Seyed Mohammad Mehdi Ahmadpanah

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RESEARCH INTERESTS

- Information-Flow Security
- Language-Based Security
- Formal Methods for Information Security
- Programming Languages and Compiler

EDUCATION

- **Amirkabir University of Technology** (Tehran Polytechnic), Tehran, Iran
  Ph.D. Candidate, Computer Engineering, Software
  September 2017 - now
  GPA: **17.70** / 20 (**4.00**/4.00)
  Research Topics: Information-Flow Security, Program Analysis, Abstract Interpretation, Runtime Monitoring, Model Checking
  Supervisor: Prof. Mehran S. Fallah

- **Amirkabir University of Technology** (Tehran Polytechnic), Tehran, Iran
  M.Sc., Information Technology, Information Security
  September 2015 - September 2017
  GPA: **17.89** / 20
  Thesis: Improving Multi-Execution-Based Mechanisms for Enforcing Information Flow Policies (Grade: 20/20)
  Supervisor: Prof. Mehran S. Fallah, Jury: Prof. Mehdi Shajari and Prof. Ramtin Khosravi

- **Amirkabir University of Technology** (Tehran Polytechnic), Tehran, Iran
  B.Sc., Computer Engineering, Software
  September 2011 - September 2015
  GPA: **17.69** / 20
  Project: A Tool for Rewriting-Based Enforcement of Noninterference in While Programs (Grade: 20/20)
  Supervisor: Prof. Mehran S. Fallah, Jury: Prof. MohammadReza Razzazi

- **Refah** High School, Semnan, Iran
  Diploma in Mathematics and Physics
  September 2007 - June 2011
  GPA: High School **19.26** / 20 , Pre-University **19.52** / 20

HONORS AND AWARDS

- Recognized as a **Scientific Talent** by the National Elites Foundation of Iran, 2018.
- Ranked **Top 3%** among Lecturers of all departments of the university (830 lecturers), according to the student evaluation for teaching *Advanced Programming*, Amirkabir University of Technology, Tehran, Iran, Spring 2018.
- Known as the **Youngest** Lecturer (at age 22), Lab. Instructor (at age 20) and Teaching Assistant (at age 16), Amirkabir University of Technology, Tehran, Iran.

- Honored as the **Best Teaching Assistant** of Computer Engineering and IT Department according to the student evaluation for *Discrete Mathematics (Spring 2017)* and *Data Structures (Fall 2017)* courses, Amirkabir University of Technology, Tehran, Iran.
- Offered for **Direct Admission** to graduate school (**Ph.D.**) in Computer Engineering - Software, from two top universities of Iran, **University of Tehran** and **Amirkabir University of Technology**, without taking the Nationwide University Entrance Exam for Ph.D. as a reward of academic records and achievements, Tehran, Iran, 2017.
- Ranked **1st** and **2nd** among all Laboratory Instructors in different topics of Computer Engineering and IT Department according to the student evaluation for teaching *Computer Lab.* and *Operating Systems Lab.*, respectively, Amirkabir University of Technology, Tehran, Iran, Fall 2016.
- Announced as the **Outstanding Student** and Achieved **1st** place among 2015-entries in Information Security major, Amirkabir University of Technology, Tehran, Iran, 2016 and 2017.
- Awarded **Outstanding Graduate Student Scholarship**, Amirkabir University of Technology, Tehran, Iran, 2016.
- Admitted to **Tarbiat-Modares University** and Achieved **43rd** place among all applicants of the Nationwide University Entrance Exam for M.Sc. in Information Technology (Approximately 30000 applicants), Iran, 2015.
- Honored as an Active Member of the **Student Scientific Association of Computer Engineering and IT Department** (Announced as The best Student Scientific Association of the University), Amirkabir University of Technology, Tehran, Iran, 2015.
- Qualified for **Direct Admission** to graduate school (**M.Sc.**) of Computer Engineering and IT Department, **Amirkabir University of Technology**, without taking the Nationwide University Entrance Exam for M.Sc. as a reward of academic records and achievements, Tehran, Iran, 2014.
- Selected as a member of the university team for the **National Scientific Olympiad** in Computer Engineering as a result of distinguished performance (**3rd** place among undergraduate students), Amirkabir University of Technology, Tehran, Iran, 2014.
- Achieved top **2%** place among all applicants of the Nationwide University Entrance Exam for B.Sc. in Mathematics and Engineering (Approximately 260000 applicants), Iran, 2011.
- Achieved top **1.5%** place among all applicants of the Nationwide University Entrance Exam for B.Sc. in Foreign Languages - English (Approximately 108000 applicants), Iran, 2011.
- Skipped **Three** grades of Elementary School as an Exceptional Talent, Tehran, Iran, 2002.

RESEARCH EXPERIENCES

- **Research Assistant** *March 2015 - now*
  Formal Security Lab. - under the supervision of Prof. Mehran S. Fallah

  Enforcing Information Flow Policies using Language-Based Techniques - Ph.D. Studies *September 2017 - now*

  My recent background studies are about Information-Flow Security, Program Analysis, Abstract Interpretation, Runtime Monitoring, and Model Checking that

have yielded to main talks entitled "Abstract Interpretation for Static Analysis of Information Flow Security" and "Relational Abstract Interpretation for Verification of Information Flow Policies".

Improving Multi-Execution-Based Mechanisms for Enforcing Information Flow Policies - M.Sc. Thesis *November 2015 - September 2017*

Information flow security means guaranteeing confidentiality and integrity by preventing illegal flows of information. This concept has led to the emergence of the theory of noninterference that acts as the semantics of information flow policies. Among various static and dynamic enforcement mechanisms already proposed for information flow policies, Secure Multi-Execution (SME) has attracted enormous attention. SME is a dynamic black-box mechanism that enforces timing- and termination-sensitive noninterference by executing multiple copies of a given program, one copy for each security level, and restricting I/O in these copies. The soundness and transparency of the mechanism highly depend on appropriate scheduling and synchronizing of the copies. Soundness means that the resulting system must be secure and transparency stipulates that the mechanism must preserve the executions of any secure program. Although an acceptable level of transparency at enforcing termination-sensitive noninterference can be achieved by using mechanisms based on SME, it does not hold for timing-sensitive noninterference.

In this thesis, we propose a novel mechanism based on SME to enforce timing-sensitive noninterference which is proven to be sound and attains a level of transparency that whenever the original program is secure, the order of output events are preserved between different output channels. We call the proposed mechanism Buffered Secure Multi-Execution (BSME) wherein the events raised by different runs of the program are buffered. Moreover, a round-robin-like scheduler determines how to run the copies of the target program.

A Tool for Rewriting-Based Enforcement of Noninterference in While Programs - B.Sc. Project *March 2015 - September 2015*

Program rewriting has recently been suggested as a means of enforcing security policies and proven more powerful than execution monitoring and static analysis. In this project, we implement a novel, sound and transparent rewriting mechanism using Program Dependence Graphs (PDG) to enforce progress-sensitive and -insensitive noninterference in programs with observable intermediate values.
More information on: http://ceit.aut.ac.ir/formalsecurity/rewriter/tool

- **Static Analysis of Unsafe Use of Variables in Java** *Spring 2014*

  The research contains reviewing the notion of unsafe use of variables due to exception occurrences. A static approach has been reported which take advantages of control flow graph and data flow analysis to automatically detect this kind of patterns that may introduce potential bugs in Java programs. The research has been done for the Research Method and Technical Report Writings course [Written and Oral Presentation].

TEACHING EXPERIENCES

- **Teaching Assistant**, **Discrete Mathematics** *Spring 2019*
  Under the supervision of Prof. Mostafa H. Chehreghani and Prof. Mehran S. Fallah
  Coordinating the team + Holding classes + Grading assignments (82 students)
- **Teaching Assistant**, **Design of Programming Languages**
  Fall 2014, Fall 2015, Fall 2016, Fall 2017, Fall 2018
  Under the supervision of Prof. Mehran S. Fallah
  Coordinating the team + Holding classes + Grading assignments (30, 44, 27, 43, 49 students)

- **Lecturer**, **Advanced Programming**, AUT
  Spring 2018 [evaluation: 19.57/20]
  Teaching the course + Coordinating lab instructors and teaching assistants + Providing lab manuals + Revising syllabus (156 students)
- **Teaching Assistant**, **Data Structures**
  Fall 2013, Fall 2014, Fall 2016, Fall 2017 [evaluation: 18.76, 18.93 and 19.08/20]
  Under the supervision of Prof. Mehdi Dehghan Takht Fooladi
  Coordinating the team + Holding classes + Designing and grading assignments and projects + Revising syllabus (120-150 students per semester)
- **Teaching Assistant**, **Discrete Mathematics**
  Spring 2014, Spring 2016, Spring 2017 [evaluation: 18.39, 18.81 and 19.33/20]
  Under the supervision of Prof. Mehran S. Fallah
  Coordinating the team + Holding classes + Grading assignments (114, 108, 151 students)
- **Teaching Assistant**, **Principles of Compiler Design**
  Spring 2016, Fall 2016, Spring 2017
  Under the supervision of Prof. MohammadReza Razzazi
  Holding classes + Grading exams + Designing and grading projects (28, 40, 22 students)
- **Instructor**, **Operating Systems Lab.**
  Spring 2016 [evaluation: 18.90/20], Fall 2016 [evaluation: 19.58/20]
  Under the supervision of Prof. Bahador Bakhshi
  Teaching the course + Designing and grading assignments and exams (13, 12 students)
- **Instructor**, **Computer Lab.**
  Fall 2016 [evaluation: 18.99 and 19.62/20]
  Under the supervision of Prof. Ahmad NickAbadi
  Teaching two groups of the course + Designing and grading assignments and exams + Revising syllabus (23, 20 students)
- **Teaching Assistant**, **Advanced Programming**
  Spring 2013, Spring 2014, Spring 2015
  Under the supervision of Prof. Seyed Majid Noorhosseini
  Coordinating the team + Holding classes + Designing and grading assignments and exams + Revising syllabus (126, 68, 55 students)
- **Teaching Assistant**, **Computer Networks II** *Spring 2015*
  Under the supervision of Prof. Masoud Sabaei
  Designing and grading assignments (60 students)
- **Teaching Assistant**, **Information Storage and Retrieval** *Spring 2015*
  Under the supervision of Prof. Ahmad NickAbadi
  Designing and grading projects (53 students)
- **Teaching Assistant**, **Software Engineering I** *Fall 2014*
  Under the supervision of Prof. Bahman Pourvatan
  Holding classes + Designing and grading assignments and projects (92 students)
- **Teaching Assistant**, **Computer Architecture** *Spring 2014*
  Under the supervision of Prof. HamidReza Zarandi
  Coordinating the team + Designing and grading assignments and projects (102 students)

PUBLICATIONS AND TECHNICAL REPORTS

- "**Buffered Secure Multi-Execution: A Fully Transparent Enforcement Mechanism for Timing-Sensitive Noninterference**" with Mehran S. Fallah - in progress.
- **"An Introduction to Reo"** - seminar report for Verification of Reactive Systems course [In Persian], Sharif University of Technology, Tehran, Iran, 2018.
- "**Service-Oriented Architecture Patterns**" - seminar report for Object-Oriented Design Patterns course [In Persian], AUT, Tehran, Iran, 2017.
- **"Improving Multi-Execution-Based Mechanisms for Enforcing Information Flow Policies"** - M.Sc. Thesis (+ Oral defense) [In Persian], AUT, 2017.
- "**Dynamic Enforcement of Security Hyperproperties**" - survey report for Seminar course [In Persian], AUT, Tehran, Iran, 2016.
- "**End-to-End Verifiable Elections**" - seminar report for Security Protocols course [In Persian], AUT, Tehran, Iran, 2016.
- "**Formal Analysis of Kerberos v5**" with Ehsan Edalat - project report for Security Protocols course [In Persian], AUT, Tehran, Iran, 2016.
- "**MSSQL Security: Overview, Mechanisms and Best Practices**" with AmirHossein Nasereddini - project report for Secure Computer Systems course [In Persian], AUT, Tehran, Iran, 2016.
- "**Meet-in-the-Middle Attacks on Feistel Constructions**" - seminar report for Applied Cryptography course [In Persian], AUT, Tehran, Iran, 2016.
- "**A New 256-bit Expansion of TwoFish Cryptosystem**" with AmirHossein Nasereddini - project report for Applied Cryptography course [In Persian], AUT, Tehran, Iran, 2016.
- "**Linear and Differential Cryptoanalysis of Twofish Cryptosystem**" with AmirHossein Nasereddini - project report for Applied Cryptography course [In Persian], AUT, Tehran, Iran, 2016.
- **"A Tool for Rewriting-Based Enforcement of Noninterference in While Programs"** - B.Sc. Project Report (+ Oral defense) [In Persian], AUT, 2015.
- "**An Introduction to Artificial Bee Colony**" - project report for Artificial Intelligence course [In Persian], AUT, Tehran, Iran, 2015.
- "**An Introduction to Lambda Calculus**" [In Persian], Hamgaam Magazine, Tehran, Iran, 2014.
- "**Static Analysis of Unsafe Use of Variables in Java**" - technical report and poster for Research Method and Technical Report Writings course [In Persian], AUT, Tehran, Iran, 2014.
- "**An Introduction To Adders**" with HamidReza Ramezani - project report for Computer Architecture course [In Persian], AUT, Tehran, Iran, 2013.

TALKS

- "**Abstract Interpretation for Static Analysis of Information Flow Security**" - Oral presentation for Ph.D. Qualification Exam [In Persian], AUT, Tehran, Iran, 2019.
- "**Relational Abstract Interpretation for Verification of Information Flow Policies**" - Oral presentation for seminar of Program Analysis course [In Persian, Slides In English], AUT, Tehran, Iran, 2018.

- "**Reo: A Channel-Based Model for Component Composition**" - Oral presentation for seminar of Verification of Reactive Systems course [In Persian], Sharif University of Technology, Tehran, Iran, 2018.
- "**Dependent Types, Twelf and Its Application in Proof**" - Oral presentation for seminar of Advanced Programming Languages course [In Persian, Slides In English], AUT, Tehran, Iran, 2017.
- "**Monitoring-Oriented Programming**" - GradTalk [In Persian, Slides In English], Computer Engineering and IT Department, AUT, Tehran, Iran, 2017.
- "**Monitoring-Oriented Programming**" - Oral presentation for seminar of Software Systems Security course [In Persian, Slides In English], AUT, Tehran, Iran, 2017.
- "**Dynamic Enforcement of Security Hyperproperties**" - Oral presentation for Seminar course [In Persian], AUT, Tehran, Iran, 2016.
- "**Probabilistic Noninterference**" - Oral presentation for seminar of Formal Models and Information Security course [In Persian, Slides In English], AUT, Tehran, Iran, 2016.
- "**End-to-End Verifiable Elections**" - Oral presentation for seminar of Security Protocols course [In Persian], AUT, Tehran, Iran, 2016.
- "**Explainable Security for Relational Databases**" - Oral presentation for seminar of Databases Security course [In Persian], AUT, Tehran, Iran, 2016.
- "**Meet-in-the-Middle Attacks on Feistel Constructions**" - Oral presentation of seminar for Applied Cryptography course [In Persian], AUT, Tehran, Iran, 2016.
- "**Static Analysis of Unsafe Use of Variables in Java**" - Oral presentation for Research Method and Technical Report Writings course [In Persian], AUT, Tehran, Iran, 2014.

WORK EXPERIENCES

- **Kolah Sefid** (Bug Bounty Platform) *September 2018 - now*
  Technical Referee (Web Application Security) and Consultant
- **Kahkeshan Moshaver** *June 2018 - now*
  Security Consultant and Provider of Security Protection Profiles
- **AUT CERT Lab.** *Summer 2015 and September 2018 - now*
  Web Application Security Tester, Software Developer and Instructor
- **Rayan Pardazan Nikro Emertat (RAPNA)** *Summer 2014*
  Software Engineer and Back-End Developer - Summer Internship
- **Sharif University of Technology Research Center**
  May 2012 - September 2015
  Question Designer and Auditor of several Employment Exams

TOP ACADEMIC COURSE PROJECTS

- **Program Analysis**
  Implementation of a data flow analyzer with the monotone framework for a while language using Racket
- **Verification of Reactive Systems**
  Verification and model checking of MESI protocol using Promela and Spin
- **Software Systems Security**
  Threat modeling and bug filing for a file integrity checker using MS Threat Modeling Tool

- **Network Security**
  Simulation of security mechanisms and defense techniques in different layers of computer networks using GNS3 and Kali
- **Database Security**
  Applying security mechanisms in Oracle including user management, roles, VPD and auditing
- **Security Protocols**
  Formal analysis of Kerberos v5 protocol using MaudePSL
- **Secure Computer Systems**
  Design and enforcement of a policy module for a BufferOverFlow vulnerable program using SELinux
- **Applied Cryptography**
  Design and implementation of a 256-bit expansion, and linear and differential analysis of TwoFish cryptosystem (written in Java)
- **Microprocessor**
  Simulation of a greenhouse control system in Proteus with ATMega16
- **Principles of Compiler Design**
  Implementation of a front-end compiler for an imperative programming language using Flex and Bison (written in C and Java)
- **Information Storage and Retrieval**
  Design and implementation of a static search engine using both traditional tf-idf method and semantic hashing for content-based document retrieval (written in Java)
- **Internet Engineering (Web Programming)**
  Design and implementation of an HTTP Analyzer (written in Java), a static webpage similar to macrumors.com (using XHTML and CSS), and a weblog publishing tool similar to Twitter (using JavaScript, PHP, HTML and CSS)
- **Operating System Lab.**
  Implementation of a calculator using shell scripting in Fedora
- **Software Engineering II**
  Analysis and design of a bookstore web application using UML
- **Software Engineering I**
  Analysis of an online shopping website using UML
- **Database Systems**
  Development of an iTunes-like desktop application using MongoDB (written in Java)
- **Design of Programming Languages**
  Implementation of an interpreter for an imperative language supports arithmetic and logical operations using OCaml
- **Computer Networks I**
  Development of an FTP client (written in Java)
- **Design of Algorithms**
  Implementation of L-Tiling algorithm and Ford-Fulkerson algorithm (written in Java)
- **Machine Language**
  Implementation of an assembly version of DES encryption algorithm using Mips

- **Data Structures**
  Development of a search engine application using Inverted-Index algorithm (written in Java)
- **Logic Circuits**
  Design and implementation of a MasterMind game in Proteus
- **Advanced Programming**
  Development of JTank (a game similar to NormalTanks), JDM (a download manager like IDM) and JCalculator (written in Java)
- **Principles of Programming**
  Development of Paint, Snake, Tetris, an English and Persian text editor and a scientific calculator with drawing diagrams (written in C)

AUDITED and ONLINE COURSES

- **University Teaching** *Jan. and Feb. 2018*
  By Prof. Min Zeng and Prof. Zou, The University of Hong Kong - Coursera
- **Formal Methods and Information Security** *Spring 2015*
  By Prof. Mehran S. Fallah, Amirkabir University of Technology
- **Advanced Programming Languages** *Fall 2015*
  By Prof. Mehran S. Fallah, Amirkabir University of Technology
- **Game Theory** *Spring 2014*
  By Prof. Mehran S. Fallah, Amirkabir University of Technology

OTHER ACTIVITIES

- Advisor and Presenter of Computer Engineering discipline in the **Workshop on Selection of University Disciplines**, University of Tehran and NODET (National Organization for Development of Exceptional Talents) of Tehran, *Aug. 2018*.
- Presenter of **CV Writing Workshop**, Amirkabir University of Technology, *Jul. 2018*.
- Founder and Coordinator of **Grad Talks**, Computer Engineering and IT Department, Amirkabir University of Technology, *Jan. 2017 - now*.
- Staff Member and Participant of the **German-Austrian-Iranian Workshop on Digital Security and Privacy**, Amirkabir University of Technology, *Oct. 2016*.
- Member of **Computer Society of Iran**, *Jun. 2016 - now*.
- Executive Director and Website Administrator of **Formal Security Lab.**, Computer Engineering and IT Department, Amirkabir University of Technology, *Oct. 2015 - now*.
- Founder and Coordinator of **Graduate Students Learning Group**, Computer Engineering and IT Department, Amirkabir University of Technology, *Oct. 2015 - July 2016*.
- Head of visiting tour of IranOpen Robotics Festival for Computer Engineering and IT students (more than 20 students), Amirkabir University of Technology, *April 2016*.
- Assistant Coordinator of Computer Engineering team for participating in the **National Scientific Olympiad**, Computer Engineering and IT Department, Amirkabir University of Technology, *2016*.
- Consultant of the **Student Scientific Association**, Computer Engineering and IT Department, Amirkabir University of Technology, *2016 - now*.

- Management Board Member and Chief of Informatics of the **Student Scientific Association** of Computer Engineering and IT Department (Elected by the votes of the students), Amirkabir University of Technology, *Jan. 2014 - Feb. 2015*.
- Staff Member of the **2nd Ideas and Programming Competitions for Smart Devices (IranMobiCode 2014+)** at Computer Engineering and IT Department, Amirkabir University of Technology, *Dec. 2014*.
- Staff Member of the **1st IdeasBazaar Event** at Computer Engineering and IT Department, Amirkabir University of Technology, *Dec. 2014*.
- Staff member of the **14th Collegiate ACM Contest** at Computer Engineering and IT Department, Amirkabir University of Technology, *Nov. 2014*.
- Staff member of the **6th Linux Festival** at Computer Engineering and IT Department, Amirkabir University of Technology, *May 2014*.
- Staff Member of the **1st Ideas and Programming Competitions for Android (IranMobiCode 2014)** at Computer Engineering and IT Department, Amirkabir University of Technology, *Mar. 2014*.
- Staff Member and Official Poster Designer of the **13th Collegiate ACM Contest** at Computer Engineering and IT Department, Amirkabir University of Technology, *Nov. 2013*.
- Staff Member and Official Poster Designer of the **1st National Student ACM Contest** at Computer Engineering and IT Department, Amirkabir University of Technology, *Mar. 2013*.
- Staff Member and Official Poster Designer of the **1st AUT AI Programming Contest** at Computer Engineering and IT Department, Amirkabir University of Technology, *Apr. 2013*.
- Participant and Official Poster Designer of the **12th Collegiate ACM Contest** at Computer Engineering and IT Department, Amirkabir University of Technology, *Nov. 2012*.
- Writer in **Pouyesh Magazine**, The publication of Guild Council at Computer Engineering and IT Department, Amirkabir University of Technology, *Sep. 2012 - now*.
- Chosen as **The Best Owner of Idea** at Technology Innovation Competition (IPTEC), Semnan, Iran, *2009*.
- Announced as **The Best Book Reader** of Public Libraries, Semnan, Iran, *2010*.

TECHNICAL SKILLS

- **Programming Languages**
  Java, C/C++, Racket, OCaml, Shell Scripting, Mips
- **Database Systems**
  MySQL, MongoDB
- **Operating System**
  Windows, Linux (Ubuntu, Kali and Fedora)
- **Web Development**
  HTML (XHTML and HTML 5), CSS, JavaScript, jQuery, PHP, Yii, XML, XSLT, J2EE
- **Miscellaneous**
  Flex and Bison, Promela and Spin, MaudePSL, CEH Tools, MS Threat Modeling Tool, PREfast, SELinux, UML, GNS3, Boson NetSim, Cisco Packet Tracer, MS Project, VHDL, Verilog, Orcad Pspice, Proteus

LANGUAGES

- **Persian** (Farsi): *Mother tongue (Native)*
- **English**: *Professional working proficiency* (MSRT*: 83/100)

REFERENCES

- **Mehran S. Fallah, Associate Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
  Email: msfallah@aut.ac.ir
- **MohammadReza Razzazi, Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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- **Seyed Majid Noorhosseini, Assistant Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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- **Masoud Sabaei, Associate Professor**
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- **Mehdi Dehghan TakhtFooladi, Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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- **Ahmad NickAbadi, Assistant Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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- **HamidReza Zarandi, Associate Professor**
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- **Bahador Bakhshi, Assistant Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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- **Hossein Pedram, Associate Professor**
  Computer Engineering and IT Department, Amirkabir University of Technology
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* English Exam conducted by the Ministry of Science, Research and Technology of Iran