

Curriculum Vitae

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Certifications are available upon request.

1 Personal Information

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2 Education

Master of Science in Physics

Sharif University of Technology,¹ Tehran, Iran (2007-2009) (GPA 3.2/4)

- Thesis title: Analysis of Repeating Gravitational Microlensing Events Towards Galactic Bulge and Magellanic Clouds
 - **Abstract:** The EROS and MACHO collaborations have studied gravitational microlensing events towards Galactic Bulge and Magellanic Clouds to investigate the dark matter content of the Galactic halo. The EROS collaboration found several events and monitored them for long periods (~ 10 years). Some of those events exhibit another variation in their light-curves. Those events were attributed by the EROS collaboration to a certain kind of variable stars and were ruled out from the sample of microlensing events. This leads to a reduction in the number of events and thus in the amount of dark matter content of the Galactic halo.
In this thesis, we have investigated repeating microlensing events. In these events, the light-curve has more than one amplification by microlensing. We propose two scenarios

¹<http://www.sharif.edu>

for such events and try to find the relative probability of their occurrence. By using several Monte-Carlo simulations, we have found this probability.

Effect of the orbital parameters of lens stars on this probability has also been investigated and corresponding plots are shown. There is also a detailed description of all the numerical methods devised for this study.

- Supervisor: Sohrab Rahvar (Associate Professor)

Bachelor of Science in Physics

Sharif University of Technology (2003-2007) (GPA 3.2/4)

- Thesis: Calculating half life of heavy elements by simulation of time-dependent Schrodinger's equation²
- Supervisor: Saman Moghimi-Araghi (Assistant Professor)

Diploma in Physics-Mathematics

Mirza-koochak Highschool (A branch of NODET³), Rasht, Iran (1999-2003)

- Thesis: Discontinuous Molecular Dynamics (DMD) simulation. (N-body simulation of arbitrary masses with a force field)

3 Research Interests

- Cosmology and Astronomy
 - I have passed courses on Special Relativity, Introductory Cosmology, Astronomy and Astrophysics while I was undergraduate. In the first two semesters of M. Sc. I attended (without registration) in two PhD courses of Advanced Topics in Gravitation and Advanced Cosmology. Some of the topics on which I have more interest (and a fair amount of self-study and experience) are
 - * Gravitational Lensing (Micro and Weak) (Both analytical and computational)
 - * Cosmic Microwave Background Anisotropies
 - * Computational Structure Formation (Many-body simulation)
 - * Modified Newtonian Dynamics (MOND)
- Biological and Soft Condensed Matter Physics

²This project was done jointly with Ms. Maryam Habibi

³National Organization for Development of Exceptional Talents

– My interest in biophysics began when I took a biophysics course with Professor Reza Ejtehadi. The course was based on Philip Nelson’s introductory book on Biological Physics. I found biophysics very interesting both in the problems it deals with and also in its approaches to such problems. Specifically, I am very interested in the following subtopics which I have explored with some more depth:

- * DNA Physics
- * Protein Folding
- * Computational Techniques (Monte-Carlo simulation, Chaotic Dynamics, ...)

Furthermore, I am very interested in experimental aspects of biophysics, but I have never got the chance to work on.

4 Awards & Honors

- Silver Medal In National Physics Olympiad, Young Scholars Club⁴ (2002)
 - A national competition on physics is held annually between all high school students in Iran. About 800 of them are selected for the second round of the Olympiad. The second exam is an essay exam and selects about 40 students. These students take part in summer training school of about 2.5 months in Young Scholar’s Club (Tehran) and I was among them. The training material consisted of some very high-quality theoretical and experimental courses. The first 7 students of this group receive gold medal, five of them take part in the International Physics Olympiad (IPhO). I was among next 20 students who receive silver medal. Silver medalists could credit some of their B. Sc. courses such as Physics 1 & 2 and labs.
- Ranked 166th in National University Entrance Exam (among about 400,000) (2003)
- Ranked 12th in National Physics Graduate Exam (among about 20,000) (2007)
- Ranked 14th in National University Physics Olympiad (2007)

5 Conferences and Seminars Attended

- The LAMMPS Workshop, Sharif University of Technology (December 2009)⁵

⁴<http://www.ysc.ac.ir>

⁵<http://psi.ir/farsi.asp?page=lammeps88>

- The 2nd Workshop on High Performance Computing, Shahid Beheshti University (January-February 2009)⁶
 - In this 12-day workshop we learned about principles of parallel computing, MPI and OpenMP standards and their implementations, setting up a computing cluster, parallel libraries and optimization techniques.
 - Lecturers: Luca Heltai (SISSA, Italy), Stefano Cozzini (CNR/INFN & SISSA, Italy)
- Mini-Workshop on Exoplanet Detection by Gravitational Microlensing, IPM, Summer 2008 (Lecturer: Martin Dominik, St-Andrews University, UK)
- IPM School and Workshop on Weak Lensing and Photo-z Techniques⁷ (June 2008)
 - In this workshop we worked out data analysis softwares of gravitational lensing such as SExtractor, SkyMaker and BPZ to analyze some real and simulated astronomical data. We finally became able to find redshifts of galaxies and discuss their color-magnitudes diagrams.
 - Lecturers: Thomas Erban (AIfA, Germany) and Bahram Mobasher (University of California at Riverside, USA)
- Weekly seminars of Cosmology group at IPM⁸
- Weekly seminars of Cosmology group at Sharif University of Technology⁹ (2007-2008)

6 Executive responsibilities

- Member of referee committee of NODET's competition of high school students' research projects¹⁰, (2004, 2005, 2007, 2008)
- Editorship of Takaneh (Scientific Magazine of Physics students at Sharif University of Technology)¹¹, (2005-2007)
 - This magazine contains papers from graduate and undergraduate students. It is also rewarded in national competition of scientific student magazines

⁶<http://physics.ipm.ac.ir/conferences/hpc09>

⁷<http://www.astro.ipm.ir/ISWLP08/index.htm>

⁸<http://www.ipm.ac.ir>

⁹<http://physics.sharif.edu/~lensing>

¹⁰<http://www.nodet.net>

¹¹<http://physics.sharif.edu/~takaneh/en/>

(held by the Ministry of Science, Research and Technology). Its papers are refereed by faculty members. I was chief-editor of Takaneh for two periods.

- Organizer of *Three Days with Mathematics* (Workshop) for K-12 students, Anzali Math House¹², Iran (Summer 2007)¹³
- Organizer of *Social Science Workshop* for high school students, Mirzakoochak High school, Rash, Iran (2005)
- Member of a group to design an experimental course of physics called *Physics Highlights* for high school students (In cooperation with Noorafarin Inc.¹⁴) (2004)
- Member of referee consultants committee, Roozbeh Award, Physical Society of Iran¹⁵ (2003)
- Organizer and Director of *Three Days with Physics* (Workshop) for high school students, Mirzakoochak Highschool, Rasht, Iran (2004)
- Head of scientific association of undergraduate physics students at Sharif. (September 2007-January 2009)
 - This association is to promote B. Sc. students to carry out phenomenological researches.

7 Publications

- Repeating Microlensing Events Towards Galactic Bulge and Magellanic Clouds (in preparation)
- Amir Masoud Pourmoosa, Hamidreza Kaviani, “Do Maxwell Equations Suffice to Describe Classical Electrodynamics?”, Takaneh¹⁶ (Magazine of Physics Students at Sharif University of Technology), No. 13 (Fall 2007)
- Amir Masoud Pourmoosa, “Dirac’s Large Numbers Hypothesis,” (review article) Takaneh, No. 13 (Fall 2007)
- Amir Masoud Pourmoosa, “Iran’s Collaboration with CERN,” (report) Takaneh, No. 10 (Summer 2005)

¹²<http://www.anzalimathhouse.com>

¹³Detailed documentation of all workshops are available at my website (in Persian).

¹⁴<http://www.noorafarin.com>

¹⁵<http://www.psi.ir>

¹⁶<http://physics.sharif.edu/~takaneh/en/>

8 Lectures

- “Interpretation of repeating microlensing events,” Cosmology Group, Sharif University of Technology, October 2008
- “From Greek Mythology to Modern Physics,” Imam Khomeini Complex, Lavasan, Iran (Summer 2008)
 - This lecture was given to middle school students from deprived cities of Iran. I was free to lecture on any subject, and I decided to talk about history of science to make them understand the modern process of science progression. I based my lecture in parts on Jostein Gaarder’s popular book “Sophie’s World” and on Gerald Holton’s “An Introduction to Physics - Unit 1 Concepts of Motion”. I’m going to prepare this lecture for a Persian popular science journal.
- “Acoustical Structure of the Ear” (Part of my project in *Electrical Acoustics* course) Sharif University of Technology (Winter 2006)
- “A New Way to Measure the Speed of Sound,” (Part of my project in *Experimental Methods in Physics* course) Sharif University of Technology (Fall 2005)
- “Measuring the Distance to the Moon (An Introduction to General Relativity),” Shahid-Beheshti Highschool, Tehran, Iran (Fall 2006)
 - This lecture was based on Clifford Will’s book: *Was Einstein Right? Putting General Relativity to the Test*, Basic Books (1993)
- “Buoyancy and Archimedes’ principle,” Mirza-koochak Highschool, Rasht, Iran (Summer 2004)
- “Limiting Velocity,” Mirza-koochak Highschool, Rasht, Iran (Winter 2003)

9 Notable Courses Passed

- Astrophysics (Professor Bahmanabadi) (Textbook: Shu)
- Special Relativity (Professor Reza Mansouri)
- Advanced Statistical Physics (Textbook: Pathria) (Graduate Course)
- Biological Physics (Professor Ejtehadi) (Textbook: Nelson) (Graduate Course)
- Computational Methods in Physics (Professor Ejtehadi) (Graduate Course)

- This course which I took at the end of my undergraduate was an extremely rewarding experience for me. I had to write my own code for each topic during the course. I gained valuable experience in writing simulations of:
 - * Molecular Dynamic (MD)
 - * Chaotic Dynamics
 - * Random Integration Techniques
 - * Percolation
 - * Discontinuous Molecular Dynamics (DMD)
 - * Semi-Self-Avoiding Random Walk
 - * Fractal Growth
 - * Ising Model (Metropolis algorithms)
- Introduction to Philosophy of Science (Mostafa Taghavi)
- Epistemology (Pirooz Fatoorchi) (Graduate Course)
- Advanced Quantum Mechanics (Professor Langari) (Textbook: J. J. Sakurai) (Graduate Course)
- Advanced Topics in Gravitation (Professor Rahvar) (Graduate Course) (Without Registration)
- Introductory Cosmology (Professor Reza Mansouri)
- Advanced Cosmology (Professor Rahvar) (Textbook: Dodelson) (Graduate Course) (Without Registration)
- Linear Algebra (Professor Ranjbar) (Mathematics Department)

10 Teaching Experience

- Teacher of research projects in Allameh-Helli highschool¹⁷ for two semesters. (2007-2008)
 - I was head of two different classes, each consisted of 15 students, working on projects in groups of two or three. All projects involved computer simulation and it was my job to teach students basic methods of using computers to solve physical problems.
 - Allameh-Helli is considered as the most prominent highschool in Iran. Many of its students are honored with medals of international scientific olympiads.

¹⁷<http://www.schoolnet.ir/~helli/>

- I had the opportunity to cooperate with Anzali Math House for a two-month course of experimental physics. The audience were interested students who participated freely. I designed a set of experiments that they could do by their own in the class, to make them enjoy thinking in the way physicists do.
- I occasionally teach my classmates near exams. For example, I have taught Electricity and Magnetism, Quantum Mechanics and Analytical Mechanics. The feedback was always very positive.

11 Other Experience

- Computer Experience
 - Familiar with Linux Operating System (kernel 2.6)
 - * I do all of my daily work as well as computational tasks in Linux.
 - Familiar with programming in C++, FORTRAN and Visual Basic
 - * My first experience in programming was in qBASIC and Pascal. I learned to design Windows-based applications using Microsoft Visual Basic 6 when I was 15. I wrote some physical simulations such as "Equipotential Liner" (to draw equipotential lines of a electrostatic configuration), "Projectile Analyzer" (to simulate trajectory of projectiles in the presence of air drag and pressure variations) as well as my high school project DMD all using Visual Basic.
 - * In my third year of B. Sc. I took a course on Computational Physics with Dr. Reza Ejtehadi.¹⁸ The course covered Molecular Dynamic, Chaotic Dynamics, Random Integration Techniques, Percolation, Fractal Growth and Metropolis algorithms. Every student had to write his/her own code for each topic. I spend almost all of my time in that semester on the course and it was a great experience for me to learn advanced techniques of scientific simulation.
 - Familiar with parallel computing (MPI and OpenMP)
 - * I am familiar with setting up a cluster, writing programs in order to take advantage of MPI and OpenMP standards, and various fine-tuning techniques to increase efficiency of programs.
 - Familiar with Web design and administration (HTML, CSS, PHP, Javascript)
 - * I have experience in setting up websites using popular content management systems like WordPress, Joomla! and Plone, one example being homepage of cosmology group at Sharif University.

¹⁸<http://sharif.edu/~ejtehadi/lectures/Computational/Computational.htm>

- Familiar with Scientific softwares (Mathematica, GNU Maxima, gnuplot)
 - * I use Maxima frequently to do integrations and solve differential equations. In the case of plotting, I am an expert in gnuplot and use it to visualize my simulation results of any kind and to fit them to analytical functions. I have also some experience in MATLAB and Curve Expert.
- Familiar with typesetting in L^AT_EX
- Familiar with (and have contribution to) some Free/Open-Source software projects (OpenOffice.org, Ubuntu, theOpenDisc, ...)
- Writing Skills
 - I have many experiences in writing scientific texts. Especially I enjoy writing texts such as laboratory manuals, lecture notes etc. Additionally I have experience in writing journalistic articles that explain difficult ideas in simple language or introduce specialized topics to a wider audience. In this regard I have a continuous contribution to Wikipedia (mostly Persian version¹⁹), editing entries related to physics and mathematics.
- Other Technical Experience
 - Experience in working with printed circuit boards and building a permanent electronic circuit (patterning, drilling, soldering...).
 - Experience in working with breadboards and different electronic elements.
 - * One of my hobbies when I was near 14 was to explore technical books for interesting electronic circuits. I spend weeks to find exact elements of each circuit in local technical shops and assemble them and pack them in a professional-looking box.

12 Language Skills

- Persian: Native
- English: Fluent (TOEFL iBT score: 105 out of 120)
- Arabic: Modest
- German: Modest

¹⁹<http://fa.wikipedia.org>

13 Hobbies

- I am fond of teaching physics. I usually look for occasions to write or speak about physics, specially for highschool students.
- I enjoy reading books in a wide variety of topics. I read novels, philosophy, history and humanities. Furthermore, I am a great fan of Persian poetry including, but not limited to, Rumi and Khayam.
- I enjoy fiddling with softwares of any kind. I amuse myself exploring new versions of softwares, learning about new features, reading software reviews etc.
- I enjoy Ping-Pong, mountain climbing, and fishing.