

# Hatim Kanchwala

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## Education

Apr. 2019 – Sept. 2022  
Aachen, Deutschland 🇩🇪

**M. Sc. Elektrotechnik, Informationstechnik und Technische Informatik**

*RWTH Aachen Universität*

*Final Grade 2,1*

- Masterarbeit "Field-Programmable Gate Array basierte Echtzeitregelung und -simulation"

Juli 2014 – Mai 2018  
Bihta (Patna), Indien 🇮🇳

**B. Tech. Electrical Engineering**

*Indian Institute of Technology Patna*

*Final Grade 7.32 / 10 (indische) = 2,1 (deutsche)*

- Bachelorarbeit "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 using soft-core microprocessors to rapidly prototype control-loop algorithms for FPGA-based real-time simulators of power systems and to allow independent formulation of power system and control-loop models.
- Introduced *control* and *data-logger* soft-cores, each based on MicroBlaze soft-core microprocessor from Xilinx and implemented on Xilinx Virtex Ultrascale+ VCU118 board, respectively dedicated to running control algorithms at switching frequency and logging simulation data at each time step.
- Conceptualised heterogeneous architecture using multiple and dedicated soft-core microprocessors, enabling hierarchical control-loop systems and fine-grained administration of real-time simulation.
- Assembled final work product using combination of proprietary Xilinx IPs from Vivado IP Integrator, HLS modules of power systems generated from ORTiS, self-authored Verilog RTL modules and binaries for soft-core microprocessor using Xilinx SDK.

Oct. 2020 – Feb. 2021  
Remote 🌐

**Intern**

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

- Implemented power systems models using open-source code-generation tool ORTiS targeted toward High-Level Synthesis for RTL co-simulation and real-time simulation on an FPGA.
- Extended HLS models with memory-mapped AXI4 register interface. Verified hardware models on Xilinx Virtex-7 VC707 FPGA board using remote debugging.
- Developed Makefile pipeline on Linux for ORTiS code generation, Vivado High-Level Synthesis, Vivado 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.
- Concluded that Shifted Rayleigh Filter outperforms other filters in terms of computational complexity while still being superior at tracking target.

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 an FPGA by independently conceptualised parallel routine for Cholesky decomposition in  $O(N)$  time complexity.
- Further optimised resource usage of parallel Cholesky decomposition architecture for maximum processor utilisation to achieve  $O(\frac{1}{4}N^2)$  resource complexity, as compared to  $O(\frac{1}{2}N^2)$  resource complexity of state-of-the-art.
- Implemented parallel architectures using Verilog HDL and Xilinx Vivado on Xilinx Zynq-7000 ZC702 and Digilent Nexys4 DDR FPGA boards, making use of open-source floating-point IPs and Xilinx Vivado IPs.
- Presented final work product to the professors of the department and was one of only two students to receive unanimous 10 / 10 grade from cohort of 50 candidates. Nominated for Best B. Tech. Thesis award from Dept of Electrical Engineering.

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.
- Programmed and simulated EDSAC architecture and ISA on myStorm Lattice iCE FPGA board using open-source toolchains, like Yosys and iverilog.
- Coordinated with team of students in UK to build hardware imitation of EDSAC memory delay line, teleprinter and paper tape reader.
- Demonstrated final work product at ChipHack 2017 workshop and presented at ORConf 2017 digital design conference in Hebden Bridge, UK, for which full sponsorship was received.

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, JavaScript, Java, Shell, HTML/CSS				
Software	Xilinx Vivado & HLS, MATLAB, Simulink, RSCAD, NI LabVIEW, GNU/Linux, git/GitHub, gdb, Verilator, L <sup>A</sup> T <sub>E</sub> X, gnuplot				
Hardware	Xilinx Virtex & Zynq SoC, Digilent Nexys4 DDR, RTDS NovaCor, Raspberry Pi, Arduino, PIC Microcontroller				
Languages	English	Hearing C2	Reading C2	Speaking C2	Writing C2
	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 with vision 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, to celebrate cultural identity and increase community engagement.
- Co-developed low-cost, sustainable standard operating model to make community effort scalable and reproducible at other locations.


Apr. 2017 – Apr. 2018

IIT Patna, India 

### Assistant Head Coordinator, Dept of Electrical Engineering

Training and Placement Cell


- Selected by class majority to represent students of Dept of Electrical Engineering.
- Led team in designing placement brochures and helped arrange on-campus placement sessions, tests and interviews.

**Apr. 2016 – Apr. 2017**  
IIT Patna, India 

### Coordinator

*Startup Relations, Entrepreneurship Club*

- Led Startup Relations department and served as mentor to early-stage on-campus startups to help develop business plans, choose investor strategies and network with advisors.
- As part of Core Committee, oversaw the organisation of E-Week 2017, the annual national-level event of Entrepreneurship Club.
- Delivered presentations as part of In-house Mentorship Lecture series based on individual technical and business experience in early-stage startups.

**Apr. 2015 – Apr. 2016**  
IIT Patna, India 

### Task Manager

*Startup Relations, Entrepreneurship Club*

- Recruited volunteers and helped organise pitching events, workshops and guest talks.
- Assisted in establishing panel of early investors and mentors for on-campus startups.

## References

**Univ.-Prof. Dr.-Ing. Andrea Benigni**

*Deputy*

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Forschungszentrum Jülich GmbH

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**Steffen Vogel, M. Sc.**

*Team Simulation Infrastructure and HPC*

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