Subhadip Chowdhury

Mathematics and Computational Sciences Department
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Academic Appointments

2020-Present **Visiting Assistant Professor**
The College of Wooster, USA

2018-2020 **Visiting Assistant Professor**
Bowdoin College, USA

Education

2012-2018 **Ph.D. in Mathematics**, *The University of Chicago, USA*
- **Advisor** - Danny Calegari
- **Dissertation Title** - Self-similarity of Ziggurat Fringes and Rigidity of Extremal Free Group Actions on the Circle

2014 **M.S. in Mathematics**, *The University of Chicago, USA*
- **Topic Proposal** - Stable Commutator Length and Quasimorphisms

2009-2012 **Bachelor of Mathematics with Honours**, *Indian Statistical Institute, Bangalore Centre, India*
- First Division with Distinction

Teaching Experience

2020-Present **Instructor of Record**, *College of Wooster*
- Introduction to Topology, Math 330 (Fall 2021)
- Numerical Analysis, Math 327 (Spring 2022)
- Chaotic Dynamical Systems, Math 299 (Spring 2023)
- Teaching Apprenticeship, IDPT 398 (Spring 2022)
- Putnam Seminar, Math 27901 (Fall 2021, Fall 2022)
- Differential Equations, Math 221 (Fall 2020)
- Transition to Advanced Mathematics, Math 215 (Spring 2021, Fall 2021, Fall 2022)
- Multivariate Calculus, Math 212 (Spring 2022, Fall 2022)
- Mathematical Foundations of Computing, Math 130 (Spring 2022, Spring 2023)
- Theory of Integral Calculus, Math 125 (Fall 2022, half-semester)
- Theory of Differential Calculus, Math 115 (Fall 2021, half-semester)
- Calculus and Analytic Geometry II, Math 112 (Spring 2021)
- Calculus and Analytic Geometry I, Math 111 (Fall 2020)

2018-2020 **Instructor of Record**, *Bowdoin College*
- Ordinary Differential Equations, Math 2208 (Fall 2019, Spring 2020)
- Linear Algebra, Math 2000 (Spring 2019)
- Multivariable Calculus, Math 1800 (Fall 2018, Spring 2019, Fall 2019, Spring 2020),
- Differential Calculus, Math 1600 (Fall 2018)

Summer 2018 **Mathematics Instructor, Chicago Academic Achievement Program**, *University of Chicago College*
- Proof-Based Methods in Mathematics

2014-2018 **Instructor of Record**, *University of Chicago*
- Mathematical Methods for Social Sciences, Math 195 (Winter 2018, Fall 2017)
- Linear Algebra, Math 196 (Summer 2017),
- Calculus III, Math 153, (Winter 2017, Winter 2016, Spring 2015)
- Calculus II, Math 152 (Fall 2016, Fall 2015, Winter 2015),
- Calculus I, Math 151 (Fall 2014)
- Elementary Functions and Calculus III, Math 133 (Spring 2016)

2013-2014 **College Fellow**, *University of Chicago*
- Teaching Assistant for Honors Calculus I-III, Math 161-163 taught by Eugenia Cheng

2013-2017 **Grader for First year graduate courses**, *University of Chicago*
- Riemannian Geometry taught by André Neves (Spring 2017)
- Differential Topology taught by Danny Calegari (Winter 2016)
- Differential Geometry taught by Sidney Webster (Winter 2015)
- Algebraic Topology taught by Danny Calegari (Fall 2013)

Mentoring Experience

2021-2023 **Primary Advisor for Senior Independent Study** (Bachelor's Thesis), *College of Wooster*
- Sabrina Helck - *The Infinity Conundrum: Understanding Topics in Set Theory and the Continuum Hypothesis*.
- Molly Hutter - *In Hot Water! Using Numerical Analysis to show the Effects of Climate Change on the Great Lakes*.
- Lucy Wickham - *Tiling Invariants*
- Michael Curran - *Curvature, Hyperbolic Space, and Hilbert's theorem*
- Ussama Mustafa - *Illustrated Story Book Generator*, jointly with the CS department

Summer 2021, 2022 **Supervisor for Applied Methods and Research Experience**, *College of Wooster*

- **Summer '22**: Funded by Goodyear Tire and Rubber Company - Innovation Technology division, students were tasked with creating a comprehensive analysis application for their non-pneumatic tires using Python, converting multi-program routines involving complex data structures and cutting-edge numerical methods, into one standardized workflow.
  Supervisees: Ussama Mustafa, Praneel Panchigar, Kevin Yuan
- **Summer '21**: A client-funded research project, where students were tasked with understanding trends in customer behavior at a regional grocery store chain, analyzing halo effects, and coming up with creative targeted programs to increase sales using customer segmentation techniques.
  Supervisees: Abigail Breitenbucher, Luke Pritchard, Maya Vasta, Kweku Yamoah

Summer 2021 **Guide for International Students in STEM**, *College of Wooster*

Spring 2019 **Mentor for Intermediate Independent Study**, *Bowdoin College*
- Theo de Quillacq - *Machine Learning*, Arav Agarwal - *Group Theory*

2021-2023 **Primary Faculty Advisor, The Student Mathematical Association of America Club**, *College of Wooster*
- Student organization promoting opportunities for community development within the mathematics department and for increasing mathematics awareness on and around campus

2018-2020 **Co-organizer, Problem Solving Session**, *Bowdoin College*
- Training undergraduates in problem solving strategies for *Putnam Competition*

2019-2020 **Co-organizer, Student of Color Study Group**, *Bowdoin College*
- Weekly study group for underrepresented students in Math, CS and Physics

2014, 2016 **Mentor for Research Experience for Undergraduates**, *University of Chicago*
- Advised expository and research papers written by undergraduate students
- Summer 2016 - *Scissors congruence* (M. C. Welsh), *Rationality of zeta functions over finite fields* (S. Park), *Canonical energy and black hole stability* (E. Hsiao)
- Summer 2014 - *An introduction to knot theory and the knot group* (L Linov), *The Jordan-Chevalley decomposition* (J. H. Yoo)

2014-2016 **Directed Reading Program Mentor**, *University of Chicago*
- Met weekly with undergraduate students to guide mathematics reading projects
- Winter 2016 - *Topology* (Dan Su)
- Fall 2015 - *The Dynamics of Circle Homeomorphisms* (Wenyu Chen)
- Spring 2014 - *Discrete Group actions on Topological Spaces* (Weston Ungemach)

2014-2016 **WOMP Mentor**, *University of Chicago*
- Warm-up program organized and run by advanced graduate students for incoming grads in the math department

2010-2011 **Instructor in Regional Mathematical Olympiad and National Mathematical Olympiad Training Camp**
- in Kolkata, West Bengal and Bangalore, Karnataka, India

Research Interests

Low dimensional dynamics and topology, specifically nonabelian group actions on the circle. Application of algebraic topology to formal language theory. Related topics in complex dynamics and big mapping class groups.

Publications and Preprints

- **Ziggurat fringes are self-similar.** *Ergodic Theory and Dynamical Systems*, doi:10.1017/etds.2015.75

  In this paper, we give explicit formulae for fringe lengths of the Calegari-Walker Ziggurats – i.e. graphs of extremal rotation numbers associated to positive words in free groups. These formulae reveal (partial) integral projective self-similarity in ziggurat fringes, which are low-dimensional projections of characteristic polyhedra on the bounded cohomology of free groups. This explains phenomena observed experimentally by Gordenko and Calegari-Walker.

- **A Topological proof that O_2 is 2-MCFL.** arxiv.org/abs/1710.04597

  In this paper, we give a new proof of Salvati's theorem that the group language O_2 is 2 multiple context free using homology theory. Unlike Salvati's proof, our arguments do not use any idea specific to two-dimensions. This raises the possibility that the argument might generalize to O_n.

Other Professional Service

Spring 2021 | **Math Curriculum Review and Restructure**, *College of Wooster*
- Helped subdivide gateway courses to fine tune student placement and increase accessibility
- created new MCQ question bank for placement tests

2015-2018 | Led a team of graduate students to place incoming Freshmen students via the **University of Chicago College Calculus Accreditation Exam** under supervision of Jitka Stehnova and John Boller
Duties included -
- Creating a MCQ question bank (2018)
- Grading subjective answers
- Designing sorting criteria and algorithm
- Processing large data sets using Excel and Python

2019 | **Judge, MAA Undergraduate Poster Session**, *JMM 2019*, Baltimore, MD

2015 | **Judge, QED Young Math Symposium**, *Math Circles of Chicago*
- Chicago's only youth math symposium

2014 | **Organizer & Moderator, AWM Postdoc Panel**, *University of Chicago*
- Regarding application process, job market etc.

2014-2018 | Webmaster and active member of the UChicago chapter of *Association for Women in Mathematics*

2014-2019 | Member of the American Mathematical Society

Invited Talks

March 2022	*Joint Mathematical Meetings - Project NExT session on Re-Imagining Grading: The Whys and Hows*, virtual, USA
Jan 2022	*Ohio Speaker's Circuit*, Kenyon College, OH, USA
Jan 2021	*Joint Mathematical Meetings - AMS Special Session on Quantization for Probability Distributions and Dynamical Systems*, Virtual, USA
Mar 2019	*Bowdoin College Department Seminar*, Bowdoin College, Brunswick, ME, USA
Apr 2018	*American Mathematical Society Spring Southeastern Sectional Meeting* , Vanderbilt University, Nashville, TN, USA
Jan 2018	*Joint Mathematical Meetings - AMS Special Session on Dynamical Systems: Smooth, Symbolic, and Measurable*, San Diego, California, USA
Sep 2017	*American Mathematical Society Fall Eastern Sectional Meeting - Special Session on Geometric Group Theory*, SUNY, Buffalo, USA
Dec 2016	*Canadian Mathematical Society Winter Meeting - Session on Geometric Group Theory and Topology in Low Dimensions*, ON, Canada

Expository Talks in Student Seminars

Feb 2020	*Rotation Number and Dynamics on the Circle*, Invited Talk, The College of Wooster
Oct 2019	*Scissor's Congruence and Hilbert's 3rd Problem*, Student Seminar, Bowdoin College
Nov 2018	*The Illumination Problem and Rational Billiards*, Student Seminar, Bowdoin College
Apr 2018	*Rotation Number and Dynamics on the Circle*, Invited Talk, Bowdoin College
Apr 2018	*Explorations in Circle Packings*, Pizza Seminar, University of Chicago
Apr 2017	*Hilberts 3rd Problem and the Dehn Invariant*, Pizza Seminar, University of Chicago
Dec 2015	*Combinatorics of chessboard puzzles about domination, independence and tours*, Pizza Seminar, University of Chicago
Nov 2013	*Cut-Copy-Paste - Algebra and Tiling*, Pizza Seminar, University of Chicago
Feb 2013	*Stable Commutator Length*, Farb and Friends Student Seminar, University of Chicago

Awards and Scholarships

2012-2013	**McCormick Fellowship**, University of Chicago Awarded by the Admissions Committee to a small number of highly rated applicants to the Ph.D. program of the Department of Mathematics, for an amount of $9000 over two years.
2012	**S.H. Aravind Gold Medal**, Indian Statistical Institute Awarded for outstanding performance in B. Math, to the student with highest CGPA in the program.
2011	**Summer Reaserch Fellowship**, Indian Academy of Science

2009	**Bronze medal, 50th International Mathematical Olympiad**, Germany
2009	**National Board of Higher Mathematics scholarship**, Department of Atomic Energy, Government of India
2008	**Kishore Vaigyanik Protsahan Yojana fellowship**, Department of Science and Technology, Government of India
2007	**National Talent Search Examination scholarship**, National Council of Education Research and Training, India

Skills and Languages

Technical	C, Python, Haskell, Mathematica, Octave, PHP, HTML, CSS, LaTeX, MS Office
Language	English, Bengali, and Hindi - fully proficient in speaking, reading, and writing

Personal Information

Citizenship	India