Mohammadreza Motabar

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Education

Bachelor of Computer Science *Tehran, Iran*

University of Tehran *Sep 2019 - Mar 2024*

- GPA: 18.81 / 20, last two years: 19.46 / 20
- Ranked second among 66 class members in the school of computer science.
- Thesis: Primality Tests and Factorization Algorithms

Diploma in Mathematics and Physics *Tehran, Iran*

Allameh Tabatabaei High School *Sep 2016 - Jun 2019*

- GPA : 19.74 / 20

Research Interests

- Cryptography and Cybersecurity
- Compilers and Automata Theory
- Algorithms and Complexity (Specially Graph Algorithms)
- Machine Learning and Data Science

Honors and Awards

2024	**Second Place,** National computer science Master's entrance exam
2022	**Third Prize,** International Mathematics Competition (IMC)
2022	**Bronze Medal,** National Mathematics Competition for university students
2020	**Top 10,** University Of Tehran's ICPC team selection
2019	Ranked top 1% among 164000 students in the highly competitive national university entrance exam and awarded undergraduate tuition fee waiver
2018	**Bronze Medal,** National Informatics Olympiad
•	Had an opportunity to continue my M.Sc. in Computer Science in my current department without taking an entrance exam
•	"Excellent in term" student in all university semesters

Research Experience

Primality Testing and Factorization Algorithms - Bachelor's Thesis *Tehran, Iran*

University of Tehran *Sep 2023 - Jun 2024*

- Advisor: Prof. Amir Ghadermarzi 🏠 *Link to the details*
- Delved into an extensive study of primality tests and their underlying number theoretical foundations. Some notable areas I studied are the Fast Fourier Transform (FFT) algorithm for fast operation on numbers, the Tonelli–Shanks algorithm for computing square roots in rings, the Miller-Rabin primality test with the extension that is based on the extended Riemann hypothesis (ERH), Lucas and Grantham's Frobenius primality tests, Succinct Certificates, and AKS. Furthermore, I studied more about Elliptic Curves and the tests based on them, like ECM, Shanks–Mestre method, Schoof method, Goldwasser–Kilian primality test, and Atkin–Morain primality test (ECPP).
- My primary reference was the Prime Numbers book, an excellent book by R. Crandall and C. Pomerance.

Integer Factorization *Lausanne, Switzerland*

EPFL (École polytechnique fédérale de Lausanne) - LASEC Lab - Summer@EPFL Program *Summer 2023*

- Advisor: Dr. Tako Boris Fouotsa, Prof. Serge Vaudenay 🏠 *Link to the details*
- Briefly studied some classic and modern primality tests and factorization methods, like the Miller-Rabin Test, Pollard p - 1 Test, ECM, QS, and NFS. Then, delved more into the Number Field Sieve (NFS) and lots of needed theoretical materials.
- Analyzed the doubling formula in the Montgomery curves to design a new way to find two numbers with the same squares, the idea that is used in the modern and pioneered factorization methods.

Relevant Coursework

- Algorithm Design and Analysis .... (18 / 20)
- Graph Theory and Applications .... (20 / 20)
- Theory of Computation .... (20 / 20)
- Artificial Intelligence .... (19.1 / 20)
- Bio-Computing .... (19.13 / 20)
- Compiler .... (20 / 20)
- Machine Language and Assembly .... (20 / 20)
- Linear Algebra .... (20 / 20)
- Algebra 1 .... (20 / 20)
- Elementary Number Theory .... (20 / 20)
- Elementary Algebraic Geometry .... (16.2 / 20)
- Mathematical Analysis 1 .... (20 / 20)

Teaching Experience

C++ Programming Language *Allameh Helli School*

- During the 2020 academic year, I taught C++ programming language, elementary algorithms, and data structures to some talented students at Allameh Helli Middle School.

Data Structures and Algorithms *Farzanegan High School*

- Partially, during the 2020 and 2021 academic years, besides solving algorithm problems, I taught advanced algorithms and data structures to some talented students at Farzanegan High School. I mainly used the Codeforces website problems and the book CLRS for my class.

Teaching Assistant *University of Tehran*

In the following courses, I was partly responsible for designing and grading assignments, projects, and exams, as well as conducting practice and problem-solving sessions.

Theory of Computation | Dr. M. Rafiee | *Spring 2024*
Algebra 1 | Prof. A. Ghadermarzi | *Fall 2023*
Elementary Number Theory | Prof. A. Ghadermarzi | *Fall 2023*
Advanced Programming | Prof. M. Ganjtabesh | *Spring 2023*
Theory of Computation | Prof. M. Alizadeh | *Spring 2023*
Compiler | Dr. D. Tahmouresi | *Spring 2023*
Data Structures and Algorithms | Prof. M. Ganjtabesh | *Fall 2022*

Fundamentals of Mathematics | Prof. M. Mojtahedi | *Fall 2022*
Graph Theory and Applications | Prof. M. M. Noori | *Fall 2022*
Fundamentals of Combinatorics | Prof. M. M. Noori | *Spring 2022*
Data Structures and Algorithms | Prof. B. Babaali | *Spring 2022*
Theory of Computation | Prof. M. Mojtahedi | *Spring 2022*
Data Structures and Algorithms | Prof. B. Babaali | *Fall 2021*

Projects

Classroom Object Oriented Language Compiler | Compiler Course's Project | *Spring 2022*   ⌂ *Link to the project*

- Implemented a compiler in C++ for the Classroom Object Oriented Language (COOL), including a syntax analyzer using Flex, a parser using Bison, and a semantic analyzer using logic inference rules.

Assembler and Disassembler | Assembly Course's Project | *Spring 2022*   ⌂ *Link to the project*

- Implemented an assembler and a disassembler for NASM x86 (converts Assembly commands to hexadecimal equivalents and vice versa using Python and Assembly).

Assembly Image Processing | Assembly Course's Mini-Project | *Spring 2022*   ⌂ *Link to the project*

- Make a BMP file format or bitmap Image, darker or lighter, parallelly with the Assembly language.

Leukemia Cells Image Segmentation | Artificial Intelligence Course's Project | *Fall 2021*   ⌂ *Link to the project*

- Used histogram analysis, Particle Swarm Optimization (PSO), and Hill Climbing algorithm to create an image clustering algorithm and tested this algorithm on the "ALL IDB" dataset for acute lymphoblastic leukemia detection.

An Approximate Solution for TSP | Bio Computing Course's Project | *Fall 2021*   ⌂ *Link to the project*

- Used the Kohonen Self-Organizing Map (SOM) and Genetic Algorithm (GA) to devise an approximate solution to the Traveling Salesman Problem.

Basic Programmable Computer | Computer Systems Course's Project | *Spring 2021*   ⌂ *Link to the project*

- Implemented the 16-bit programmable computer based on Morris Mano's basic computer in Logisim.

Presentations

General Number Field Sieve | *Summer 2023*   ⌂ *Link to the details*

- Presented my research on Number Field Sieve to the members of the LASEC lab at EPFL University.

An Explicit Nash Equilibrium for a Market Share Attraction Game | *Fall 2022*

- Presented one of the papers that modelled the market and introduced the Nash equilibrium for choosing the prices of our products.

Introduction to Polynomial Rings | *Spring 2022*

- Delivered a presentation on polynomial rings and their algebraic structure, arriving at important lemmas and theorems, including Gauss's lemma on fractional fields.

Dynamic Weapon Target Assignment Problem | *Fall 2021*

- Modeled the Dynamic Weapon Target Assignment Problem to be suited for bio-inspired combinatorial optimization methods, namely Particle Swarm Optimization and Genetic Algorithm.

Introduction to Spectral Graph Theory | *Fall 2020*

- A quick introduction to spectral graph theory and important theorems built up to Kirchhof's Matrix-Tree theorem and used spectral graph theory to discuss the chromatic number, graph structure, and graph polynomials.

Game Theoretical Semantics | *Spring 2020*

- presented Game Theoretical Semantics for formal languages, particularly First-Order languages, and compared it to Tarskian model-based semantics.

Work Experience

Allameh Helli Publications *Tehtran, Iran*
Book Editor *2022 - 2023*

- Assisted in authoring a sequence of instructional programming books for C++ and Python.

GreenOly *Tehtran, Iran*
Full-stack Developer *Sep 2022 - Jan 2023*

- Using Laravel, Tailwind, Alpine.js, and Livewire, I developed parts of a website for educational reasons.

Certifications

- Supervised Machine Learning — *Coursera / Jan 2024*
- Cryptography I — *Coursera / Dec 2023*
- Introduction to TCP/IP — *Coursera / Mar 2023*
- Advanced Styling with Responsive Design — *Coursera / Nov 2022*
- Introduction to CSS3 — *Coursera / Oct 2022*
- Interactivity with JavaScript — *Coursera / Oct 2022*
- Introduction to HTML5 — *Coursera / Sep 2022*
- Learning Python — *Coursera / Aug 2022*
- Task-Oriented Course In Version Control With Git — *Quera / Nov 2021*

Volunteer Activities

University of Tehran   *Tehran, Iran*
Organizing a Competition
Designed a series of competitions with some of my friends to increase cooperation and engagement between different majors in my school of Mathematics, Statistics, and Computer Science in addition to raising the scientific level of the School.

University of Tehran   *Tehran, Iran*
Involvement In Assisting Fellow Students
Developed a comprehensive tutorial for compilers course on how to set up and use the framework necessary for the course projects.

Technical Skills

Programming	C++, C, Python, PHP, HTML, CSS, JavaScript
Frameworks	Laravel, Tailwind, Alpine.js, Livewire
Miscellaneous	Linux, LaTeX, Git

Languages

English	TOEFL (91/ 120): Reading 25/30, Listening 29/30, Speaking 21/30, Writing 16/30
Persian	Native

Interests and Hobbies

Science	Solving problems and puzzles, Programming, Website development, Cryptography, Economics
Art	Guitar, Painting
Sports	Futsal, Ping pong, Running

References

Dr. Amir Ghadermarzi	Assistant Professor, University of Tehran (a.ghadermarzi@ut.ac.ir)
Dr. Mojtaba Mojtahedi	Postdoctoral researcher, Ghent University (mojtaba.mojtahedi@ugent.be)
Dr. Majid Alizadeh	Associate Professor, University of Tehran (majidalizadeh@ut.ac.ir)