Mohammadreza Motabar

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Education

Bachelor of Computer Science *Tehran, Iran*

University of Tehran *Sept 2019 - Current*

- GPA : 18.76 / 20, last two years: 19.22 / 20
- Ranked second among 66 members of the class in the school of computer science.

Diploma in Mathematics and Physics *Tehran, Iran*

Allameh Tabatabaei High School *Sept 2016 - June 2019*

- GPA : 19.74

Research Interests

- Cryptography
- Algorithms and Complexity (Specially Graph Algorithms)
- Cyber Security
- Mechanism Design and Game Theory
- Programming Languages and Compilers (Automata Theory)

Honors and Awards

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

2018 **Bronze Medal,** National Informatics Olympiad

- Have an opportunity to continue MSc in Computer Science in my current department without taking an entrance exam.

Research Experience

Integer Factorization *Lausanne, Switzerland*

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

- Advisor: Prof. Serge Vaudenay, Dr. Tako Boris Fouotsa
- I studied the General Number Field Sieve algorithm and some different approaches in the steps of the algorithm. I tried to determine whether or not we can use the doubling formula in the Montgomery curve to factorize a given number.

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

University of Tehran *Fall 2023*

- Advisor: Prof. Amir Ghadermarzi
- Ongoing (I will mainly read parts of the book "Prime Numbers" by R. Crandall and C. Pomerance.)

Relevant Coursework

- Algorithm Design and Analysis ..... (18 / 20)
- Graph Theory and Applications ..... (20 / 20)
- Theory of Computation ..... (20 / 20)
- Strategic Games 1 ..... (19.1 / 20)
- Compiler ..... (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

Algebra 1 *Fall 2023*

Teaching assistant for Prof. A. Ghadermarzi, University of Tehran

Elementary Number Theory *Fall 2023*

Teaching assistant for Prof. A. Ghadermarzi, University of Tehran

Advanced Programming *Spring 2023*

Teaching assistant for Prof. M. Ganjtabesh, University of Tehran

Introduction to Theory of Computation *Spring 2023*

Teaching assistant for Prof. M. Alizadeh, University of Tehran

Compiler *Spring 2023*

Teaching assistant for Dr. D. Tahmouresi, University of Tehran

Data Structures and Algorithms *Fall 2022*

Teaching assistant for Prof. M. Ganjtabesh, University of Tehran

Fundamentals of Mathematics *Fall 2022*

Teaching assistant for Prof. M. Mojtahedi, University of Tehran

Graph Theory and Applications *Fall 2022*

Teaching assistant for Prof. M. M. Noori, University of Tehran

Fundamentals of Combinatorics *Spring 2022*

Teaching assistant for Prof. M. M. Noori, University of Tehran

Data Structures and Algorithms *Spring 2022*

Teaching assistant for Prof. B. Babaali, University of Tehran

Introduction to Theory of Computation *Spring 2022*

Teaching assistant for Prof. M. Mojtahedi, University of Tehran

Data Structures and Algorithms *Fall 2021*

Teaching assistant for Prof. B. Babaali, University of Tehran

Data Structures and Algorithms *2020 - 2021*

Farzanegan Highschool

Projects

Classroom Object Oriented Language (COOL) Compiler *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 Dis-assembler with Python and Assembly Language *Link to the project*

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

Assembly Image Processing *Link to the project*

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

Basic Programmable Computer/CPU *Link to the project*

- Implemented the 16-bit programmable computer based on Morris Mano basic computer in logisim.

Leukemia Cells Image Segmentation *Link to the project*

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

An Approximate Solution for TSP *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.

Compiler for a New Painting Language

- Designed and implemented a client program and a server program that client program convert the input code to the JSON and send it to the server program then server program render an image and send the image to client.

Btree Maze Solver *Link to the project*

- Programmed a maze solver in C++ with Dijkstra's shortest path algorithm using Btree for efficiency.

Presentations

Introduction to Polynomial Rings

- We talked about polynomial rings and built up the algebraic structure on them, arriving at important lemmas and theorem including Guess's lemma on fractional fields.

Introduction to Spectral Graph Theory

- A quick introduction to spectral graph theory and important theorems building up to Kirchhof's Matrix-Tree theorem. In this presentation we used spectral graph theory to talk about chromatic number, graph structure and graph polynomials.

Game Theoretical Semantics

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

Dynamic Weapon Target Assignment Problem

- I modeled Dynamic Weapon Target Assignment Problem to be suited for bio-inspired combinatorial optimization methods, namely PSO and GA.

An Explicit Nash Equilibrium for a Market Share Attraction Game

- I presented one of the papers which modeled the market and introduced the Nash equilibrium for choosing the prices of our products.

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

- Task-Oriented Course In Version Control With Git *Quera.org / Nov 2021*
- Learning Python *Coursera / Aug 2022*
- Introduction to HTML5 *Coursera / Sep 2022*
- Interactivity with JavaScript *Coursera / Oct 2022*
- Introduction to CSS3 *Coursera / Oct 2022*
- Advanced Styling with Responsive Design *Coursera / Nov 2022*
- Introduction to TCP/IP *Coursera / Mar 2023*