Saba Molaei

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Education

2020–Now **Sharif University of Technology (SUT)**, B.Sc. in Computer Science

- **GPA :** GPA: 18.9/20 (U.S. GPA using this website: 3.92/4)
- **B.Sc. Project:** *Quasi-Twisting doubly-covered rectangles*
- **Research Interests:** Computational Geometry, Reconfiguration Algorithms, Graph Algorithms, Computer Vision

Honors & Awards

2020 **National Universities Entrance Exam**, Admitted in 1st Ranked University in Iran (SUT)

2019 **Bronze Medal in Iranian National Mathematical Olympiad**, The top 60 students out of 20000 participants.

2019, 2018 **Iranian National Olympiad of Informatics**, The top 10% of participants are admitted.

2019 **Iranian National Olympiad of Physics**, The top 10% of participants are admitted.

2017 **1st place in Mathematical Kangaroo competition in Semnan province**, Link

Research Experience

Jul 2024 - Ongoing **Reconfiguration of Lattice-based Sliding Squares**, under supervision of Hugo Alves Akitaya

- This project focuses on efficient reconfiguration of modular robotic systems using meta-modules while maintaining connectivity. We simulated moves in different models with sliding moves and explored multi-agent reconfiguration, inspired by the papers Distributed reconfiguration of 2D lattice-based modular robotic systems and Efficiently Reconfiguring a Connected Swarm of Labeled Robots. Finally, we develop a parallel algorithm for reconfiguration using sliding moves.
  paper 1 (Finding Shortest Reconfiguration Sequences for Modular Robots) accepted to the FWCG 2024 .
  paper 2 (Parallel Sliding Squares) submitted to SOCG 2025.

Aug 2024 - Ongoing **Graph Threading**, under supervision of Rebecca Lin

- This project tackles an open problem in Graph Threading with Turn Costs, focusing on threading 3D grid graphs and lattices with the minimum number of strings, each with fixed length and turns. We are developing lower bounds on the number of strings required, proving hardness results for grid-based 2D and 3D graphs, and designing approximation and efficient algorithms for specific cases. For visual context and a better understanding of the project, see this.

Oct 2023 - June 2024 **Quasi-Twisting doubly-covered rectangles**, under supervision of Alireza Zarei

- An open problem from the paper *Quasi-Twisting Convex Polyhedra*. The project investigates which shapes can be quasi-twisted from doubly-covered rectangles. In the quasi-twisting process, A doubly-covered convex rectangle is cut along a simple closed quasigeodesic into two halves, which are then reglued to form a different convex polyhedron. We found simple closed quasi-geodesics on the doubly-covered rectangles, examined their properties and constructed the resulting polyhedra.
  Paper is in preparation for EuroCG 2025

Related Courses

- Computational Geometry+ (19.5/20)
- Geometric Folding Algorithms (Online)
- Randomized Algorithms+ (18.4/20)
- Advanced Algorithms+ (18.4/20)
- Analysis of Algorithms (19.6/20)
- Fundamental of 3D Computer Vision (19.2/20)
- Data Structures (20/20)
- Linear Algebra 1 (20/20)
- Discrete Mathematics (20/20)
- Advanced Programming (20/20)

+: Graduate Course

Course Projects

- NP-Complete Puzzles
- Non-crossing Matching of Online Points
- Orthogonal Art Gallery Problem

Teaching Experiences

2023 **Head Teaching Assistant**, Analysis of Algorithms, Sharif University of Technology, Prof. Shahram Khazaei

2023, 2022 **Teaching Assistant**, Data Structures, Sharif University of Technology, Prof. Shahram Khazaei (2023), Prof. Mahdi Safanejad-Boroujeni (2022

2021 **Teaching Assistant**, Probability & Applications, Sharif University of Technology, Prof. Hamid-Reza Fanai

2021 **Teaching Assistant**, Basic Programming, Sharif University of Technology, Prof. Mojtaba Tefagh

2021 **Teaching Assistant**, Linear Algebra, Sharif University of Technology, Prof. Samira Hossein Ghorban

Activities

- Mentorship in Rasta's summer school - CS teaching group of SUT
- Participating in the translation of the book "Modern Olympiad Number Theory"
- Lecture on Orthogonal Art Gallery Problem - Student scientific association of SUT
- Logic and GUI design for simulated games and messenger App - Tech: Java, JavaFX, Swing
- Teaching Problem Solving in Mathematical Olympiad - Farzanegan High-school, Shahrud
- Teaching Problem Solving in Geometry and Combinatorics - Ejei1 High-school, Isfahan

Summer Schools

2022 **Summer School on Mathematics (Iran Math School)**, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran

2018 **Summer Camp on Mathematics (Iranian National Mathematical Olympiad)**, Student have classes on Combinatorics, Geometry, Number Theory and Algebra, Tehran, Iran

Skills

IT Skills Java, Python, C/C++, Latex, Ipe (extensible drawing editor)

Soft Skills Creativity, Problem-solving, Emotional intelligence, Team-Work

Languages

- Farsi/Persian (native)
- English (TOEFL: 105/120)

Interests

Swimming I love swimming and water-related activities. I have professional swimming experience and was a member of my hometown's swimming team.

Painting I enjoy painting with various mediums like oil paint, acrylic, gouache, watercolor, stained glass (vitrail), and even markers. I'm also passionate about sculpture, journaling, and creative writing.

LEGO I've participated in educational LEGO classes and even competed in the World Robot Olympiad (WRO).

Origami Japanese culture, especially the art of origami, has always fascinated me.