
- Oversaw the organisation of annual national-level event E-Week 2017.
- Delivered lectures as part of In-house Mentorship series.

References

Univ.-Prof. Dr.-Ing. Andrea Benigni
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Forschungszentrum Jülich GmbH
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Team Simulation Infrastructure and HPC
Institute for Automation of Complex Power Systems,
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