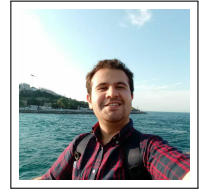


# Javad Ebadi

School of Physics, IPM, Farmanieh Ave.  
Tehran  
Iran

+98 (914) 326 1369  
✉ [javad.ebadi.1990@gmail.com](mailto:javad.ebadi.1990@gmail.com)  
📁 [javadebadi1990.github.io](https://github.com/javadebadi1990)



## Personal Information and Contact

First Name Javad  
Last Name Ebadi  
Date of Birth 09 September 1990  
Address School of Physics, Institute for Research in Fundamental Sciences (IPM), next to Kouhe Nour Building, Farmanieh Ave.  
Primary Email [javad.ebadi.1990@gmail.com](mailto:javad.ebadi.1990@gmail.com)  
Email [javad.ebadi.1990@gmail.com](mailto:javad.ebadi.1990@gmail.com) , [javadebadi@ipm.ir](mailto:javadebadi@ipm.ir), [javad.ebadi@cern.ch](mailto:javad.ebadi@cern.ch)  
Github <https://github.com/javadebadi>, <https://github.com/javadebadi1990>

## Education

2015–2020 **PhD in Particle Physics**  
Institute for Research in Fundamental Sciences (IPM), Tehran, Iran  
GPA 18.26/20  
Thesis Top quark as a tool to probe new physics  
Adviser Mojtaba Mohammadi Najafabadi  
2013–2015 **MSc in Physics (Gravity)**  
Sharif University of Technology, Tehran, Iran  
GPA 18.9/20  
Thesis Horizons of a radiating cosmological black hole  
Advisers Reza Mansouri, Javad Taghizadeh Firouzjaee  
2010–2013 **BSc in Physics**  
Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran  
GPA 16.51/20  
Project Quantum mechanics in curved spacetime  
2008–2010 **BSc in Mechanical Engineering**  
Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

## Research Interest

- **Data Science and Machine Learning**
- **Particle Physics Phenomenology:** Beyond the Standard Model (BSM) searches at colliders, Axion-like particles, Dark Matter, Higgs physics, Top quark physics
- **Experimental Particle Physics**
- **Machine Learning in Physics:** Top tagging, Quark/gluon jet discrimination

- **Cosmology**

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## Research Experience

- 2019 I was involved in CMS experiment at CERN for 5 months. The analysis was "single top plus photon" channel. The job was made up of a few parts. The first part was writing an analysis code in which I used the 2016 data to write and debug my code. I wrote my codes in C++, Python and Bash. The link for my code is available [here](#). Since the CMS experiment constantly updates its criteria for analysis, I have written a code such that it can be easily updated and adapted to situation. The other part of the job was about reading data from CMS database which was being done using CMS experiment tools.
- 2018-2019 Axions and axion-like particles are well motivated particles in many beyond the Standard Model scenarios. In collaboration with my supervisor and Sara Khatibi, we suggested new channels to study these models at the HL-LHC. Our results showed that LHC searches for axions is complementary to low energy experiments. The simulation and analysis process was similar to my previous works.
- 2017-2018 My first job in numeric calculation and collider phenomenology was about same sign tops in FCNC models. I learned MadGraph and generated sample of events for various couplings at the LHC. I used Pythia to shower and hadronize. Then, passed the events to Delphes for detector simulation in CMS detector. The analysis of events was done using root-cern data analysis framework. I did statistical inference to set bounds on parameters of the new physics model.
- 2016-2017 For part of my qualification exam in PhD, I reviewed Dark Matter (DM) physics. I reviewed theoretical topics such as DM production in the early Universe, thermal freeze-out, freeze-in and calculated analytical formulas related to them. The DM detection methods including collider searches, direct and indirect detection. The PDF file of the review could be found in [here](#).
- 2015 In my MSc thesis, I was working on theoretical physics. The problem was about the horizons of a black hole which was radiating. I have used xAct to do some tensor calculation. The xAct is a very powerful Mathematica package with a tremendous ability to do analytical tensor calculation. I was computing the rate of Hawking radiation for various vacuum of black holes.

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## Teaching Experience

- 2018 **MadGraph software for Monte Carlo simulation.** The link for videos of this lecture are [here](#) in Persian.
- 2018 **root-cern data analysis framework.** The link for videos of this lecture are [here](#) in Persian.
- 2019 **High School Physics.**
- 2019-2020 **Data Science with Python.**

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## Social Media Experience

2017-now **Administrator of a social media channel for particle physics.** In September 2017, I created a Telegram (Social Media app) channel to post important arXiv papers, news and other related topics to particle physics such as machine learning. A few months later, my friend, Majid Ekhterachian from the University of Maryland, joined the channel as an administrator. Our channel has over 280 subscribers which are mainly graduate students and faculties in physics. The contents are in Persian and English languages and our mission is to spread news about particle physics in our country. The link for this media is [here](#).

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## Publications

- **On the effective couplings of Higgs**  
In preperation
- **Standard Model Physics at the HL-LHC and HE-LHC HL-LHC Collaboration and HE-LHC Working Group**  
(P. Azzi et al.).  
Feb 11, 2019. 219 pp.  
[CERN-LPCC-2018-03](#)
- **New probes for axionlike particles at hadron colliders**  
Javad Ebadi, Sara Khatibi, Mojtaba Mohammadi Najafabadi.  
Jan 10, 2019. 11 pp.  
[DOI: 10.1103/PhysRevD.100.015016](#)
- **Performance of fully-connected neural networks for top tagging**  
Javad Ebadi, Daruosh Haji Raissi  
26th IPM Physics Spring Conference
- **Same-sign top pair plus W production in flavor changing vector and scalar models**  
Javad Ebadi, Fatemeh Elahi, Morteza Khatiri, Mojtaba Mohammadi Najafabadi.  
Jun 9, 2018. 15 pp.  
[DOI: 10.1103/PhysRevD.98.075012](#)

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## Computer skills

- **Programming Languages:** C/C++ (**4 years of experience**), Python, Java, Bash scripting
- **Version Control Systems (VCS):** Git, Github
- **Notebooks:** Jupyter-Notebook
- **Operating Systems (OS):** Unix/Linux, Windows, Android
- **Computational Softwares:** Wolfram Mathematica, MATLAB/Octave
- **Particle Physics Packages (Theory):** FeynRules, FeynCalc
- **Particle Physics Packages (Numeric):** MadGraph (event generation), Delphes (detector simulation), root-cern (data analysis)

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## Data Science and Machine Learning Skills

Portfolio Since August 15, 2019, I create a portfolio for data science and machine learning [here](#).

- **Story Telling and Writing Reports**
- **Getting Data**

- **Data Cleaning and Pre-processing**
- **Data Visualization:** matplotlib (Python), seaborn (Python), Mathematica, root (C++)
- **Data Analysis:** numpy (Python), pandas (Python), root (C++)
- **Statistics:** Probability, inference, estimation, confidence level, hypothesis test
- **Machine Learning:** scikit-learn, keras, tensorflow
- **Machine Learning Algorithms:** linear regression, logistic regression, boosted decision trees (BDT), support vector machines (SVM), k-nearest neighbors (kNN), k-means, principal component analysis (PCA), neural networks (NN), deep neural networks (DNN), convolutional neural networks (CNN), anomaly detection, recommender systems
- **Machine Learning Concepts:** linear algebra, calculus, supervised learning, unsupervised learning, reinforcement learning, forward propagation, backward propagation, loss function, cost function, optimizers, adam optimizer, gradient descent, stochastic gradient descent, hyper-parameter optimization, SVM kernel, convolution, transfer learning, metrics, precision, recall, confusion matrix, F1 score, ROC, AUC

## Selected Physics Coursework

- Mathematical Physics I (18.9/20)
- Classical Mechanics (17.5/20)
- Advanced Quantum Mechanics (19.5/20)
- General Relativity (18.0/20)
- Quantum Field Theory I (18.0/20)
- Mathematical Physics II (20.0/20)
- Advanced Electrodynamics (18.0/20)
- Advanced Statistical Mechanics (20.0/20)
- Particle Physics (16.5/20)
- Quantum Field Theory II (18.5/20)

## Certificates

- 2017 **The Unix Workbench** by Johns Hopkins University on Coursera. Certificate earned at Wednesday, September 11, 2019 1:41 AM GMT (91.8%) ([Link](#))
- 2018 **Machine Learning** by Stanford University on Coursera. Certificate earned at Thursday, September 26, 2019 1:15 AM GMT (98.4%) ([Link](#))
- 2019 **Neural Networks and Deep Learning** by deeplearning.ai on Coursera. Certificate earned at Monday, October 21, 2019 11:13 AM GMT (100%) ([Link](#))
- 2019 **What is Data Science?** by IBM on Coursera. Certificate earned at Friday, November 22, 2019 3:21 PM GMT (99%) ([Link](#))
- 2019 **Python for Data Science and AI** by Joseph Santarcangelo, IBM on Coursera. Certificate earned at Sunday, November 24, 2019 5:11 PM GMT (100%) ([Link](#))

## Selected Seminars and Talks

- **New Probes for Axion-like Particles at Hadron Colliders** (IPM - 2019)
- **New Probes for Axion-like Particles at Hadron Colliders** (3rd International Turkey-Iran Joint Conference on LHC Physics - 2019)
- **Same-sign top pair plus W production in flavor changing vector and scalar models** (Two days workshop on particle physics - Shahid Beheshti University - 2018)
- **Same-sign top pair plus W production in flavor changing vector and scalar models** (IPM - 2018)
- **Dark Matter Detection Methods** (IPM - 2017)

- **Topological Defects in Cosmology** (IPM - 2017)
- **Quantum Aspects of Black Holes** (Sharif University of Technology - 2015)
- **What is Life?** (Philosophy of Science Department., Sharif University of Technology - 2014)

## Selected Schools, Workshops and Conferences (Attended)

- IPM Workshop on Particle Physics Phenomenology (IWPPP) (IPM - 2019)
- IPM Workshop on Particle Physics Phenomenology (IWPPP) (IPM - 2018)
- Second Iran & Turkey Joint Conference on LHC Physics (IPM - 2017) Summer School on Particle Physics (ICTP - 2017)
- IPM Workshop on Particle Physics Phenomenology (IWPPP) (IPM - 2017)
- Summer School on Cosmology (ICTP - 2016)
- Recent Trends in String Theory and Related Topics (IPM - 2016)
- IPM school and conference on Particle Physics (IPP15): Neutrino physics, dark matter and B-physics (IPM - 2015)

## English Test Scores

TOEFL(2016) 100/120

| skill | Reading | Listening | Speaking | Writing |
|-------|---------|-----------|----------|---------|
| score | 28/30   | 28/30     | 22/30    | 22/30   |

## Languages

- **Persian** (Native)
- **English** (Advanced)
- **Azerbaijani** (Native)
- **Arabic** (Novice Low)
- **Turkish** (Novice High)
- **German** (Beginner)

## Awards and Honors

- 2019 Invited speaker to Iran-Turkey joint LHC conference with full support fund in Turkey
- 2017 Iran's National Elites Foundation Award for doing a scientific project in lieu of the compulsory military service
- 2017 Invited to participate in ICTP particle physics summer school with full support fund in Italy
- 2016 Invited to participate in ICTP cosmology summer school with half support fund in Italy
- 2014 Iran's National Elites Foundation Award
- 2015 Top 5 participants in Scientific Olympiad for University Students in Physics, Iran
- 2013 Ranked 10 among 6000 participants in the Nationwide Graduate Entrance Exam in Physics, Iran
- 2008 Ranked 418 (12 by region) among 319,259 participants in the Nationwide University Entrance Qualification Test (similar to SAT)
- 2007 Qualified for the **final** stage of the National Mathematical Olympiad, Iran

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## References

### **Mehdi Golshani**

Professor, Physics Department, Sharif University of Technology, Tehran, Iran.

E-mail: [mehdigolshani@yahoo.com](mailto:mehdigolshani@yahoo.com)

### **Mojtaba Mohammadi Najafabadi**

Professor, School of Particles and Accelerators, Institute for Research in Fundamental Science (IPM), Tehran, Iran.

E-mail: [mojtaba.mohammadi.najafabadi@gmail.com](mailto:mojtaba.mohammadi.najafabadi@gmail.com)

### **Javad Taghizadeh Firouzjaee**

Assistant professor, Khajeh Nasir Toosi University of Technology, Tehran, Iran.

E-mail: [taghizade.javad@gmail.com](mailto:taghizade.javad@gmail.com)

### **Fatemeh Elahi**

PostDoc, School of Particles and Accelerators, Institute for Research in Fundamental Science (IPM), Tehran, Iran.

E-mail: [elahi.f7@gmail.com](mailto:elahi.f7@gmail.com)

### **Mortaza Khatiri Yanehsari**

PostDoc, School of Physics, Institute for Research in Fundamental Science (IPM), Tehran, Iran.

E-mail: [mortaza.khatiri@gmail.com](mailto:mortaza.khatiri@gmail.com)

### **Sara Khatibi**

Assistant professor, University of Tehran, Tehran, Iran.

E-mail: [sara.khatibi@ut.ac.ir](mailto:sara.khatibi@ut.ac.ir)

### **Kazem Azizi**

Assistan Professor, University of Tehran, Tehran, Iran.

E-mail: [kazem.azizi@ut.ac.ir](mailto:kazem.azizi@ut.ac.ir)