Marziyeh Mousavi

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Education

B.Sc. Computer Engineering *2022 - present*
Department of ECE, University of Tehran, Tehran, Iran
Cumulative GPA: 18.38/20 (3.91/4.00)

Diploma of mathmatics and physics *2016-2022*
National Organization For Development of Exceptional talents
GPA: 18.8/20.

Honors and Awards

- Among **top 15%** of B.Sc. students in Computer Engineering at University of Tehran.
- **Ranked 138th (top 0.1%)** among almost 145,000 participants in the Nationwide Iranian University Entrance Exam in Mathematics and Physics.

Research Interests

- Formal Verification of Cyber Physical Systems
- Automated Reasoning
- Model Checking
- Program Analysis
- Programming Languages
- Automata learning

Research Experience

Formal Methods and Verification Lab (University of Tehran) *April 2025 – Present*
Research Assistant under the supervision of Prof. Ghasemi and Prof. Sirjani

Tinification of Rebeca Models

- Modified Rebeca codes to generate equivalent TinyTwin representations.
- Applied static analysis techniques to study and reason about system behavior.
- Designed a dependency graph to capture component interactions.
- Incorporated scheduling problem insights from Cyber-Physical Systems (CPS) to improve efficiency and support analysis.

Sosy Lab (Ludwig Maximilian University of Munich) *March 2025-Present*

Remote Research Assistant under the supervision of Prof. Lee

Extending Moxichecker

- Implemented interpolation-based algorithms (ISMC and IMC) to improve performance and strengthen verification power.
- Added predicate abstraction to enhance the IC3 implementation.
- Achieved more efficient and reliable verification within the framework.

Tehran Institute for Advanced Studies

Research intern under the supervision of Prof. Hojjat *Summer 2025*

SAT-Solver-Based Approach for DFA Decomposition

- Applied SAT solvers to identify decomposed Deterministic Finite Automata (DFAs).
- Extended the approach to determine whether a given DFA can be composed into k parts.
- Enabled systematic exploration of decomposition possibilities.
- Improved the efficiency of analyzing DFA structures.

Projects

CPY compiler

- Designed and implemented a **compiler for the CPY language**, a C-like language with Python-inspired indentation-based scoping.
- Developed key **static analysis** components, including **symbol table construction** and **type checking**.
- Implemented advanced static analysis techniques for:
  - **Memory management error detection**, such as use-after-free scenarios.
  - **Reachability analysis**, enabling optimization by eliminating unreachable code.
- Modified the base grammar to incorporate Python-like features while preserving C-style constructs.
- Strengthened expertise in **compiler design**, **language parsing**, and **optimization techniques**, completed as part of a compiler course final project.

Coursera Automated Reasoning Course

- Gained practical experience with key concepts such as **resolution**, **DPLL**, **CDCL**, **Tseitin transformation**, and the **simplex method**.
- Broadened understanding of the **heuristics and algorithms** that power modern SAT and SMT solvers.
- Strengthened ability to reason formally about problems and apply automated tools for **logic-based verification and optimization**.

Coursera Symbolic Model Checking Course

- Applied formal methods to classic verification problems, reinforcing knowledge of **temporal logic**, **state-space exploration**, and **symbolic representations**.
- Strengthened skills in **formal verification techniques**, leveraging SMT solvers to ensure correctness and consistency in complex systems.

Data Structures and Algorithms

- Completed multiple projects for a **Data Structures course**, building a strong foundation in core data structures and algorithms.
- Implemented and applied a variety of algorithms involving **stacks, queues, trees, and graphs**.
- Demonstrated the ability to **implement algorithms from scratch** and adapt them to solve diverse computational problems.
- Applied concepts of **algorithmic design**, **time complexity analysis**, and **optimization techniques**.

XV6 Modified

- Gained hands-on experience in **kernel development**, **low-level programming**, and **system-level design**.
- Strengthened skills in working with **embedded systems** and operating system internals.

Teaching Assistant Experience

Formal Language and Automata Theory *Fall 2024, Spring 2025, fall 2026*

Eng. Mousavi and **Dr. H. Hojjat**

- **designing questions on** PDA (Pushdown Automata) , CFG (Context-Free Grammar) ,CFL and DCFL ,Reduction,Decidability and Recognizability and **grading homework**
- currently working as a **head teaching assistant**

Theory of Formal language and automata *Fall 2024 , Spring 2025*
Dr. M. Dolati

- **designing questions on** DFA,NFA and **grading homework**

Basics of data science *summer 2024*
Prof. M. Khoshnevisan

Artificial Intelligence *summer 2024*
University of Tehran- ACM chapter

Introduction to Computer Systems and Programming *Fall 2023*
Dr. M. Hashemi, Dr. M. Moradi

Volunteer Experience

ACM mentorship
University of Tehran ACM Student Chapter

I served as a mentor for the Artificial Intelligence course in ACM, where I played a key role in supporting students' learning and course development. My responsibilities included designing homework assignments and projects, assisting with grading and feedback, and providing guidance on various AI concepts. Additionally, I helped facilitate discussions, answered questions, and supported students during office hours, ensuring they gained a deeper understanding of the material and succeeded in the course. This experience enhanced my teaching, communication, and organizational skills, while also reinforcing my knowledge of artificial intelligence.

Class Principal
Department of Computer Engineering, University of Tehran

As the elected class principal for two consecutive years, I served as the trusted liaison between my classmates and the faculty. In this role, I regularly communicated students' concerns, feedback, and course-related issues to the department dean and professors, ensuring that their voices were heard and addressed. Beyond communication, I took on organizational responsibilities, helping to coordinate class and exam schedules so that the academic experience would run smoothly. This position required trust, reliability, and leadership, and it gave me the opportunity to strengthen my organizational and problem-solving skills while supporting both my peers and the faculty.

Skills

- **Language Skills:**
  - **English:** C1 / IELTS to be taken soon
  - **Persian:** Native Proficiency
- **Technical Skills:**

  Compiler Development, **Operating System Development**, **Static Analysis**, **Model Checking**, **Formal Verification**, **Hardware Design and Simulation**

- **Programming Skills:**
  - **Programming Languages:**
    - Experienced in **C**, **C++**, **Python**, **Java**, **verilog**.
    - Familiar with **Bash**, **mCRL2** , **Lingua Franca** , **Rebeca** , **coq**.
  - **Programming Tools:**
    - ANTLR, Z3 ,Multisim,Modelsim,Vivado,Quartus,Linux LaTeX,