

# Sandesh Kalantre

IIT Bombay

34 , H4  
IIT Bombay, Mumbai- 400076  
✉ kalantresandesh@gmail.com  
📄 sandeshkalantre.github.io

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## Education

- 2014-2018 **Sophomore Undergraduate, B.Tech in Engineering Physics, IIT Bombay, CPI - 9.81/10.**  
Pursuing a minor in **Computer Science** and Honours in **Physics**
- 2012-2014 **Intermediate/+2, S. P. College, Pune,**  
Percentage – 94.31.  
Ranked 1<sup>st</sup> in the college among 800 students
- 2012 **Matriculation, Dyanmata High School, Amravati,**  
Percentage – 97.82.

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## Academic Achievements

- 2011 Awarded a **Gold Medal** at the 16<sup>th</sup> International Astronomy Olympiad, Almaty, Kazakhstan and **ranked 1<sup>st</sup>** among participants from 21 countries.
- 2012 Awarded a **Gold Medal** at the 6<sup>th</sup> International Olympiad on Astronomy and Astrophysics, Rio de Janeiro, Brazil and ranked 18<sup>th</sup> among participants from 28 countries.
- 2013 Awarded a **Silver Medal** at the 7<sup>th</sup> International Olympiad on Astronomy and Astrophysics, Volos, Greece.
- 2013 **Gold Medal** and certificate of Merit in Indian National Physics Olympiad(2013) for being among national top 35 out of  $\approx 10000$  students.
- 2014 Awarded an **AP** grade (given only to top 1%) for **exceptional performance** in *PH108 Quantum Physics and Application*, *CH107 Physical Chemistry*, *CS101 Computer Programming and Utilization* and *EE112 Introduction to Electronics* at IIT Bombay.
- 2010 **All India Rank 4** in 4<sup>th</sup> International Mathematical Olympiad organised by Science Olympiad Foundation(SOF).
- 2009 **All India Rank 5** in 12<sup>th</sup> National Science Olympiad organised by Science Olympiad Foundation(SOF).

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## Scholarships

- 2013 Kishore Vigyan Protsahan Yojana(**KVPY**) awarded by Department of Science and Technology, India for promotion of basic sciences among high school students to  $\approx 250$  students in the country.
- 2010 National Talent Search Scholarship(**NTSE**) awarded by the National Council for Educational Research and Training to  $\approx 1000$  students in the country
- 2011, 2012, 2013 Infosys Award for International Olympiad medalists by HBCSE in association with the Infosys Foundation and TIFR Endowment Fund.
- 2012 Amul Vidya Shree Award for excelling in Secondary School Certificate(SSC) Examination, 2012

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## Academic Projects

**Summer 2015 Quantum Computing and Information** - ongoing

**Prof. P. K. Panigrahi, IISER Kolkata**

- Examined the canonical quantum algorithms - Deutsch-Josza, Shor & Grover and studied their computational complexities.
- Worked on Counterfactual Cryptography using Noh's protocol for designing quantum digital signature schemes.
- Applied Grover's Search algorithm to search for the existence of an Eulerian circuit in a graph in  $\mathcal{O}(n^{1.5})$  time given the adjacency list representation.
- This project was supported under the National Initiative on Undergraduate Science (NIUS) Programme in Physics which is awarded to top 20 students in the country.

**Autumn 2014 NumCpp - mathematical library in C++**

**Prof. D. B. Pathak, IIT Bombay**

- Wrote a stack based parser using Dijkstra's shunting yard algorithm to parse function definitions as well as mathematical equations.
- Implemented routines for numerical integration using Riemann and Monte-Carlo methods over 1 and multiple dimensions, numerical differentiation and root finding of a function in a given interval.
- Wrote procedures for matrix operations and finding the Fast Fourier Transform(FFT) of an array of complex numbers.

**Autumn 2014 Pulsar Observatory for Students(POS)-2014**

**K. Krishnakumar, Radio Astronomy Centre, Ooty**

- Studied the operation of the Ooty Radio Telescope (ORT), a 530-metre (1,740 ft) long and 30-metre (98 ft) wide Cylindrical Paraboloid telescope.
- Collected raw time-series data for pulsars using the ORT and analysed using Numpy/Scipy (Python).
- The processed data was used to explore various properties such as the Dispersion Measure(DM), modulation index and pulse broadening due to interstellar scattering for various pulsars.
- The slides of the presentation I gave are available at [http://home.iitb.ac.in/~sandeshkalantre/presentations/sandesh\\_pos2014.pdf](http://home.iitb.ac.in/~sandeshkalantre/presentations/sandesh_pos2014.pdf)

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## Work Experience

**2015 IPhorum** - Mumbai

- Worked in a team of 2 in development of IPhorum - a browser based application for tasks such as voting, translation upload and feedback submission among *approx* 100 users.
- The application was used in the **International Physics Olympiad (IPhO) - Mumbai, 2015** for the aforementioned tasks among the 82 participating countries.
- Used *Node.js* as the server application and MongoDB as the primary database.

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## Position of Responsibility

**Autumn 2015 Teaching Assistant**

PH107 - Quantum Physics and Applications

- Mentoring a batch of  $\approx 40$  students in the course content and tutorial problems.
- Involved in evaluating assignments and exams.

**Summer 2015 Resource Person**

Indian National Astronomy Olympiad Programme - HBCSE-TIFR, Mumbai

- Involved in mentoring and evaluating students for selection to the International Olympiad in Astronomy and Astrophysics
- The team was awarded 3 Gold & 2 Silver Medals and the Best Team award. This was India's best result in 9 years.

**2015-2016 Convener**

## Maths and Physics Club, IIT Bombay

- Involved in generating problems and organisation of **Bazinga**, an annual quiz on Physics/Maths.
- Currently developing experiments in Physics to be demonstrated to students.

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## Courses

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|---------------|---|
| Physics       | Classical Mechanics*, Special Relativity*, Non-Linear Dynamics*, Quantum Physics and Applications, Electricity and Magnetism, Physics lab   |
| Mathematics   | Complex Analysis*, Calculus, Linear Algebra, Differential Equations   |
| Other Courses | Computer Networks*,Data Analysis and Interpretation*,Economics* ,Electronics Lab - I-II*,Computer Programmimg and Utilization, Physical Chemistry, Organic and Inorganic Chemistry, Chemistry Lab, Engineering Drawing, Mechanical Workshop, Biology, Introduction to Electronics |

(\* courses are will be completed by end of Autumn 2015)

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## Computer skills

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|-------------------|---|
| Programming       | C,C++,Python,Haskell,HTML,CSS,Javascript,Perl,bash                                    |
| Operating Systems | Linux,Mac OSX, Windows  |
| Software packages | L <sup>A</sup> T <sub>E</sub> X,NumPy,SciPy,matplotlib,gnuplot,Octave,Pelican,Node.js |

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## Extra-curricular activities

- Built a Kelvin Water Dropper and demonstrated build-up of a potential difference under Maths and Physics club, IIT Bombay.
- Secured 2<sup>nd</sup> position in the Bazinga Physics Quiz organised by Maths and Physics club, IIT Bombay.
- Associated with National Service Scheme, IIT Bombay under Educational Outreach program.
- Secured first prize in Debate competition held at Dynamata High School, Amravati, Maharashtra.
- Secured first place in Inter-School Geography Quiz.
- Participated in the *Personality Development Camp* organised at Bhonsala Military School, Nagpur, Maharashtra for two weeks.