

# Purnata Ghosal

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<b>Date of Birth</b>	2 <sup>nd</sup> May 1992	<b>Webpage</b>	<a href="http://www.cse.iitm.ac.in/~purnata/">http://www.cse.iitm.ac.in/~purnata/</a>
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## Personal Profile

I am a PhD Scholar at Indian Institute of Technology, Madras, currently in my sixth year. I am interested in Complexity Theory in general. During my PhD, I have worked in Algebraic Complexity Theory, the study of computational problems on polynomials. I have been passionate about research from the latter years of my undergraduate degree, because of which I pursued small projects in and outside my institute. Currently, I am looking forward to opportunities for working in academic research.

## Education

<b>2014-Now</b>	PhD in Computer Science - Indian Institute of Technology, Madras CGPA - 8.47/10
<b>2010-2014</b>	Bachelor of Engineering (Hons) - Indian Institute of Engineering, Science and Technology, Shibpur <i>Passed with 82.71% marks.</i>
<b>2008-2010</b>	High School Education (CBSE) - DAV Model School, Durgapur <i>Passed All-India Senior Secondary Certificate Examination with 95.8% marks.</i>

## Projects

<b>July 2014 - Present</b>	Indian Institute of Technology, Madras <i>PhD (Algebraic Complexity Theory)</i>  I am studying arithmetic circuits, which are models of computation for polynomials over a field. I am interested in identity testing of special classes of multilinear circuits, and showing lower bounds against classes of arithmetic circuits both in the classical sense and parameterized by degree of the polynomial. I recently submitted my PhD thesis titled <i>On Lower Bounds and PIT for Parameterized Algebraic Models</i> .
<b>Jul 2013 - May 2014</b>	Indian Institute of Engineering, Science and Technology, Shibpur <i>B.E Final Year Project</i>  Comparative study of the optimal nature of final solutions obtained by using a Genetic Algorithm on the outputs of four classifier algorithms (C4.5, CN2, RISE and PRISM) on a collection of datasets versus using a reward-punishment weight assignment on the candidate solutions.
<b>May - Jun 2013</b>	Indian Institute of Technology, Kharagpur <i>Summer Intern</i>  Implemented the adaptively improved Douglas-Peucker Algorithm for polygonal approximation of gray-scale images and compared the output with a Digital Geometric method for polygonal approximation on the same image set.

**Nov 2012-** Saha Institute of Nuclear Physics  
**Feb 2013** *Winter Intern*

I classified cosmic ray data into gamma and hadron particles using a phenomenological method (i.e properties of the particles). The data was interpreted using the ROOT Framework (a C/C++ interpreter based framework) and TMVA (Toolkit for Multi Variate Analysis) Framework was used for classification.

## Publications

- *On Constant Depth Circuits Parameterized by Degree: Identity Testing and Depth Reduction* by Purnata Ghosal, Om Prakash, B. V. Raghavendra Rao appeared in the proceedings of the International Computing and Combinatorics Conference (COCOON) 2017, pages 250-261.
- *On Proving Parameterized Size Lower Bounds for Multilinear Algebraic Models* by Purnata Ghosal, B. V. Raghavendra Rao appeared in the proceedings of the International Computing and Combinatorics Conference (COCOON) 2019, pages 178-192.
- *A note on parameterized polynomial identity testing using hitting set generators* by Purnata Ghosal, B. V. Raghavendra Rao appeared in Information Processing Letters, Volume 151.
- *On Lower Bounds and PIT for Parameterized Algebraic Models*, PhD Thesis by Purnata Ghosal (submitted for the completion of the MS-PhD Dual Degree Programme at IIT Madras).

## Talks

**Mar 2016** On Derandomizing Algorithms that Err Extremely Rarely  
*Authors: Oded Goldreich, Avi Wigderson*

Presented the paper as a Complexity Theory Meet (Cotmeet) seminar at IIT Madras.

**Aug 2017** On Constant Depth Circuits Parameterized by Degree: Identity Testing and Depth Reduction  
*Authors: Purnata Ghosal, Om Prakash, B. V. Raghavendra Rao*

Presented at the Computing and Combinatorics Conference (COCOON) 2017.

**Aug 2018** Separating Monotone VP and VNP  
*Author: Amir Yehudayoff*

Presented the paper as a Complexity Theory Meet (Cotmeet) seminar at IIT Madras.

**Jan, Mar 2019** Parameterized Lower Bounds on Multilinear Algebraic Models  
*Authors: Purnata Ghosal, B. V. Raghavendra Rao*

Presented as a Complexity Seminar at Saarland University and later at the Workshop on Algebraic Complexity Theory (WACT) 2019.

**Aug 2019** Lower Bounds for sums of powers of low degree univariates  
*Authors: Neeraj Kayal, Pascal Koiran, Timothée Pecatte, Chandan Saha*

Presented the paper as a Complexity Theory Meet (Cotmeet) seminar at IIT Madras.

## Coursework and Teaching

**Courses:** The following are courses that I took part in, at IIT Madras. Grades are on a scale of 10:

<i>Advanced Data Structures and Algorithms</i>	9
<i>Mathematical Concepts for Computer Science</i>	9
<i>Algorithmic Algebra</i>	9
<i>Advanced Theory of Computation</i>	7
<i>Advanced Complexity Theory</i>	8
<i>Modern Techniques in Theory of Computation</i>	8
<i>Advanced Algorithms</i>	8
<i>Probability and Computing</i>	9
I have also audited a course on <i>Representation Theory</i> .	

**Teaching:** I was a Teaching Assistant for the following courses:

*Computational Engineering*  
*Languages, Machines and Computation*  
*Fundamentals of Data Science*  
*Advanced Data Structures and Algorithms*  
*Pseudorandomness*  
*Logic and Combinatorics in Computer Science*  
*Randomized Algorithms*  
*Computability and Complexity*

## Software Skills and Other Achievements

### ■ Software

- Proficient in programming in *C, C++, Python 2.7, Java*
- *Oracle Certified Web Component Developer* (J2EE 5, JSTL 1.0, Struts Framework 1.2.9)
- *Comfortable with scripting in  $\text{\LaTeX}$ , Comfortable with Windows and Linux environments*

### ■ Scholastic Achievements

- *Recipient of National Talent Search Scholarship by qualifying NTS Examination conducted by NCERT, Government of India.*
- *Participated in an Oracle Certified JAVA (J2EE 5) Web Component Developing course conducted by NIIT and completed a web development project using Struts 1.2.9 framework, JSTL 1.0.*