# Purnata Ghosal

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| **Date of Birth** | $2^{nd}$ May 1992 | **Phone** | +91 9176489305 |
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## Personal Profile

I am a researcher working in theoretical computer science, more specifically Algebraic Complexity Theory. I completed my PhD degree from Indian Institute of Technology, Madras in July 2020, and am currently a Post-Doctoral Research Associate with Dr. Christian Ikenmeyer at the University of Liverpool. I am currently interested in learning and using Geometric Complexity Theory techniques to obtain new lower bounds on classes of polynomials.

## Education

**2020-Now**   Postdoc, Computer Science Department - University of Liverpool

Research Area - Geometric Complexity Theory

**2014-2020**   PhD in Computer Science - Indian Institute of Technology, Madras

Research Area - Algebraic Complexity Theory

**2010-2014**   B.E. (Hons) - Indian Institute of Engineering, Science and Technology, Shibpur

## Projects

**Nov 2020 - Present**   University of Liverpool
*Postdoc (Geometric Complexity Theory)*

GCT is an approach of solving long-standing open questions in Algebraic Complexity Theory using ideas from Algebraic Geometry and Representation Theory of polynomials. Our work is on problems concerning the class of arithmetic formulas, using the continuant polynomial, which can efficiently approximate the class.

**July 2014 - July 2020**   Indian Institute of Technology, Madras
*PhD (Algebraic Complexity Theory)*

I am studying arithmetic circuits, which are models of computation for polynomials over a field. I have explored 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 submitted my PhD thesis titled *On Lower Bounds and PIT for Parameterized Algebraic Models* in July 2020.

## Publications

- *Limitations of sums of bounded-read formulas* by Purnata Ghosal, B. V. Raghavendra Rao *to appear* in the proceedings of the International Computer Science Symposium in Russia (CSR), 2021.

- *On Proving Parameterized Size Lower Bounds for Multilinear Algebraic Models* by Purnata Ghosal, B. V. Raghavendra Rao appeared in Fundamenta Informaticae, Volume 177, pages 69-93.

- *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).

- *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 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.

- *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.

## Talks

**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.

**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.

## Teaching Assistantship

During my PhD, I was a Teaching Assistant for the following courses that include some amount of discrete mathematics, basic programming, automata theory and Turing machines, structural complexity, circuit complexity, communication complexity, and some other topics.

- Topics in Complexity Theory

- Computability and Complexity

- Pseudorandomness

- Logic and Combinatorics in Computer Science

- Randomized Algorithms

- Fundamentals of Data Science

- Advanced Data Structures and Algorithms

- Languages, Machines and Computation

- Computational Engineering