# Bishal Deb

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bishaldeb.com

## Research Interests

Algebraic, Bijective and Enumerative Combinatorics

## Education

***2019 - Present*** ◇ **PhD. in Mathematics, University College London (UCL), United Kingdom**
*Funded by Dean's Scholarship and Departmental Teaching Assistantship*
Supervisor: Prof. Alan D. Sokal

***2018 - 2019*** ◇ **Master 2 Informatique Fondamentale, Université Paris-Est Marne-la-Vallée (UPEM)*, France**
Résultat d'admission (Grade) 16.177/20
*Funded by LabEx Bezout M2 scholarship (2018-19)*
Thesis title: Combinatorics of Stammering Tableaux
Supervisors: Prof. Samuele Giraudo and
Prof. Matthieu Josuat-Vèrges

***2017 - 2018*** ◇ **First year of MSc. in Computer Science, Chennai Mathematical Institute (CMI), India.** CGPA 9.43/10
*Full scholarship from CMI*

***2014 - 2017*** ◇ **BSc. (Hons) in Mathematics and Computer Science, CMI.** CGPA 8.89/10
*Funded by INSPIRE SHE Scholarship, Government of India*

## Employment and Internships

***February 2022 - Present*** ◇ Data Engineer at Realm Inc., Part-time employee.

***May 2018 - July 2018*** ◇ Product Intern at Adobe Systems, Noida, India.
Project title: Topological Data Analysis
Supervisor: K. Balaji

***May 2017 - July 2017*** ◇ Product Intern at Adobe Systems, Noida.
Project title: Singular Learning Theory
Supervisor: K. Balaji

## Publications

### Journal Publications

[1] B. Deb; *Bijection between Increasing Binary Trees and Rook Placements on Double Staircases*; To Appear in Electronic Journal of Combinatorics. arXiv preprint: https://arxiv.org/abs/2112.04872

*now Université Gustave Eiffel

### Publications in Conference Proceedings

[2] X. Chen, B. Deb, A. Dyachenko, T. Gilmore, and A. D. Sokal; *Coefficientwise total positivity of some matrices defined by linear recurrences*; In Séminaire Lotharingien de Combinatoire 85B (2021), Proceedings of the 33rd International Conference on "Formal Power Series and Algebraic Combinatorics." URL: https://www.mat.univie.ac.at/ slc/wpapers/FPSAC2021/30.html

[3] A. Clifton, B. Deb, Y. Huang, S. Spiro, and S. Yoo; *Continuously Increasing Subsequences of Random Multiset Permutations*; In Séminaire Lotharingien de Combinatoire 86B (2022), Proceedings of the 34th International Conference on "Formal Power Series and Algebraic Combinatorics." URL: https://www.mat.univie.ac.at/ slc/wpapers/FPSAC2022/4.html

[4] B. Deb, A. Sarkar, N. Kumari, A. Rupela, P. Gupta, and Balaji K.; *Multimapper: Data Density Sensitive Topological Visualization*; IEEE International Conference on Data Mining Workshops (ICDMW), 2018. doi:10.1109/ICDMW.2018.00153

### Patents

[5] A. Rupela, P. Gupta, N. Kumari, B. Deb, Balaji K., and A. Sarkar; *Generating varied-scale topological visualizations of multi-dimensional data*; U.S. Patent 11,100,127, issued August 24, 2021. https://patents.google.com/patent/US11100127B2/en

### Unpublished/Work in Progress

[1] B. Deb, and A. D. Sokal; *Classical continued fractions for some multivariate polynomials generalizing the Genocchi and median Genocchi numbers*; In preparation; Draft available upon request.

[2] B. Deb; *Chromatic Polynomial and Heaps of Pieces*;
arXiv preprint: https://arxiv.org/abs/1902.02240

[3] X. Chen, B. Deb, A. Dyachenko, T. Gilmore, and A. D. Sokal; *Coefficientwise total positivity of some matrices defined by linear recurrences*; In progress.

[4] B. Deb, A. Dyachenko, M. Pétréolle, and A. D. Sokal; *Lattice paths and branched continued fractions III. Generalizations of the Laguerre, rook and Lah polynomials*; In preparation.

[5] B. Deb, A. Dyachenko, and A. D. Sokal; *Total positivity beyond production matrices: Experiments on the generic Lah polynomials*; In progress.

[6] B. Deb, and A. D. Sokal; *Second Order Stirling Cycle Polynomials and Total Positivity*; In progress.

## Talks and posters

### Conference Presentations

- *Continuously Increasing Subsequences of Random Multiset Permutations*, (July 18, 2022) poster presentation at 34th International Conference on Formal Power Series & Algebraic Combinatorics, Indian Institute of Science, Bangalore, India.
- *Multivariate continued fractions associated to Genocchi and median Genocchi numbers*, (June 9, 2022) at Heilbronn Meeting on Positivity Problems Associated to Permutation Patterns, Lancaster University, UK.
- *Combinatorics of continued fractions in the realm of permutations and Genocchi numbers*, (March 26, 2022) at Graduate Students Combinatorics Conference 2022

- *Total positivity of the Eulerian triangle: A big generalisation of Brenti's conjecture*,
  - (July 16th, 2021) British Early Career Mathematicians' Colloquium 2021,
  - (June 8th, 2021) at Young Researchers in Mathematics 2021,
  - (April 24th, 2021) at Graduate Students Combinatorics Conference 2021.

**Seminar Presentations**

**2022**:

- *Combinatorics and total positivity*, (August 23rd, 2022) Chennai Mathematical Institute, Chennai, India. (Invited)
- *Continued fractions and combinatorial sequences: factorials, Genocchi and median Genocchi numbers*, (August 17th, 2022) Institute of Mathematical Sciences, Chennai, India. (Invited)
- *Combinatorics of continued fractions in the realm of permutations and Genocchi numbers*, (April 20, 2022) at Graduate Online Combinatorics Colloquium. (Invited)
- *Combinatorial Hodge Theory*, (March 9, 2022) at UCL-LSE combinatorics reading group.

**2021**:

- *Analysing a strategy for a card guessing game via continuously increasing subsequences in multiset permutations*,
  - (November 18th, 2021) at Algebra, Representations, Combinatorics and Symmetric functions in India (ARCSIN).
  - (November 15th, 2021) at UCL Combinatorics Seminar series.

**2020**:

- *Total Positivity during Distressing Times*, (November 17, 2020) at Postgraduate Student Seminar Series, Department of Mathematics, UCL.
- *Combinatorics of Stammering Tableaux*, (July 31, 2022) at Online Weekly Research Seminar for Early Career Mathematicians from India. (Invited)

**2019**:

- *A Mathematical Pursuit of Happiness*, (September 14, 2019) outreach talk to mathematics undergraduates at Digboi College, Assam, India.
- *Chromatic Polynomials and Heaps of Pieces*, (May 20, 2019) at GT Combinatoire Énumérative et Algébrique, Laboratoire Bordelais de Recherche En Informatique, Université de Bordeaux, France. (Invited)

**2017**:

- *Chromatic Polynomials and Heaps of Pieces*, (March 14, 2017) at Institute of Mathematical Sciences, Chennai.

## Conferences/Workshops Attended

**In-person**

- Formal Power Series and Algebraic Combinatorics 2022, Indian Institute of Science, Bangalore, India.
- Algorithmic and Enumerative Combinatorics 2022, Technical University of Vienna, Austria.

- Early Career Researchers in Mathematics 2022, UCL, UK.
- Heilbronn Meeting on Positivity Problems Associated to Permutation Patterns, 2022, Lancaster University, UK.
- Göran Gustafsson Symposium 2022, Institut Mittag-Leffler, Sweden.
- Summer School on Geometric and Algebraic Combinatorics, 2019, Sorbonne Université at Jussieu, France.

**Online**

2021-22

- Graduate Student Combinatorics Conference 2022

2020-21

- Lattice Paths, Combinatorics and Interactions
- Permutation Patterns 2021
- Graduate Student Combinatorics Conference 2021
- Formal Power Series and Algebraic Combinatorics
- AlCoVE: an Algebraic Combinatorics Virtual Expedition
- Young Researchers in Mathematics 2021
- British Early Career Mathematicians Colloquium 2021

2019-20

- Algebraic Combinatorics Online Workshop (ACOW)
- AlCoVE: an Algebraic Combinatorics Virtual Expedition
- Formal Power Series and Algebraic Combinatorics 2020

## Teaching Experience

- **Modules Tutored at UCL** – Analysis 1 and 2 (MATH0003 and MATH0004), Algebra 1 and 2 (MATH0005 and MATH0006), Further Linear Algebra (MATH0014), Mathematical Methods 3 (MATH0016).
- **Moderating Experience at UCL** – Online problem sessions for MATH0016.
- **Marking experience at UCL** – MATH0005, MATH0016, Combinatorial Optimisation (MATH0028), An Introduction to Mathematica (MATH0032), Computational Methods (MATH0058).
- Developer for UCL's STACK (System for Teaching and Assessment using a Computer algebra Kernel) question bank.
- **Marking experience at CMI** – Topics in Combinatorics (Spring 2018).

## Skills

- **Programming Languages** - `Haskell, Java, Mathematica, Python, Sage, SQL`
- **Typesetting Languages** - LaTeX
- **Web designing** - *HTML, CSS*
- **Languages** : English (Fluent), Bengali (Native tongue), Hindi (Working proficiency), Assamese (Can read and speak).

## Other Professional Roles and Activities

- Organiser of ECRM 2022, an in-person conference for mathematics PhD students in UK organised by PhD students from Department of Mathematics, UCL.
- Reviewer for Annals of Combinatorics, Electronic Journal of Combinatorics.
- Research Student Representative at Department of Mathematics, UCL (September 2020 - May 2022).
- Editor of Gonit Sora, a bilingual web magazine.
- Organised a successful series of webinars (since June 2020) on behalf of Gonit Sora (Gonit Sora webinar page).
- Volunteered at London Mathematics Outreach.
- Joint Event Co-ordinator of Tessellate 2018, the academic and cultural festival of CMI.
- Organiser of Student Talks at CMI (2017-2018).
- Visharad (Graduate) in Tabla (Indian Percussion Instrument) from Bhatkhande Sangit Vidyapith, Lucknow, India. Senior Diploma in Art & Craft from Society of Art and Craft, West Bengal, India. Vocal music student at Darbar Academy (2021 - Present).

## Achievements

- Mayer de Rothschild Studentship (2021-2022) at Department of Mathematics, UCL.
- Davenport Prize in Pure Mathematics (2020-2021) for best PhD student in Pure Mathematics for work done in the first year of research at Department of Mathematics, UCL.
- One of seven international students selected for LabEx Bezout M2 scholarship (2018-19).
- Recipient of INSPIRE SHE scholarship for being in the top 1% of Assam State board in class 12 exams.

*Last updated on November 24, 2022.*