Gauranga Kumar Baishya

LinkedIn — Email — Phone: +91 7086090441 — GitHub — Website —
Guwahati, Assam

Education

Grade 10 — May 2016
Shrimanta Shankar Academy — *CGPA: 10/10*

High School, Grade 12 | ***Concentration: Mathematics, Physics, Chemistry, CS*** — Aug. 2017 – May 2019
Shrimanta Shankar Academy — *CGPA: 8.76/10*

B.Sc. | ***Mathematics*** — Aug. 2019- Dec 2022
Tezpur University — *CGPA: 8.02/10*

M.Sc. | ***Mathematics (dropped out)*** — 2022- 2023
Indian Institute of Technology Kharagpur — CGPA: 8.75/10

M.Sc. | ***Data Science*** — 2023- present
Chennai Mathematical Institute — *CGPA: 8.08/10*

Public Talks & expository Research Papers presented

Public Talk on the Life and Work of John Von Neumann — Fall 2023
A talk for school kids on the occasion of National Math Day (22nd Dec) — slides

Mathematics Olympiad Training Workshop/Camp — Autumn 2023
A public talk arranged for state-level math olympiad winners — 37th Annual Congress of AAM

Combinatorial proofs of two Euler type identities due to Andrews — Spring 2021
Cristina Ballantine, Richard Bielak
For Pdf, click here — For video, click here

The nil radical of a ring as an intersection of all the prime ideals of the ring — Spring 2021
Gauranga Kumar Baishya, Dr. Wade Bloomquist
Poster & Presentation Slides — For video, click here

The Gabriel's Horn Paradox — Spring 2021
The Presentation Nights, The Polymath Jr. REU
For Pdf, click here — For video, click here

End of program Presentation — Spring 2021
The Polymath Jr. REU — For video, click here

Catalan Numbers — Spring 2021
A Public Talk — For slides, click here

Generating Function for Bell Numbers — Spring 2021
A Public Talk — For slides, click here

Recommendations

Kaustav Kashyap Das, California Institute of Technology — Recommendation in LinkedIn.

Michael Kuhn, Software Engineer II - AppFolio — Recommendation in LinkedIn.

Dr. Henrique Camara, Harvard Medical School — Recommendation in LinkedIn.

Srijit Mukherjee, Penn State University — Recommendation in LinkedIn.

RESEARCH INTERNSHIP & PROJECTS

Summer Internship | **Harvard University, US (On Site)** May 2024 - July 2024
Harvard University, US Supervisor: Prof. Yu-Hua Tseng

- Deconvolution Analysis: Improved accuracy over an existing deconvolution tool, using a W-NNLS regression model to integrate single-cell RNA-seq data across multiple subjects, estimating cell type proportions in bulk RNA-seq while accounting for gene expression variability and cross-subject differences.

Project | ***Normalized Cuts and Image Segmentation*** August 2023 - November 2023
Applied Linear Algebra project, Chennai Mathematical Institute (CMI) Supervisor: Dr. Priyavrat Deshpande

- Implemented graph-based image segmentation using normalized cuts (Shi and Malik), optimized via a generalized eigenvalue problem and spectral clustering. Efficiently segmented large-scale images by minimizing intra-group similarity and maximizing inter-group dissimilarity. Report

Project | ***Visualisation using R*** | ***Global Suicides (1985-2015) Dashboard*** August 2023 - November 2023
Institute of Mathematical Sciences, Chennai Shiny App link: Dashboard

- Developed a dashboard that provide some general insight on the delicate matter of suicides all over the world based on a dataset with data that range from 1985 to 2015 for every country accounting for sex, age and economic variables such as per capita GDP.

Project | ***Computational Genomics*** | ***Multimodal Single-Cell Integration*** April 2023 - October 2023
Institute of Mathematical Sciences, Chennai Supervisor: Dr. Sandeep Choubey

- The goal of the project is to predict how DNA, RNA, and protein measurements co-vary in single cells as bone marrow stem cells develop into more mature blood cells. I am trying to develop a model trained on a subset of a 300,000-cell time course dataset of CD34+ hematopoietic stem and progenitor cells (HSPC) from four human donors at five time points generated for this competition by Cellarity, a cell-centric drug creation company.

Reading internship | ***Theory Of Computation*** | ***CS*** December 2022
IIT Kharagpur Supervisor: Dr. Bodhayan Roy

- Studied Time and Space complexity, intractability and advanced topics which includes approximation algorithms, probabilistic algorithms, Alternation, Interactive proof systems, Parallel Computation and a bit of cryptography.

Reading Internship | ***Analytic & Algebraic Number Theory*** Summer 2021
For certificate, click here Supervisor: Prof. Anupam Saikia, IIT Guwahati

- Did a rigorous reading and discussion of the book "A Classical Introduction to Modern Number Theory" by Ireland and Rosen.

Research in Computer Science | ***Combinatorics and CS*** Summer 2021
Polymath Jr. REU Supervisor: Dr. Pat Devlin, Yale, US

- Did a research on the following problem: Suppose we pick positive integers n and k such that $n > k > 1$. The goal is to write down as many distinct permutations of Sym_n, the symmetric group of order n with the constraint that any two permutations that we pick must have a common subsequence of length at least k. What's the most number of permutations we could choose subject to this constraint?
- Did a reading of the book Erdős–Ko–Rado Theorems: Algebraic Approaches which describes the extremal combinatorics behind the research problem
- Presented a group talk titled "The Erdős Ko Rado group". Presentation link.

Use of Generating functions in Discrete Mathematics & CS | ***Combinatorics, CS*** Spring 2021
Cardiff University, Wales, UK Supervisor: Dr. Manjil Saikia

- Did a reading internship of the whole book, generatingfunctionology which studies some of the things like finding an exact formula for the members of a sequence, finding a recurrence formula, finding averages and other statistical properties of a sequence, finding an asymptotic formula for a sequence, proving unimodality, convexity etc and proving beautiful identities.

Study of Knot Theory and Abstract Algebra | ***Mathematics*** Fall 2020

Georgia Institute Of Technology, Atlanta, US Supervisor: Dr. Wade Bloomquist

- Did a reading internship Of Ring Theory; (Introduction to rings, Euclidean domains, Principal ideal domains, Unique factorisation domains and Polynomial Rings); Field Theory(Basic Theory of field extensions, Algebraic extensions, separable and inseparable extensions & cyclotomic polynomials and extensions.
- Did a reading internship of The Knot Book which describes the mathematical Theory of Knots.
- Prepared a small semester project titled "The nil radical of a ring as an intersection of all prime ideals.Poster & Presentation Slides.

Study of Representation Theory in the Symmetric Group | ***Mathematics*** Fall 2020

Cardiff University, Wales, UK Supervisor: Dr. Manjil Saikia

- Did a reading internship of the book, The Symmetric Book which studies group representations; matrix representations, G-modules and group algebra, complete reducibility and Maschke's theorem, G-homomorphisms and Schur's lemma, commutant and endomorphism algebras, group characters, inner products of characters, tensor products and restricted & induced representations.

Study of Partitions of numbers using Combinatorial techniques | ***Combinatorics*** Fall 2020

IIT-Delhi, India Supervisor: Dr. Biplab Basak

- Did a detailed study of the following: Let a(n) be the number of partitions of n such that the set of even parts has exactly one element, b(n) be the difference between the number of parts in all odd partitions of n and the number of parts in all distinct partitions of n, and c(n) be the number of partitions of n in which exactly one part is repeated. Beck conjectured that a(n) = b(n) and Andrews, using generating functions, proved that a(n) = b(n) = c(n), A combinatorial proof of Andrew's result, it relies on bijections between a set and a multiset, where the partitions in the multiset are decorated with bit strings. Certificate.

My published articles/write-ups

1) A very short anthology of some beautiful numbers, mathematical terms and expressions [PDF]
(It got published in the Gonitsora web magazine)

2) Catalan numbers and Dyck paths [PDF]

3) Two advanced tests of convergence [PDF]

Mathematics, Data Science & programming courses studied

Mathematics: Analytical & Elementary Number Theory, Analytic & Differential Geometry, Topology (A first course), Abstract Algebra (Group Theory, Ring Theory and Field Theory), Numerical Methods, Analysis (Real Analysis(I & II), Complex Analysis(I and II)), Discrete Mathematics (including Graph Theory), Logic and Foundations in Mathematics, Ordinary & Partial Differential Equations, Linear Algebra, Non Linear Optimization methods, Integral Equations and Variational Methods, Special Functions and Integral Transform.

Computer Science & Programming: C, C++, Python, Algorithm Design Techniques, Design and Analysis of Algorithms using Python and C++, Competitive Programming, Relational Database Management Systems using SQL

Data Science: Linear Algebra and its Applications, Data Mining and Machine Learning, Deep Learning, Big Data and Distributed Computing using Hadoop, Visualisation using R, Natural Language Processing, Regression and Classification

Statistics for Data Analysis: Advanced Probability Theory, Statistical Inference using R **(**Distributions, Joint Distributions, Expected values and moment generating functions, Limit Theorems, Distributions derived from normal distributions, Survey Sampling, Estimation of parameters and Fitting of Probability Distributions, Hypotheses Testing, Comparing two samples, Analysis of variance and categorical data**)**

Conferences, Seminars & Webinars Attended

International Webinar titled "Galois groups of random integer polynomials" Spring 2021
Prof. Manjul Bhargava, Princeton University

International Webinar titled "Mathematics of the football" Spring 2021
Prof. Fernando R. Villegas, ICTP Trieste, Italy

International Webinar (held via Zoom) titled "A brief history of Hecke operators" Spring 2021
Prof. Akshay Venkatesh, fields medalist, Institute for Advanced Study, Princeton

International Webinar titled "The Riemann Hypothesis and why it is important" Spring 2021
Prof. Ken Ono, Thomas Jefferson Professor of Mathematics, University of Virginia

International Webinar titled "Ramanujan Graphs and the Matrix Completion" Spring 2021
Prof. Mathukumalli Vidyasagar, FRS ; SERB National Science Chair and Professor, IIT Hyderabad

International Webinar titled "The Geometry of a Robotic Arm in a Tunnel" Fall 2020
Dr. Cesar Ceballos, Technical University of Graz, Austria

International Conference In Number Theory and Discrete Mathematics Fall 2020
American Mathematical Society

International Conference In Cyber Security and Privacy Fall 2020
American Mathematical Society

International Conference In Special Functions and Applications Fall 2020
BBD University, Lucknow, India

International webinar in 1 & 2 dimentional holes in spaces Fall 2020
Prof. Matthias Kreck, University Of Bonn, Germany

National Webinar on lengths of curves and Area of Figures Spring 2020
Prof. Rajeeva L. Karandikar, Ex director, Chennai Mathematical Institute (CMI), India

National Webinar on The Congruent Number Problem & Elliptic Curves Spring 2020
Prof. Anupam Saikia, Indian Institute Of Technology (IIT), Guwahati, India

International Webinar on Fermat's Last Theorem & a failure of Unique Factorization Spring 2020
Dept. of Mathematics, IQAC Lumding College, India

International Webinar on an Introduction to Algebraic Geometry Spring 2020
Dr. Tarig Abdelgadir, Loughborough University, UK

Honors, Fellowships and Awards

Selected in the prestigious Khorana Scholars Program March 2024
For link to the official site, click here.

Secured an All Indian rank (AIR-89) in IIT-JAM in mathematics March 2022
Scorecard

Selected in Mathematics Training and Talent Search Programme (MTTS) June–July 2021
Funded by NBHM, MTTS is the most popular national undergraduate/graduate training programme in Mathematics running in India. For link to the official site, click here.

Madhava Mathematical Competition Jan-2020
Special Recognition for securing Rank 1 in the entire North East Region, India.

JNCASR Summer Research Fellowship June 2020
A Highly Honoured Merit based grant for students pursuing education in STEM fields.

An accomplishment in Quora fall 2020–present
My space in Quora earned 50k followers that discusses neuroscience & psychology

Best Academian Award May 2017
A Trophy for excellence in academics during my high School education.

Qualified NTSE (National Talent Search Examination) Scholarship. 2017
Merit based scholarship.

Indian National Mathematics Olympiad (INMO) 2016
Among the top candidates in India, scoring appreciable marks in the Nationals.

Regional Mathematics Olympiad (RMO) 2012-2017
Qualified 5 times to the National Round.

Mathletics Competition 2012-2016
Qualified 6 times to the State Merit List and secured State Rank 1 and 2 once.

State Math Olympiad 2012-2016
Qualified it each time I appeared, into the State Merit List and secured State Rank 1 once.

State Chemistry Olympiad 2016
Qualified it 4 times, into the State Merit List (top 5), and secured State Rank 1 once.

IASST National Science Day Quiz 2016
Won State rank 2 representing my school; prize distributed by Padma Shri awardee, Jadav Payeng.

School Math Topper Award 2013
Secured School Rank 1 in International Mathematics Olympiad conducted by Science Olympiad Foundation.

Intra school and Inter school Quizzes 2012-2016
Participated and won many Co-Curricular Activity (CCA) Quiz competitions.

WORKSHOPS AND SUMMER SCHOOLS ATTENDED

AI and Machine Learning Summer School September 2023
Cambridge Centre for AI in medicine exhibition

- The CCAIM summer school in AI and ML in healthcare provided me with advanced insights into the application of sophisticated algorithms, enhancing my understanding of their intricate implementations and transformative impact in medical and healthcare research.

Applications of Machine Learning Techniques in Biology using Weka September 2022
Supervisor: Prof. M.M.Gromiha, IIT Madras Certificate, click here

- Learned bio-informatics, protein structure and function, protein interactions: computational techniques and handling computational biology lab. Used these knowledge to implement Machine Learning Techniques to understand protein structure and function, mutational analysis better.

Mathematics Training and Talent Search Programme (MTTS)-2021 12 June–4 July 2021
For link to the official site, click here India

- Took advanced courses in Logic & Foundations of mathematics, Real Analysis, Linear Algebra, Geometry (curve tracing, sketching of surfaces, classification of quadric surfaces), Discrete Probability, Combinatorics and Elementary Number theory.

Lecture series on "Random Continued Fractions: A Markov Chain approach" April–May 2019
Prof. Alok Goswami, Indian Statistical Institute Kolkata, India

- Attended lectures on Markov Chains and processes and learned about Gauss Dynamical systems.
- Lectured on Advanced probability Theory and Graph Theory: Through Erdős Probabilistic solutions and random continued fractions.

Workshop on Mathematics Olympiad 2017
Conducted by NBHM Assam, India

- Attended lecture series and problem solving sessions by the resource persons B.J.Venkatachala, Professor Of Mathematics, IISC Bangalore and national co-ordinator, Indian National Mathematics Olympiad (INMO), C.R. Pranesachar, professor HBCSE-TIFR, Prithwijit Dey (once deputy leader, Indian IMO team) and M.B.Rege, Regional Co- ordinator of Indian National Olympiads and Professor, dept of mathematics, NEHU.
- Attended various basic & advanced lectures on several topics of Number Theory, Geometry and Trigonometry, Combinatorics and Algebra.

Workshop on Physics and Astronomy, Biochemistry, Robotics and Electronics 2015, 2016
Regional Science Centre Guwahati, Assam

- Attended lecture series and experimental sessions by Various professors from different universities on Robotics, Electronics, Physics and Astronomy and Biochemistry.

Workshop on Mathematics Olympiad Training conducted by NBHM 2014
Gauhati University Guwahati, Assam

- Attended lecture series and problem-solving sessions by various professors from IITs & Guwahati University
- Attended various basic & advanced lectures on several topics of Number Theory, Geometry and Trigonometry, Combinatorics and Algebra.

Involvement In Social Work

NSS

Tutored local underprivileged students in science and mathematics, a part of National Social Service(NSS).

Gonitsora

Presented papers and have been a constant in the weekly webinars of Gonitsora. Gonit Sora is a multi-lingual web magazine devoted to publishing well-written and original articles related to science and technology in general and mathematics in particular.

InnovateHer/ Mathematical Enrichment Programme (Online Maths Training)

I established an initiative called "InnovateHer," with a primary focus on promoting and popularizing mathematics education in the underserved areas of Assam and particularly among high school girls in the state through an another program named *Mathematical Enrichment Programme*, an initiative by AAM