

# Mojtaba Khodadadi

## Research Interests

Application of Machine Learning in Data Analysis, Computational Social Science, User & Human Behavior, Online Social Media Analysis, Spread of {mis}Information in Social Media, Social Physics, The Physics of Data, Complex Systems, Stochastic Processes, Statistical Physics of {Complex Networks, Social Systems, Financial Markets}, Econophysics, Computational Finance, Collective Phenomena in Complex Systems

## Education

- 2015 – 2016 **ICTP Postgraduate Diploma Programme in Physics**, *International Centre for Theoretical Physics (ICTP)*, Trieste, Italy.
  - Thesis: "Application of the Critical Variable Selection in Keyword Extraction". [abstract](#)
  - Supervisors: [Prof. Matteo Marsili](#).
- 2013 – 2015 **M.Sc. Condensed Matter Physics with Highest Distinction (Summa Cum Laude)**, *Isfahan University of Technology (IUT)*, Isfahan, Iran.
  - GPA: 19.15/20 (%96, 4.00/4.00), thesis grade: 19.5/20 (%98, 4.00/4.00).
  - Master's thesis: "Investigation of Epileptic Seizures by Analyzing EEG Data using Machine Learning". [abstract](#)
  - Supervisors: [Dr. Farhad Shahbazi](#) from *Isfahan University of Technology* & [Prof. Mohammad Reza Rahimi Tabar](#) from *Sharif University of Technology* and *Oldenburg University*.
- 2009 – 2013 **B.Sc. Physics with Distinction**, *Isfahan University of Technology (IUT)*, Isfahan, Iran.
  - GPA: 17.54/20 (%88, 3.78/4.00), and Major GPA: 17.82/20 (%90, 3.85/4.00).
- 2005 – 2009 **Diploma Mathematics & Physics**, *Saadi High School & Adle Pre-University School*, Isfahan, Iran.
  - Diploma GPA: 19.69/20 (%98, 4.00/4.00), and Pre-University GPA: 19.51/20 (%98, 4.00/4.00).

## Selected Honors and Awards

### Computer-related:

- 2013 **Merit-Based Admission Offer**, to Master's Program in both **Software Eng. and AI** without entrance exam, *School of Computer Engineering, Iran University of Science and Technology*, Tehran, Iran (declined).
- 2010 **Honored as Outstanding Researcher Activity**, *SBM Project*, President of IUT, Isfahan, Iran.
- 2010 **Institute of Steel Employee Support & Retirement Fund Award**, *SBM Project*, Chairman & CEO.
- 2009 **Ranked 2nd in 11th Iran's National Youth Kharazmi Award with the Statuette**, for "*Smart Bandwidth Manager (SBM)*" Project, Minister of Science, Research and Technology & Minister of Education, Iran.

### Physics-related:

- 2016 **PhD Admission Offer with 4-year Fellowship**, in both **Statistical Physics** and **Physics & Chemistry of Biological Systems** program, *International School for Advanced Studies (SISSA)*, Trieste, Italy (declined).
- 2010 & 2015 **Isfahan University of Technology Dean Award with the Statuette**, President of IUT, Isfahan, Iran.
- 2014 & 2015 **Ranked 1st, out of 70 Students**, in all Programs of M.Sc. Physics according to GPA, IUT, Isfahan, Iran.
- 2014 & 2015 **Ranked 1st, out of 33 M.Sc. Students**, in Condensed Matter Physics Program according to GPA, IUT.
- 2013 **Ranked 15th in 18th Iran's National Collegiate Scientific Olympiad**, among all B.Sc Physics Students of Nation, Iran.
- 2013 **Merit-Based Admission Offer**, to full-time Master's Program in **Physics** without Entrance exam, IUT, Iran.
- 2013 **Ranked 4th, out of 67 in Undergraduate Physics program**, according to GPA, IUT, Isfahan, Iran.

## Fellowships & Grants

- 2015 – 2016 **ICTP Scholarship and Travel Grant**, International Centre for Theoretical Physics, Trieste, Italy.
- 2013 & 2015 **Iran's National Elites Foundation 2-year Graduate Fellowship**, Government of Iran.
- 2010 & 2015 **University Outstanding Student Scholarship**, Isfahan University of Technology, Isfahan, Iran.
- 2014 **Isfahan University of Technology Research Grant**, for Master's Thesis, Isfahan, Iran.
- 2009 – 2013 **Iran's National Elites Foundation 4-year Undergraduate Fellowship**, Government of Iran.
- 2011 **Isfahan Science & Technology Town (ISTT) Research Grant**, for *eCMS Project*, Isfahan, Iran.
- 2010 **Iran's National Elites Foundation Research Grant**, for "*Smart Bandwidth Manager (SBM)*" Project, Vice President for Science and Technology, Government of Iran.

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## Invited Lectures

- Winter 2015 **Scientific Computing with Python: An Introduction to Data Analysis & High Performance Computing (16 hours)** , **at the age of 23**, for **graduate students of Physics**, Department of Physics, *Isfahan University of Technology (IUT)*, Isfahan, Iran. [more info](#). [invitation-certificate](#), [github](#).
- Winter 2014 **Python Short Course for Physics Students: An introduction to Scientific Computing (14 hours)** , **at the age of 22**, for **graduate students of Physics**, Electronic and Open Learning Center, *Isfahan University of Technology (IUT)*, Isfahan, Iran. [invitation-certificate](#), [github](#).
- Summer 2010 **Java Programming Course: from Novice to Professional (50 hours)**, **at the age of 18**, for **senior and graduate students of Computer Science & Engineering**, Electronic and Open Learning Center, *Isfahan University of Technology (IUT)*, Isfahan, Iran. [more info](#) [invitation-certificate](#).

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## Publications

- Sep 26 - Oct 2, 2015 M. Khodadadi, F. Shahbazi, "**Classification of Epilepsy Focus in Interictal and Ictal States**", *accepted for 20-minute presentation at Conference On Complex Systems 2015*, Arizona, USA. [link](#).
- In preparation M. Khodadadi, F. Shahbazi, "**PyMarkov: A Python Module for Markovian Stochastic Processes**".
- In preparation M. Khodadadi, F. Shahbazi, "**PyCorrState: A Python Package for Correlation States Extraction**".
- Current project M. Khodadadi, M. Akbarzadeh, M. Marsili, "**Study of the Network of Taxi Data in the City of Isfahan**".
- Current project M. Khodadadi, M. Marsili, "**Critical Variable Selection as a Keyword Selection Method**".

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## Research Experience

- Nov 2016 – Feb 2017 **Visiting Scientist**, working with *Prof. Matteo Marsili*, Quantitative Life Sciences section, International Centre for Theoretical Physics (ICTP), Trieste, Italy.  
Fields of research: Keyword Extraction, Data Analysis, Complex Systems, Statistical & Machine Learning, Text Mining.
  - Designing and building a keyword extraction tool based upon Critical Variable Selection (CVS).
- Sep – Oct 2016 **Visiting Researcher**, working with *Dr. Marzieh Zare*, School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.  
Fields of research: Data Analysis, Machine Learning, Computational Neuroscience, Complex Systems.
  - Identifying correlation states of the brains of 12 patients suffering language-based learning disorder (LLD).
- Sep – Nov 2016 **Visiting Researcher**, working with *Dr. Meisam Akbarzadeh*, Department of Transportation Engineering, Isfahan University of Technology, Isfahan, Iran.  
Fields of research: Data Analysis, Network Science, Public Transportation, Power Law Behavior.
  - Investigating taxi services data in the city of Isfahan and study dynamics of its network.
- May – Sep 2016 **Graduate Researcher (ICTP Diploma's Thesis)**, under supervision of *Prof. Matteo Marsili*, Quantitative Life Sciences section, International Centre for Theoretical Physics (ICTP), Trieste, Italy. [abstract](#).  
Fields of research: Keyword Extraction, Data Analysis, Complex Systems, Statistical & Machine Learning, Text Mining.
  - Implementing the Critical Variable Selection (CVS) algorithm in Python and Fortran via Stochastic Gradient Descent.
  - Designing and building a keyword extraction tool based upon CVS.
- 2014 – 2015 **Graduate Researcher (Master's Thesis)**, under supervision of *Dr. F. Shahbazi* and *Prof. M.R.R. Tabar*, Physics department, Isfahan University of Technology and Sharif University of Technology, Iran. [abstract](#).  
Fields of research: EEG Data Analysis, Machine Learning, Stochastic Processes, Complex Systems.
  - Identifying epilepsy seizures focus by correlation matrix and stochastic processes methods.
  - Investigating the possibility of seizure prediction using hierarchical clustering of correlation matrices of different parts of brain over time.
- 2011 – 2013 **Researcher**, Association of Efflorescence Creativity, Isfahan Science & Technology Town (ISTT), Isfahan.
  - Implementing an integrated **Electronic Content Management System (eCMS)** and upgrading **eLibrary** to **eCMS**.
- 2007 – 2011 **Researcher**, IT Center, Isfahan University of Technology (IUT), Isfahan, Iran.
  - Designing and implementing **Smart Bandwidth Manager (SBM)** core.
  - Developing, testing and debugging **SBM** v2.2.1.
- 2010 **Researcher**, Research Projects Office, Isfahan Science & Technology Town (ISTT), Isfahan, Iran.
  - Developing, testing and debugging **SBM** v2.1.1 .

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## Relevant Courses

- Postgraduate Program, ICTP Statistical Mechanics (E, %100), Numerical Methods (E, %100), Numerical Methods II (E, %100).  
E: Excellent. [grading system](#)
- M.Sc., IUT Computational Physics (20, %100), Advanced Statistical Mechanics (19.1, %96),  
Advanced Statistical Mechanics II containing structure & dynamics of complex networks and stochastic processes (20, %100). [grading system](#)
- B.Sc., IUT Computational Physics (20 out of 20, %100), Statistical Mechanics (20, %100), Biophysics (20, %100).
- Online Courses Machine Learning (A. Ng, Coursera), Probabilistic Graphical Model (D. Koller, Coursera).
- Apr – May 2016 Machine Learning & Markov Processes, [Spring College on the Physics of Complex Systems](#) at ICTP.

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## Computer Skills

**11 years' experience** in computer programming.

Java **8 years' experience**,

- Multithreaded Programming, Object Oriented Programming, Socket Programming, Web Scraping.
- JSP, JSF, Hibernate, Swing, JUnit, Log4j, GWT, NIO, Java Sockets, RegEx, iText, Servlets, Struts, JDBC.

Python **4 years' experience**,

- Scientific Computing.
- NumPy, Pandas, Matplotlib, Scikit-learn, SciPy, VPython, Dask, NetworkX, Graph-tool, Blosc, Bcolz.

Database MySQL, SQLite.

Software Gephi, Mathematica, Maple.

IDE & Editor Netbeans, IPython, Spyder, IEP IDE, PyScripter, Ninja IDE, Spyder, Eclipse.

Other Familiar with GIT, Fortran, C++, PHP, Javascript, AJAX, SQL, LaTeX.

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## Work Experience

2007 – 2011 **Java Developer**, *IT Center, Isfahan University of Technology*, Isfahan, Iran.

- Designing, Implementing, Developing and Supporting the **Electronic Library (eLibrary)**.
- Testing the **Smart Bandwidth Management (SBM)** on the IUT internet network.

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## Teacher Assistantship and Selected Presentation

Fall 2015 **Advanced Statistical Mechanics I (graduate course)**, *Instructor: Dr. J. Hashemifar*, Physics Dept., IUT.

Fall 2015 **Advanced Statistical Mechanics II (graduate course)**, *Instructor: Dr. F. Shahbazi*, Physics Dept., IUT.

Fall 2014 **Modern Physics**, *Instructor: Dr. F. Fazileh*, Physics Dept., IUT.

Fall 2015 **Monthly Presentation (in English)**, *Instructor: Dr. N. Seriani & Dr. O. Gonzalez*, Condensed Matter & Statistical Physics, ICTP, Trieste, Italy.

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## Long Projects

2008 – 2010 **Smart Bandwidth Manager (SBM)**, *IT Center, Isfahan University of Technology (IUT)*, Isfahan, Iran.

SBM is a dynamic network bandwidth management software that I and my friend have implemented at IT Center of IUT when we were high school students. **SBM saves 48,000\$ per year for Isfahan University of Technology.**

**Awards:** 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> award in **Honors & Awards** section and the last grant in **Fellowships & Grants** section are related to this project. I started working on this project **at the age of 16**. [more info](#)

2011 – 2013 **Electronic Content Management System (eCMS)**, *Isfahan Science & Technology Town (ISTT)*, Iran.

eCMS is a research project which its main task is extracting metadata from ebook files and checking them with LoC website for validity. It also uses Tesseract OCR technology for scanned ebooks.

**Awards:** 6<sup>th</sup> grant in **Fellowships & Grants** section is related to this project. [more info](#)

2007 – 2010 **Electronic Library (eLibrary)**, *IT Center, Isfahan University of Technology (IUT)*, Isfahan, Iran.

eLibrary enables users to search in metadata and subject of ebooks. **eLibrary was sold to two universities each paid 8000\$ (equals to 5 years' salary of one employee in Iran).** [more info](#)

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## Non-Academic Courses

Summer 2012 **Introduction to Market Research and Marketing**, Isfahan Science & Technology Town (ISTT), Isfahan.

Fall 2011 **Ideas and Opportunities**, Isfahan Science & Technology Town (ISTT), Isfahan, Iran.

Summer 2011 **Entrepreneurship**, SITCO International, NIIT Isfahan Center, Iran's National Elites Foundation (BMN).

April 2010 **Security & Hack**, Ashiyaneh Security Corporation, Tehran, Iran.

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## Conference Organization

January 2015 **12th Iran National Conference on Condensed Matter Physics**, *Member of Organization Committee*, Isfahan University of Technology, Isfahan, Iran.

September 2014 **International Iran Conferences on Quantum Information 2014 (IICQI)**, *Member of Local Coordinating Committee*, Sharif University of Technology and Isfahan University of Technology, Isfahan, Iran, [more info](#).

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## References

**Prof. Matteo Marsili**, *ICTP*, [marsili@ictp.it](mailto:marsili@ictp.it), +390402240461, Trieste, Italy.

**Dr. Farhad Shahbazi**, *IUT*, [shahbazi@cc.iut.ac.ir](mailto:shahbazi@cc.iut.ac.ir), +12268992370, Isfahan, Iran.

**Prof. Mohammad Reza Rahimi Tabar**, *Sharif University & Oldenburg University*, [mohammed.r.rahimi.tabar@uni-oldenburg.de](mailto:mohammed.r.rahimi.tabar@uni-oldenburg.de), +4915167310755, Oldenburg, Germany.

**Dr. Sebastiano Pilati**, *IUT*, [spilati@ictp.it](mailto:spilati@ictp.it), +390402240257, Trieste, Italy.

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