

# Aryan Hemmati

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## Education

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**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), Algebraic Geometry, Special Relativity, General Relativity, K-theory seminar (Étale Cohomology)
- GPA: 17/20

## Teaching Experience

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- **General Topology:** Teaching Assistant

During the spring semester of 2024, I worked as an assistant to Prof. Bahraini. I was mainly tasked with holding TA classes, where I discussed complementary topics such as Kuratowski fan space and projective limit topology. I also helped prepare 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 of Dr. Boomeri during the spring semesters of 2023 and 2024. I designed the final project of the course, where I tried to focus on 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 Olympiad). I have also held problem-solving sessions on AOPS and IYSC (the institution responsible for training and selecting Iran's IMO team). I was the head of the number theory team in IYSC where I gave lectures on analytical number theory, Dirichlet characters, Pólya-Vinogradov inequality, and various inequalities on  $\mathbb{R}$ .

## Experiences

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- I have 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-Seshadri theorems. My main source for the project was [an expository note by R. Thomas](#) on GIT. Through this project, I learned about the basics of representation theory, algebraic geometry, the theory of Lie groups, and various concepts of differential geometry such as connections and stability. I also had to learn a great deal of symplectic geometry. I'm writing my thesis on this project and it's yet to be completed.

## Relevant Studies

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During my bachelor years, I 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 the 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. Schroeter:** Personal study
- **Knot Theory by K. Reidemeister:** Personal study

## Presentations

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- **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 axiomatizations of geometry, Von Neumann's work and Coordinatization theorem
- **On Furstenberg Transformation of the Torus:** On minimal but not uniquely ergodic diffeomorphisms and Furstenberg construction, 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
- **Elementary Proof of Hartogs Extension Theorem:** As a part of complex analysis course by Prof. Alireza Bahraini
- **A New Approach to P vs. NP: Geometric Complexity Theory:** On new approaches to 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 a seminar on algorithm and computation organized by Prof. Morteza Alimi
- **Minimal Addressing Schemes of Graphs and Squashed Cubes:** A presentation given in a seminar on graph theory organized by Prof. Javad Ebrahimi
- **Coloring Discrepancy and Applications:** On different bounds and techniques for 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

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- **BICMR-IPM Conference on Geometry and Topology:** A series of talks on various topics of topology
- **Gold Medal in IMS contest 2024:** Rank 4
- **ICO 2020 (Iran Combinatorics Olympiad):** Rank 8
- **Silver Medal in the selection test of Iran's IMO team 2019:** Rank 18

## Voluntary Activities

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- **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](#))

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- **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

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