CURRICULUM VITAE

PERSONAL INFORMATION

Name: Susheel Shankar

Affiliaton: Department of Mathematics and Computer Science, Weizmann Institute of Science

Contact: susheel.shankar@weizmann.ac.il

EDUCATION

Master of Science in Mathematics and Computer Science 2022 - 2025
Weizmann Institute of Science, Rehovot, Israel.

Bachelor of Science (Research) in Mathematics 2018 - 2022
Indian Institute of Science, Bangalore. CGPA : 9.1/10

MASTER'S THESIS

Complex Cellular Decomposition November 2023-January 2025

Abstract: The Cellular parametrization theorem developed by Binyamini and Novikov has numerous applications as shown in their work complex cellular structures. We provide a modification to the aforementioned result in the real cell case so that the obtained real cellular cover is compatible with the given functions over the cell and disjoint over the positive real part of the cell. This result in particular helps us obtain a set of real cellular maps that form disjoint cover of semialgebraic sets whose size is polynomial in terms of its complexity. We further show that the improved result implies the preparation theorem by Lion and Rolin in its full strength for bounded semialgebraic functions, with precise polynomial bounds on the number of cells and a strong control on the units . Advisor: Gal Binyamini

BACHELOR'S THESIS

l adic Representations and Congruences of Coefficients of Modular Forms October 2021-April 2022

We study the congruence relations for the coefficients of cusp forms, modulo prime powers. We use the theorem of Serre-Deligne on the relationship between l adic representations and coefficients of special kinds of cusp forms, to develop the structure theory of modular forms mod l, using which we classify the primes l for which one can obtain congruence relations for the coefficients. The results further show that there are only a finite number of primes for which one can obtain such congruence relations and that some of the known congruence relations are the best there are, in the sense that they cannot be improved to a congruence relation modulo higher powers of primes or in terms of other primes.

Advisor: Shaunak Deo

AWARDS & FELLOWSHIPS

Master's Degree Fellowship- Weizmann Institute of Science(2022-2024)

Kishore Vaigyanik Protsahan Yojana (KVPY) research fellowship- the Department of Science and Technology, Government of India (2022-2024)

TALKS& SEMINARS

- O-minimality Seminar, Weizmann Institute of Science- 2023.
- Tame geometry and applications, Weizmann Institute of Science- 2025.

TEACHING/GRADING EXPERIENCES

Teaching Assistant in the Course Basic Topics I by Harry Dym - Fall 2023

- Assisted in teaching foundational mathematics concepts to graduate students.
- Guided students through assignments.

RELEVANT COURSEWORK

1. **Sheaf Cohomology**
   Introdcution to Presheaves, Sheaves, Homological Algebra. Cohomology Theories, Triangulated and Derived Categories, Grothendieck's six functor formalism.
2. **Introduction to Hodge Theory**

   Holomorphic functions of several variables. Complex manifolds. Examples of period maps. Kahler Package. Lefschetz theorems. Polarized Hodge structures.
3. **Exponential Sums** Gauss and Jacobi sums, Kloosterman sums, moments bounds, equations over finite fields, Zeta functions of hypersurfaces, Riemann hypothesis for sums in one variable, and the Hasse-Davenport relation.
4. **Elliptic Curves**
   Theory of Algebraic curves: Affine Algebraic sets, Hilbert's Null-stellensatz, Intersection numbers, Projective curves, Bezout's Theorem, Divisors, Riemann-Roch Theorem.

   Elliptic curves: The Weierstrass equation, Elliptic curves over complex numbers, finite fields, local fields of characteristic zero and Number fields.
5. **Commutative Algebra and Aglebraic Geometry**
   Affine varieties, Morphisms, Sheaves of functions, Serre's lemma, Non-affine varieties, projective varieties, Dimension, Noether's normalization lemma, Chevalley theorem, principal ideal theorem. Zariski tangent space, smooth varieties.
6. **Representation theory of finite groups**

   Representations of Finite Groups, Character Theory, Explicit decomposition of Representations, Induced Representations, Frobenius Reciprocity, Mackey's irreducibility criterion. Group Algebra, the density theorem. Jordan-Hölder Theorem, Krull-Schmidt Theorem

TECHNICAL SKILLS

- Programming Languages: C, Python (Numpy, pandas)
- Mathematical software: MATLAB
- Other tools: LaTeX