VINIT KUMAR SINGH

Curriculum Vitae

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Second Year Undergraduate Student of the Department of Physics,

Indian Institute of Technology, Kharagpur.

Educations

- 2016 – till date**. Integrated MSc.**, *Indian Institute of Technology, Kharagpur*, **8.84 CGPA**.
- 2014**. 12th - CBSE**, *Birla High School,* Kolkata, **91.4%**.
- 2012**. 10th - CISCE**, *St. Helen's School,* Howrah, **94.2%**.

Academic Distinction

- Recipient of Inspire Scholarship awarded by DST, Government of India.
- Currently ranked **3rd** in my department in terms of CGPA.
- Secured 9.65/10 SGPA in my second semester.
- IIT-JEE Advanced 2016, All India Rank 4781.
- NSTSE – 2015, All India Rank 918 (State Rank 21).
- Qualified for KVPY SA 2014 second round.
- SOF IMO – 2014, International Rank 1554.
- Zonal Topper in FTRE 2013.

Scholastic Activities

- Active Coder at Hackerrank having won one Silver and three Bronze medals in different competitions. I have a 4-star badge in Algorithms and 2-star badge in Machine Learning with international ranks: 5476 in Algorithms, 1786 in Mathematics and 2872 in Project Euler+.
- Learned Statistical Mechanics: Algorithms and Computations by Dr. Werner Krauth, École normale supérieure.
- Learning Statistical Mechanics from online courses of Dr. Leonard Susskind, Stanford University.
- Enrolled in an additional course, Computational Number Theory, taught by Prof. Abhijit Das (Department of Computer Science and Engineering, IIT Kharagpur).
- Completed an additional course, Design and Analysis of Algorithm, taught by Prof. Sourav Mukhopadhyay (Department of Mathematics and Computing, IIT Kharagpur).
- Learned Machine Learning from online courses of Andrew Ng, Adjunct Professor, Stanford University.
- Learned Quantum Mechanics – I on MITOCW taught by Prof. Allan Adams.
- Learned Introduction to Enumerative Combinatorics from online courses of Evgeny Smirnov, Associate Professor, Higher School of Economics.

Projects and Workshops

• Winter Project on Computational Physics

- Guided by Prof. Sudhansu S. Mandal of Department of Physics during academic session 2017-18.
- The aim of the project was to determine the stability of Skyrmions with a variation of Magnetic Field, Magnetic Anisotropy, exchange stiffness and Dzyaloshinskii-Moriya vector.
- Used Variational calculations to determine the stability of Ferromagnet, Spiral and Cone phases.
- Used Conjugate Gradient Minimization approach on the Continuum Energy Functional to determine the stability of the Spiral, the Skyrmion and the Elliptic Cone phases of crystal.
- Learned numerical analysis for Vector Calculus along with Basic Integral and Differential Calculus.

- Applied Functional Algebra using Matlab Packages and was able to use advanced graphical tools, like Vector Field Plots and 3D Curve-Fitting tool, in Matlab.
- Used parallel programming to optimize running time of my codes on a Supercomputer.

• Semester Project on Computational Optics

- Guided by Prof. Partha Roy Chaudhuri of Department of Physics during academic session 2017-18.
- Studied Fraunhofer Diffraction of light through the aperture of different shapes by coding them on MATLAB using Fast Fourier Transform Technique. Using Inverse Fast Fourier Transform Technique, I could get back the real shape of the aperture from the diffracted image.

• Winter Workshop on Image Processing

- Learned Image Processing on OpenCV including Image Filtering, Edge Detection, Blob Detection and Line Detection using Hough Transform.
- Performed fill bucket operation like in MS-Paint using Image Processing
- Used Video Processing to solve the problem statement of counting the goals in a Robosoccer match.
- Learned Face detection using Haar Cascade.

Personal Projects

- Computed Ground state energy of Helium Atom using variational Monte Carlo method employing Metropolis Algorithm.
- Given any Potential function varying over distance, determined its wave function and discrete energy eigenstates by using Shooting and Matching method over one-dimensional time-independent Schrodinger's wave equation for energy eigenstates.
- Solved second order differential equations computationally (Runge – Kutta method) to obtain solutions of Forced and Damped Oscillators.
- Calculator – programmed a scientific calculator using C that could compute the answer of given mixed expressions containing a wide range of mathematical operators and functions. Variables can be used for storage of answers. It also contained Matrix computation mode.

Computer Skills

- Python 3
- C/C++
- PARI/GP
- OpenCV
- SQL
- Solidworks and DWG Editor
- MATLAB
- Java
- MS Office
- Wolfram Alpha
- Linux based Operating System

Extra Academic Activity

- National Service Scheme (NSS), IIT Kharagpur, Unit – 12, Group Leader.
- My unit won Gold Medal in Annual NSS Camp 2016 under my leadership.
- In NSS we educate unprivileged students, maintain the village school, build village roads, conduct surveys to improve the standard of living of villagers, conduct cleanliness drives and spread awareness about important government policies.
- Acted in Technology Filmmaking and Photography Society's Fresher's production – "Kalaakar".