

# AMITABH YADAV

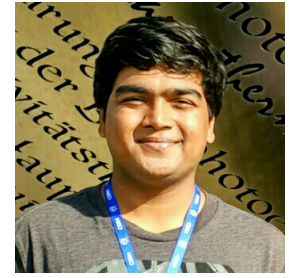
Electronics & Computer Engineer

☎ (+41) 766 241 471 ✉ [amitabhydv@gmail.com](mailto:amitabhydv@gmail.com)

🌐 [amitabhyadav](https://www.amitabhyadav.com)

in [amitabhydv](https://www.amitabhydv.com)

🌐 [amitabhyadav.com](https://www.amitabhyadav.com)



## SUMMARY

I'm an M.Sc. Graduate specializing in Hw/Sw Co-Design, Circuit Design and Quantum Computing – a cheerful nerd who loves Mathematics, Physics, Electronics and problem-solving. I'm currently a Fellow at CERN and an Affiliate at Berkeley National Lab. My interest is in Advanced Computer Architectures, VLSI Design and Nanoelectronics to enable the development of power-efficient high-performance electronics.

## EDUCATION

### University of California, Berkeley, U.S.A.

*November 2019 - present*

AFFILIATE at Department of Physics

- Working with LBNL on Quantum Information Project (HEP.QPR at Physics@Berkeley ☞)
- Audited courses: CS61C Machine Structures, EE290-2 Hardware for Machine Learning.

### Delft University of Technology, the Netherlands

*September 2017 - August 2019*

MASTER OF SCIENCE (M.SC.) in Computer Engineering/EEMCS

CGPA: 8.2/10.0

- Master Thesis on 'CC-Spin: A Micro-architecture design for scalable control of Spin-Qubit Quantum Processor' conducted at QuTech, TU Delft. Grade: 9/10.
- **Research Assistant:** Quantum & Computer Engineering Lab, QuTech/TU Delft (6 months)
- **Teaching Assistant:**
  - (i) 'The Building Blocks of a Quantum Computer' MOOC on edx.org (12+ weeks).
  - (ii) 'EE1D11 Digital Systems and Programming in C' Spring 2019 Undergraduate Course (8 weeks).

### ETH Zurich, Switzerland

*11-14 September 2018*

Summer School in Quantum Information at Theoretical Physics department (D-PHYS).

### University of Petroleum and Energy Studies, India

*August 2013 - June 2017*

BACHELOR OF TECHNOLOGY (B.TECH.) in Electronics Engineering/EE Dept.

CGPA: 3.1/4.0

- Thesis: 'Design and Simulation of 16-bit Microcontroller in VHDL/Xilinx ISE'. (8 months)
- 3<sup>rd</sup> Year Project: 'Embedded Audio Morse-Code Encoder and Decoder' (4 months)

## PROFESSIONAL EXPERIENCE

### CERN (European Organization for Nuclear Research)

*October 2020 - present*

*Electronics Engineer / Fellow*

*Geneva, Switzerland*

- Lead developer and SoC Design Engineer for CERN's RadiatiOn Monitoring Electronics (CROME) running on Zynq-7020 SoC and communicating over the TCP/IP network via ROMULUSlib.
- CERN guide for SM-18 LHC Superconducting magnet facility and ATLAS Experiment Cavern.

### SyncMindAI ([syncmind.org](https://syncmind.org))

*January 2021 - present*

*Chief AI/ML Engineer and Co-Founder*

*Geneva, Switzerland*

- Chief in-charge of implementing AI/ML hardware optimizations for EdgeAI ASIC design and IP design for training and real-time inference. (presentation video☞)
- Designed the online developer toolchain, using Gitlab and Grafana, for visualizing and running algorithms on ECoG Neural Data.

**LBNL (Lawrence Berkeley National Laboratory)***November 2019 - present**Research Associate - HEP.QPR (under H. Gray (PI), P. Calafiura)**Berkeley, California*

- Developed the ‘Quantum Hough Transform (QHT)’ algorithm for Charged-Particle Track Reconstruction and identifying multi-parameter defined tracks in CERN’s TrackML particle dataset.
- Leveraging quantum superposition phenomena on input parameters and implementing Grover-Long subroutine, QHT algorithm is developed to study track- and vertex- fitting efficiency.
- Since Dec. 2020, I am a Research Affiliate with ‘Machine Learning for Fundamental Physics’ group [↗](#).

**QuTech/Intel Quantum Computing Lab***September 2018 - August 2019**Master Thesis Research (under N. Khammassi (Intel, Oregon), K. Bertels (QuTech)) Delft, Netherlands*

- Implemented the CC-Spin Micro-architecture on Cyclone-V SoC using Verilog, C and Tcl.
- Central Controller (CC-Spin) is connected to FPGA-controlled Direct Digital Synthesis (DDS) units via LVDS links for multi-channel synchronous waveform generation (I/Q and DC Pulses).
- Designed: Quantum Instruction Pipeline, Microcode Unit, 8b/10b Encoder-Decoder, SERDES, Timing Control Unit and SPI Master (DDS controller) to perform Qubit control with precise timing.
- Proposed a scalable micro-architecture for NISQ-era Hybrid Quantum-Classical Algorithms (QAOA).

**DARE (Delft Aerospace Rocket Engineering) - Stratos-III***October 2017 - July 2018**Electronics/Firmware Engineer - Core Team Member**Delft, Netherlands*

- Avionics Hardware development on ARM Cortex-M3/LPC1768 MCU.
- PCB Design using Altium Designer 18 for Stratos-III Sounding Rocket electronics.
- Writing firmware for ADC/DAQ in Assembly and C.
- Volunteer at in-house manufacturing of Sorbital, Paraffin & Aluminum based Solid Rocket Fuel.

**CERN (European Organization for Nuclear Research)***June 2017 - August 2017**Summer Intern - ATLAS Pixel Group/EP-ADE-ID (under C. Solans, A. Sharma) Geneva, Switzerland*

- Developed front-end DAQ firmware components for FEI-4 Silicon Pixel readout on Xilinx KC705.
- Integrated IPBus (UDP/IP) (front-end monitoring) with 8b/10b encoded Rx/Tx Core to communicate with back-end Gigabit TRx (GBT) protocol and developed the data-routing entity ‘E-Link Bank’.

**Lockheed Martin Corp.***August 2015 - May 2017**Electronics Team Lead, Roll-on/Roll-off University Design Challenge**New Delhi & Dehradun*

- Developed the detailed technical designs for Aerial Surveillance System, Payload Control and Communication System for payload specification on Lockheed Martin C-130J Super-Hercules Aircraft.

**BARC (Bhabha Atomic Research Center)***June 2016 - July 2016**Summer Intern - Data Acquisition & Processing Systems Group**Mumbai, India*

- Developed Compression and De-Noising libraries for A, B and C Scan Ultrasonic Scan Data for application in NDT of Materials. (Report [↗](#))
- Achieved loss-less compression up to 75.37% in C-Scan data using information coding algorithms.
- Analyzed compression ratio & noise in Lossy compression for DCT, DFT and Wavelet Transform.

**ONGC (Oil & Natural Gas Corporation) Ltd.***June 2015 - July 2015**Summer Intern - Geodata Processing & Interpretation Center (GEOPIC-HQ)**Dehradun, India*

- Study of Computer Networks and Security, OSI Model and RAID Data Storage & Analysis at GEOPIC.

## AWARDS

---

- SyncMindAI, an EdgeAI startup co-founded by my colleague and I, is selected among top-10 Swiss Deep-Tech Ventures for AIT – Academia to Industry transition training. (2021)
- Honoric address at UPES Undergraduate Convocation. (2017)
- Ranked 1st at University Best Research Award 2017 for developing an IoT and Wireless Sensor Network based system for Landslide Forecasting in the Himalayan Regions, funded by UPES's Research Initiative for Students of Engineering (RISE). (2017)
- International Rank 1st at CanSat Competition 2017 held in Texas, USA. (2017)
- National Rank 1st and secured a research grant of USD 40,000 by Lockheed Martin Corp. in Critical Design Phase of C130-J Super Hercules Aircraft Roll-On/Roll-Off Design Challenge. (2016)
- International Rank 4th (1st in Eurasia) at CanSat Competition 2016 held in Texas, USA. (2016)
- Ranked 8th at University Best Research Award 2015 for developing a Wireless Sensor Network for Health Monitoring and Indoor Location Tracking, funded by RISE. (2015)

## ACADEMIC PROJECTS

---

- Digit Recognition using Convolutional NNs on MNIST, Netflix Recommendation System and Text Game using Reinforcement Learning. (MITx on edX projects).
- Running Shor's Algorithm on IBM Quantum Experience using IBM-Q QISKit. GitHub ↗
- BICMOS5 Fabrication & Measurement of IC parameters in EKL Cleanroom, TU Delft. (16 hours)
- OpenCL implementation of Smith-Waterman Algorithm for Protein/DNA Sequencing. (GPU)
- Performance improvement of Plasma processor (opencores.org) in VHDL. (Processor Design Project)
- Parallel Poisson Solver on Distributed Memory HPC cluster using MPI. (HPC)
- Design & Jitter Analysis of Quad-Phase By-6 frequency divider in Cadence. (Digital IC Design)
- Development of Classic Snake Game using Software Design Patterns in Java. (ATHENS 2017)
- University-Funded research projects (INR 45,000) on Wireless Sensor Network system
  - (i) Landslide Forecasting for Himalayan Range [UPES RESEARCH AWARD 2017: RANK #1ST]
  - (ii) Patient Monitoring and Tracking System. [UPES RESEARCH AWARD 2016: RANK #8TH]
- Project Geo-Rover: Robot Navigation and Camera Interfacing for Digital mapping of a geographical area using a Land rover.

## ACADEMIC COURSE WORK

---

- **Graduate:** Graduate Computer Architecture, Advanced Digital IC Design, IC Fabrication Lab, High-Speed SI & Digital Design, Quantum Information Theory, Quantum Information Project, Electronics for Quantum Computing, Quantum Communication, EDA Algorithms for System Design, VLSI Test and Verification, Processor Design Project, Sensors and Actuators, and Advanced Computing Systems.
- **Undergraduate:** Engineering Mathematics (I, II, III), Physics (I, II), Probability Theory and Random Processes, Numerical Methods, Microelectronics (BJT & FET) Devices, Linear IC/ Analog Design, Digital Design, VLSI Design, Electromagnetic Field Theory, Analog and Digital Communication, Microwave Engineering, Antenna Theory, Network Theory, Microprocessors, C++, AI, MEMS and Satellite Communication.

## INTERNATIONAL ACHIEVEMENTS

---

### Intercollegiate Rocket Engineering Competition (IREC) 2017

August 2016 - May 2017

Chief Electronics and Payload System Engineer

Spaceport America, New Mexico, USA

- Developed the avionics and telemetry systems in the Sounding Rocket, Kalam.
- Developed electronics payload - a custom-built Hexacopter, for Multi-Terrain landing.
- All payload electronics systems are implemented using triple-modular redundancy.
- Kalam is a 2.8 meters tall, carbon fibre built (with Titanium Nose-cone tip), COTS Solid-propellant based sounding rocket, designed for altitude range of 10km AGL and speed upto 1 Mach.

### Cansat Competition (U.S. Naval Research Lab, NASA, JPL)

August 2014 - June 2017

Technical Advisor 2017, Team Leader (Electronics) 2016, Team Member 2015

Texas, USA

CANSAT 2017 (Advisor) International Rank#1 (96.32%) out of 96 teams. Developed 'Venus Glider', a helical gliding payload weighing under 500g with real-time video feed at ground. **(Report ↗)**  
**"Indian students grab first position in global aerospace competition in Texas."**  
(India Today ↗)

CANSAT 2016 (Leader) Lead the development & integration of Sensor Subsystem, Telemetry System and real-time decent monitoring system by Ground Station for the mission payload, 'Mars Glider' (500g). International Rank of 4th out of 72 teams. **(Report ↗)**  
**"Indian Students present epic CanSat System at Global Aerospace Competition in Texas, & left NASA absolutely stunned."** (BusinessInsider ↗)

CANSAT 2015 (Member) Developed the Sensor Subsystem (Arduino MCU) and Ground Control Station (MATLAB based GUI) for the Mission Payload, *Auto-Gyro Recovery Imager* (500g). **(Video ↗)**

## POSITION OF RESPONSIBILITY

---

### Directorate of Student Affairs (DSA)

August 2016 - March 2017

Head, UPES Discipline Committee (DC)

University of Petroleum and Energy Studies

- Handled all student grievances and supervised safety regulations during Cultural & Technical fests.
- Spearheaded a team of 100+ active DC members across College of Engineering Studies, UPES to successfully ensure Anti-Ragging, Gender Sensitization, Anti Substance Abuse, and Road Traffic Safety.

### Department of Electronics Engineering

August 2013 - June 2017

Class Representative (CR)

University of Petroleum and Energy Studies

- CR is an annually elected position for 4 students based on majority voting in class.
- Responsibilities include (but not limited to), handling academic/administrative inquiries, information dissemination and job-placement; representing the class at university/departmental meetings etc.

### UPES-IEEE Student Chapter

August 2016 - Nov 2017

IT & Design Head

University of Petroleum and Energy Studies

- Served as committee member of university's IEEE Student Chapter headed by President, Tanmay Jain.
- Planned and Maintained UPES-IEEE website, organized online activities and managed the forum.

### Ignite 2015 - Annual Techno, Legal & Management Fest

Nov 2014 - Feb 2015

IT & Design Manager

University of Petroleum and Energy Studies

- Managed website, online registrations and posters designs for various events and talks during the fest.

## TECHNICAL STRENGTHS

---

<b>Programming Languages</b>	C (incl. POSIX and Linux Kernel), Java, Python (SciPy, NumPy, Matplotlib, Seaborn, Pandas, Pytorch, Qiskit, PennyLane), CUDA, OpenMP, MATLAB, Verilog and VHDL (expert).
<b>Software &amp; Tools</b>	Quartus Prime, Xilinx Vivado and Vitis, CATIA, LTSPICE, Altium Designer, L <sup>A</sup> T <sub>E</sub> X, Cadence (Virtuoso, Spectre)
<b>OS</b>	Windows, OSX, Linux(Ubuntu, CentOS, Petalinux, Yocto Project)
<b>Laboratory</b>	EKL (Class-10 IC Cleanroom), Embedded Hardware and Robotics Lab
<b>Rapid Prototyping</b>	Lathe, Welding (Gas and Arc), 3D printing, Fibre Glass moulding.

## SUMMER SCHOOLS, WORKSHOPS & EXTRA-CURRICULAR

---

- **Scientific Societies: ACM and Nature Physics (Student Member).**
- ‘BigCompute20’ Conference held Feb 11 - Feb 12, 2020, organized by Rescale Inc. in San Francisco.
- Nature conference on ‘Technologies for Neuroscience’ Online
- “Venture Lab: Business Creation ENGINEERING” workshop in Lausanne, Switzerland.
- ‘TechCrunch: Robotics + AI Conference’ held March 3, 2020 in Berkeley, California.
- ‘TUD15 Software Design Patterns’ 2018 at ATHENS Programme [↗](#)
- Introduction to Swarm Robotics at IIT Bombay.
- Embedded Design Workshop 2016 by Prof. D.V. Gadre. (Texas Instruments Lab, NSIT Delhi)
- Network Security and Ethical Hacking Workshop 2015 (Nettech Pvt. Ltd.)
- EEMCS, TU Delft Blogger 2017-18.
- Cross Country Cycling - Around Lac Leman (185km), Vlaadingen to Delft (115 km) etc.
- Volunteering: Mentor at Dweebs Global
  - 10th Uttarakhand State Science and Technology Congress 2015-16.
  - 1st International Conference on Intelligent Communication, Control and Devices 2016.
- Industry/Professional Courses: Expert VHDL (by Doulos, London) - 2021;
  - Embedded Linux (by Doulos, London) - 2021;
  - First-Aid, Saving Life Actions (by CERN) - 2021.
- Certified MOOCs:
  - Particle Physics: An Introduction (University of Geneva, Coursera) - 2017;
  - Quantum Cryptography (TU Delft & Caltech, EDX) - 2018;
  - Quantum Machine Learning (University of Toronto, EDX) - 2019;
  - Machine Learning: From Linear Models to Deep learning (MIT, EDX) - 2021.
- Languages: Hindi (Native), English (C2 proficiency) and French (A2 proficiency).

...

## LIST OF PUBLICATIONS (Citations: 38, Google Scholar [↗](#))

---

1. **A. Yadav**, H. Boukabasche, N. Gerber, K. Ceesay-Seitz, D. Perrin, “ROMULUSlib: An autonomous, TCP/IP-based, multi-architecture C networking library for D.A.Q. and Control applications [↗](#)”, International Conference on Accelerator and Large Experimental Physics Control Systems (ICALEPCS) Conference, Shanghai Advanced Research Institute, China (October 2021).
2. H. Gray, J. Wonho, V. R. Pascuzzi, R. Sawada, K. Terashi, **A. Yadav** “Quantum Pattern Recognition for Tracking in High Energy Physics [↗](#)”, SnowMass 2021.
3. K. Bertels, A. Sarkar, T. Hubregtsen, M. Serrao, A. A. Mouedenne, **A. Yadav**, A. Krol, I. Ashraf “Quantum Computer Architecture Toward Full-Stack Quantum Accelerators [↗](#),” in IEEE Transactions on Quantum Engineering, vol. 1, pp. 1-17, 2020, doi: 10.1109/TQE.2020.2981074.
4. **Amitabh Yadav**, Carlos Solans Sanchez, Abhishek Sharma (2017) “*FE-I4 Firmware Development and Integration with FELIX for the Pixel Detector*” [↗](#). CERN Document Server, Meyrin, Switzerland.
5. **Amitabh Yadav**, Vivek Kaundal, Abhishek Sharma et. al. (2017) “*Wireless Sensor Network Based Patient Health Monitoring and Tracking System*” [↗](#) In Proceeding of International Conference on Intelligent Communication, Control and Devices (pp. 903-917). Springer, Singapore.

### Preprint:

7. **A. Yadav**, W. Lavrijsen, P. Calafiura, H. Gray, “A Quantum Hough Transform Algorithm for Track Reconstruction”, *arXiv preprint* in preparation.
8. **Amitabh Yadav**, Nader Khammassi, Koen Bertels, “*CC-Spin: A scalable Microarchitecture design for Control of Spin-Qubit Quantum Accelerator*” [↗](#) (2020).

### Thesis:

9. Master Thesis: “*CC-Spin: A Micro-architecture design for scalable control of Spin-Qubit Quantum Processor*” [↗](#), August 2019 (presentation [↗](#))

## PATENT

---

1. **Amitabh Yadav**, Vivek Kaundal, Abhishek Sharma et. al. (2016) “*WSN based Patient Health Monitoring and Tracking System*”. (Indian Patent No. 201611039333)

## CONFERENCE PRESENTATIONS/POSTER

---

1. Invited talk on “ROMULUSlib: A TCP/IP based, multi-architecture C networking library for DAQ and Control” at the International Conference on Accelerator and Large Experimental Physics Control Systems, at Shanghai Advanced Research Institute (SARI), China. (2021) (PDF [↗](#) | Video [↗](#))
2. Invited Talk on “*CC-Spin: A Micro-architecture design for scalable control of Quantum Processors*”. at Advanced Quantum Testbed (AQT) Meeting, Lawrence Berkeley National Laboratory/University of California, Berkeley. (PDF [↗](#) | April 2, 2020)
3. Poster on “*Quantum Pattern Recognition for High Energy Physics (HEP)*”. (March 9, 2020) HEP.QPR (W. Bhimji, W. Lavrijsen, P. Calafiura, H. Gray, E. Rohm, A. Yadav) at US Department of Energy, Review Meeting. (Poster [↗](#))
4. Invited Talk “*Quantum Hough Transform for Charged-Particle Track Reconstruction*”. (Jan 7, 2020) at Annual ATLAS LBNL Meeting 2020, Lawrence Berkeley National Laboratory. (PDF [↗](#))
5. Invited Participant at ‘*Quantum Algorithms*’ Seminar [↗](#) (Feb 25 - Feb 28, 2020) Simons Institute for the Theory of Computing, University of California, Berkeley.

## APPENDIX

---

### Academic References (submitted via Ph.D. application portal)

- Dr. Heather Gray heather.gray@berkeley.edu  
Assistant Professor, University of California, Berkeley (USA).
- Dr. Koen Bertels K.L.M.Bertels@tudelft.nl  
Professor, Delft University of Technology (Netherlands).
- Dr. Sushabhan Choudhury schoudhury@ddn.upes.ac.in  
Professor, University of Petroleum and Energy Studies (India).

### Professional References (hyperlinks)

- Dr. Carlos Solans Sanchez Reference letter [↗](#)  
carlos.solans@cern.ch  
Staff Scientist (ATLAS Experimental Physics)  
European Organization for Nuclear Research (CERN, Switzerland).
  - Dr. Nader Khammassi Reference letter [↗](#)  
nader.khammassi@intel.com  
Research Scientist, Intel Quantum Laboratory Hillsboro (USA).
  - Dr. Hamza Boukabache Reference letter [↗](#)  
hamza.boukabache@cern.ch  
Staff Scientist (Radiation Protection and Instrumentation)  
European Organization for Nuclear Research (CERN, Switzerland).
- 

### Other Featured Links:

- My interview at Lawrence Berkeley National Laboratory (LBNL) [↗](#) : (2020)  
“Connecting the Dots: Researcher Works to Adapt Image-Recognition Technique Into the Quantum  
*Amitabh Yadav combines expertise in quantum computing, particle physics in Berkeley Lab project*”
- My interview at CERN: A Great Career Starter [↗](#) (2020)  
Personal Interview of my experience as a CERN Summer Student by the CERN Alumni Network.
- Please note that all hyperlinks ( [↗](#) ) in this CV are available at [amitabhyadav.com/links](https://amitabhyadav.com/links) [↗](#).

...