

Debadri Das

✉ debadridas@stanford.edu

☎ +1-650-680-9365

🌐 <https://github.com/debadridas>

Education

Sept. 2018 – Mar. 2020 🎓 **MASTERS CANDIDATE IN APPLIED PHYSICS**
Stanford University
Stanford, California, United States of America.
Current GPA: 3.90/4

Sept. 2014 – May 2018 🎓 **B.TECH IN ENGINEERING PHYSICS**
Delhi Technological University
New Delhi, India.
Overall GPA: 9.19/10
Major: Electronics Engineering
Minor: Nanotechnology

Apr. 2010 – June 2014 🎓 **HIGH SCHOOL DIPLOMA**
St. Augustine's Day School
Barrackpore, Kolkata, India.

Research Experience

Dec. 2018 – Dec. 2019 🎓 **RESEARCH ASSISTANT**
X-Ray Science, Accelerator Physics
SLAC National Accelerator Laboratory
Menlo Park, California, United States of America.
Supervisor: Dr. Ryan Coffee

- Attempting to build a 16 detector X-ray spectrometer that uses deep learning to achieve very high energy resolution over multiple energy windows for molecular frame photo-electron and Auger electron spectroscopy as well as so-called *attoclock reconstruction* of X-Ray Free-Electron Laser (XFEL) pulses.
- Demonstrated mathematically that the implementation of a *Convolutional Neural Network* (CNN) has the potential to reach accuracy beyond any previous deterministic algorithms for noisy spectrums with multiple poles.
- Optimized an adaptive *Kernel Density Estimation* algorithm in the form of a 2-layer CNN using *Tensorflow*, running on a FPGA, with respect to the number of nodes and hits, to ensure the best prediction from minimum resources.
- Designing an analog pre-processing *sample-and-hold* circuit to circumventing the limitations of high-speed digitizers by a factor of ~ 4 through the idea of a *non-uniform sampling clock*, feeding the neural network with low noise data to achieve resolution < 0.25 eV for 100 eV electrons.

Research Experience (continued)

Mar. 2019 – Dec. 2019

 **RESEARCH ASSISTANT**

AMO Science, Laser Physics

Hollberg Lab, Stanford University

Stanford, California, United States of America.

Supervisor: Prof. Leo Hollberg

- Designed a *Second Harmonic Generation* (SHG) experiment, with the aim to do electro-optic modulation (EOM) on a temperature-controlled, phase-matched non-linear KTP crystal for fast tuning between green light frequencies with stable spatial modes.
- Commissioned a ultra-high vacuum ($\sim 10^{-9}$ Torr) system, wired up the electrical and measurement systems, and machined parts for the vacuum chamber using *Autodesk Inventor* for fabricating *MEMs vapor iodide cells*, which with the fast tunable green laser setup can drive an extremely precise atomic clock for improving the timing data in GPS signaling in the form of a compact atomic device.
- Figuring out a procedure to fuse pyrex and silicon substrates for fabricating the compact cells by the virtue of *anodic bonding*, which can be commercialized later.

Jan. 2017 – May 2018

 **RESEARCH ASSISTANT**

Quantum Computing, Quantum Information Science

Jaypee Institute of Information Technology

Noida, India.

Supervisor: Prof. Anirban Pathak

- Experimentally demonstrated the violation of Bell's inequality on IBM's *5 qubit Quantum Processor* (IBMQ) in the form of a Magic Square Game.
- Performed Clifford decomposition of complex input operation matrices and optimized the number of gates according to constraints of the available IBMQ architectures.
- Demonstrated the drop in gate fidelity from $\sim 99\%$ for a single gate to $\sim 45\%$ for a 38 gate circuit, using *state tomography*, which was critical in understanding the limitations of IBMQ.

June 2017 – Aug. 2017

 **SUMMER RESEARCH FELLOW**

Photonics, Quantum Cryptography

Indian Institute of Technology (IIT)

Madras, India.

Supervisor: Prof. Anil Prabhakar

- Set up an optical table to implement a *Differential Phase Shift Quantum Key Distribution* (DPS-QKD) system and engineered experiments to characterize a wide-range of optical components like the *phase modulator* and interface it a *Xilinx* FPGA.
- Devised a novel simulator on Python to benchmark experimental data from the setup with a maximum of 14,384 bits with user-defined settings of physical conditions and implemented it on two independent *Raspberry Pi*'s interacting through TCP sockets.

Projects

- Sept. 2019 – Dec. 2019  **FABRICATING SUPERCONDUCTING RESONATORS WITH VACUUM GAP CAPACITORS**
Circuit QED, Quantum Information
Stanford Nanofabrication Facility
Stanford, California, United States of America.
- Supervisors: Usha Raghuram, Swaroop Kommera, Don Gardner
- Developing a process to fabricate non-planar vacuum gap parallel plate capacitors and spiral inductors with niobium, operating in the microwave regime (~ 5 GHz).
 - Removing the sacrificial dielectric layer to create the required vacuum gap in the capacitor is crucial in improving *Q-factor* of the resonators avoiding the *two-layer system* (TLS) imperfections that crop up at the metal-dielectric interface.
 - Executed a full-factorial Design of Experiment (DOE) to figure out a process to etch niobium 9x selective to oxide and analysed the interplay of various process parameters using *JMP* software.
- Sept. 2018 – Dec. 2018  **APPPHYS203: ATOMS, FIELDS, AND PHOTONS**
Quantum Optics, Quantum Information
Stanford University
Stanford, California, United States of America.
- Instructors: Prof. Benjamin Lev, Prof. Amir H. Safavi-Naeini
- Simulated results from a paper on *Quantum Non-Demolition* (QND) measurements comparing two methods with efficiencies of $\sim 30\%$ and $\sim 89\%$ in Python's open-source software for simulating the dynamics of open quantum systems, *QuTip*.
 - Replicated results from another paper showing the possibility of one photon exciting two atoms simultaneously using the *stochastic master equation solver* in *QuTip*.
- Sept. 2017 – Mar. 2018  **IMPACT OF SINGLE PHOTON SOURCES IN SECURED QUANTUM COMMUNICATION**
Quantum Information Science, Photonics
Delhi Technological University
New Delhi, India.
- Supervisor: Dr. Pawan K. Tyagi
- Surveyed the *BB84 Quantum Key Distribution* protocol employing *Nitrogen* and *Silicon vacancy centers* in diamond as a potential single photon source and compared figure of merits, in terms of efficiency, security and key rate.

Projects (continued)

- Sept. 2017 – Apr. 2018  **MOTO-BUDDY: A SMART HELMET COMPANY**
Entrepreneurship, Co-founder
Delhi Technological University
New Delhi, India.
- Designed *smart helmets* through a careful correlation of the 3D pitch and roll angles along with the angular velocities to train a supervised machine learning model for sending alerts a nearby medical facility on sensing an event.
 - This was later funded by *Government of Gujarat, India* as one of the top 20 teams all over the country, since it could potentially cut down the medical attention time for two-wheeler accidents in India by a factor of ~ 3 .
- Feb. 2017 – May 2017  **MINOR PROJECT II: ANALYSIS OF TRANSPARENT GATE RECESSED CHANNEL (TGRC) NANO-MOSFETS**
Electrical Engineering, Numerical Analysis
Delhi Technological University
New Delhi, India.
- Supervisor: Dr. Rishu Chaujar
- Investigated RF performance of the device in terms of transconductance, drain-induced barrier lowering (DIBL), channel resistance parasitic capacitances, cut-off frequency and maximum oscillator frequency using *ATLAS-3D* device simulator.
 - Comparison with *Conventional Recessed Channel (CRC)* MOSFET at THz frequency range show a 42% enhancement in cut-off frequency, 132% increment in maximum oscillator frequency and significant improvement in parasitic capacitances for TGRC-MOSFET, hence significant for THz applications.
- Sept. 2016 – Dec. 2016  **MINOR PROJECT I: ANALYSIS OF DUAL GATE (DG) NANO-MOSFETS**
Electrical Engineering, Numerical Analysis
Delhi Technological University
New Delhi, India.
- Supervisor: Dr. Rishu Chaujar
- Developed a comprehensive theoretical understanding of *Short Channel Effects* and its role in degrading device performance.
 - Assessed solutions by making structural and compositional alterations and engineered simulations on *Genius-TCAD* to show superior linear performance in sub-50nm regime for Surrounding Gate Electrode Work-function Engineered-Silicon Nanowire (SGEWE-SNW) MOSFET.

Projects (continued)

June 2016 – July 2016

🔺 **QUANTUM IMAGE PROCESSING**

Quantum Information, Image Processing

Jaypee Institute of Information Technology

Noida, India.

Supervisor: Prof. Anirban Pathak

- Reviewed various methods for representing Quantum Images like *Novel Enhanced Quantum Representation (NEQR)* and schemes to carry out fundamental morphological operations of erosion and dilution.
- Focused on the problem of *Quantum Image Matching* and modified existing algorithms for a *quadratic* speedup in its processing time.

Dec. 2015 – Jan. 2016

🔺 **PERSISTENCE OF VISION CLOCK**

Electronics, PCB Design

Texas Instruments

New Delhi, India.

- Designed a PCB with a single array of 8 LEDs and the microcontroller *MSP430* by Texas Instruments, which on being rotated by a motor at a certain frequency uses the persistence of vision to generate the entire analog clock with hours, minutes, and seconds hands.

June 2015 – July 2015

🔺 **CLAIMS EXPRESS: A HEALTH INSURANCE SOFTWARE**

Software development, Programming

IBM Skill Development Program

Kolkata, India.

- Programmed a complete enterprise-level software for a health insurance company using *Javascript, Java Enterprise Edition (J2EE)* and *DB2*, a database by IBM. This would allow clients to securely login and initialize an insurance request, while also allowing an automated-agent to process it, generating an automated e-mail about the details to the client.

Honours and Awards

2018 🏆 **VICE CHANCELLOR'S MEDAL FOR ACHIEVING FIRST CLASS WITH DISTINCTION, *Delhi Technological University. New Delhi, India.***

2017 🏆 **BEST PROJECT AWARD FOR THE PROTOTYPING OF SMART HELMET IN THE INSTA-SEED COMPETITION, *Netaji Subhash Institute of Technology. New Delhi, India.***

2014 🏆 **ALL INDIA RANK 35 IN NATIONWIDE EDUCATION AND SCHOLARSHIP TEST, *The Students' Unity Foundation of India. New Delhi, India.***

🏆 **WITHIN TOP 1.5% AMONG 1.3 MILLION STUDENTS PARTICIPATING IN JOINT ENTRANCE EXAMINATION(MAINS), *NCERT. Kolkata, India.***

2012 🏆 **STATE RANK 1 IN THE SCIENCE EXHIBITION, *The Science Congress. Kolkata, India.***

Positions of Responsibility

- 2017-18 **PLACEMENT COORDINATOR FOR ENGINEERING PHYSICS (EP) UNDERGRADUATES, *Delhi Technological University, New Delhi, India.*** Point-of-contact person for companies visiting on-campus for recruiting EP undergraduates.
- 2017 **ENGIFEST HOSPITALITY HEAD, *Delhi Technological University, New Delhi, India.*** Supervised a team of over 70 volunteers in the college's annual cultural festival, *Engifest.*
- ROTARACT SOCIETY, *Delhi Technological University, New Delhi, India.*** Monitored a Blood-Donation Camp with over 100 on-campus participants.
- DEPARTMENT INDUSTRIAL VISIT ORGANIZER, *Delhi Technological University, New Delhi, India.*** Managed a series of tours and seminars to *Indian Institute of Remote Sensing* and *Wadia Institute of Himalayan Geology* who illustrated a wide-range of novel forecasting gadgets.