Aryan Hemmati

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Education

Sharif University of Technology, BA in Pure Mathematics (minor in theoretical CS) Sep 2021 – Jan 2026 (Exp.)

- **Coursework:** Algebra I, Analysis I, II, Topology, Algebraic Topology, Manifold Geometry, Complex Analysis, Measure Theory, Real Analysis, Commutative Algebra (audit at IPM), Riemann Surfaces (audit at UT)
- GPA: 17/20

Teaching Experience

- **General Topology**: Teaching Assistant

  During spring semester of 2024 as assistant of Prof. Bahraini. I was mainly tasked with holding TA classes, where I talked about different complementary topics such as Kuratowski fan space and projective limit topology. I also helped in the preparation of homework assignments.

- **Chaos Theory**: Teaching Assistant

  I was a teaching assistant for this course during the fall semester of 2022. I was mainly tasked with grading the students' assignments and occasionally holding problem solving sessions.

- **Advanced Programming**: Teaching Assistant

  I was a teaching assistant for this course during the spring semesters of 2023,2024. I designed the final project of the course, where I tried to focus on topics of computational geometry and multi-threading while addressing issues of graphical workflow, concurrency and optimization.

- **IMO Preparation courses**: Head of number theory team in Iran IMO summer camp

  I have had numerous experiences teaching high school students contest-level mathematics and helping them master problem solving skills required to participate in mathematical competitions such as IMO (international mathematical competition). I have also held problem solving sessions on AOPS and YSC (the institution responsible for training and selecting Iran's IMO team). I have been the head of number theory team in YSC where I gave lectures on analytical number theory, Dirichlet characters, Pólya-Vinogradov inequality and inequalities on $\mathbb{R}$.

Experiences

- I've recently finished my bachelor project with Prof. Bahraini on Geometric Invariant Theory and its approach through symplectic geometry, focusing on concepts of slope and stability of vector bundles and Kempf-Ness & Narasimhan-Seshadari theorems. My main source for the project was an expository note by R. Thomas GIT and symplectic reductions. Through this project I learned about basics of representation theory, algebraic geometry, theory of Lie groups and various concepts of differential geometry such as connections. I also had to learn great deals of symplectic geometry. I'm currently writing my thesis on this project and it's yet to be completed.

Relevant Studies

During my bachelor years I have participated in several seminars (organized by me and my peers) where we all studied several chapters of a book and gave presentations on them. These seminars include:

- **Geometric Invariant Theory by D. Mumford, et al. (along with numerous articles)**: Bachelor project
- **Differential Geometry of Curves and Surfaces by M.P. Do Carmo**: Personal study
- **Commutative Algebra by H. Matsumura**: Course in IPM (under supervision of H. Hedayatzadeh)
- **Introduction to Non-Archimedean Geometry by P. Achinger**: Seminar on Rigid Analytic Geometry
- **Fourier–Mukai transforms in Algebraic Geometry by D. Huybrechts**: Seminar on derived categories
- **An Introduction to Knot Theory by W.B.R. Lickorish**: Seminar in IPM (under supervision of A. Kamalinejad)
- **Relativity: Special, General and Cosmological by W. Rindler**: Courses of special and general relativity
- **Introduction to Quantum Mechanics by D.J. Griffiths, D.F. Scroeter**: Personal study
- **Knot Theory by K. Reidemeister**: Personal study

Presentations

- **Dessins d'Enfants and the Absolute Galois Group**: Introductory presentation to the theory of Grothendieck's Dessins d'Enfants and their Galois actions
- **Continuous Geometry**: On Von Neumann's work and Coordinatization theorem

- **Cohomology for Dynamical Systems**: A presentation on methods of Algebraic Topology in Dynamical Systems and Livšic theorem, given as a part of the Geometry and Topology Seminar organized by Prof. Amin Talebi
- **Ultrafilters in Topology**: As a part of the General Topology course by Prof. Alireza Bahraini
- **A New Approach to P vs. NP: Geometric Complexity Theory**: On new approaches of complexity problems via algebraic geometry and representation theory
- **Node Connectivity Augmentation of Highly Connected Graphs**: Expository talk on a paper of the same name, as a part of the seminar of algorithm and computation organized by Prof. Morteza Alimi
- **Minimal Addressing Schemes of Graphs and Squashed Cubes**: A presentation given in the seminar of graph theory organized by Prof. Javad Ebrahimi
- **Coloring Discrepancy and Applications**: On different bounds and techniques on coloring discrepancy problem as a part of the Combinatorial Optimization course by Prof. Morteza Alimi
- **Basic techniques on Principal Component Analysis**: As part of lectures on the Advanced Programming course

Awards and Events

- **BICMR-IPM Conference on Geometry and Topology**: A series of talks on various topics of topology
- **Gold Medal in IMS contest 2024**: Rank 3
- **Gold Medal in ICO 2020 (Iran Combinatorics Olympiad)**
- **Silver Medal in the selection test of Iran's IMO team 2019**: Rank 16

Voluntary Activities

- **Calculus Problem-Solving Sessions**: Held midterm and final preparation sessions
- **Differential Equations Problem-Solving Sessions**: Held midterm and final preparation sessions
- **Graph embeddings: An introduction to the theory of Dessins d'Enfants**: A basic talk on graph embeddings and Dessins and their application to solving Pell equations. This talk was given to high school students
- **A brief introduction to Topological Fixed Point Theory**: On the history of fixed point theory and giving a combinatorial proof to Brouwer fixed point theorem. This talk was given to high school students

Technical Skills & Experience (LinkedIn)

- **Java Programming**: Advanced
- **Python Programming**: Advanced
- **LaTeX Programming**: Advanced
- **Go Programming**: Intermediate
- **Part-time junior software engineer in Balad**
- **Part-time optimization engineer in Reverso**

Languages

- **English**: Proficient
- **German**: Intermediate
- **French**: Beginner