Mohammadreza Ebrahimi Khuzani

Department of Physics, Isfahan University of Technology, Isfahan, Iran
Email: m.reza.ebrahimi1995@gmial.com
Website: mohammadreza-ebrahimi.github.io
Phone Numbers: (+98) 936 402 5670
Born on 6 April 1995, Isfahan, Iran

EDUCATION

CERN Summer School. Machine Learning in High Energy Physics   2021
The École Polytechnique Fédérale de Lausanne (EPFL),
Lausanne, Switzerland
Certificate of Excellence, +4 ECTS Credits of EPFL

M.Sc. Particle Physics and Fields Theory   2018 - 2021
Isfahan University of Technology (IUT), Isfahan, Iran
(The only member of the CMS experiment in Iran - Ranked 2nd among Iranian universities in physics according to U.S.News)
GPA: 17.21/20 (Before Covid-19)
Thesis Title: Thermodynamic geometry of pure Lovelock black holes and investigation of Friedmann equations by the first law approach. (**19.4/20**)
Supervisor: Prof. Behrouz Mirza, **Advisor:** Dr. Ahmad Shirzad

B.Sc. Atomic and Molecular Physics   2013 - 2018
Semnan University, Semnan, Iran
GPA (Major): 15.11/20
Supervisor: Dr. Merhad Ghominejad

RESEARCH INTERESTS

Machine Learning and Data Analyze
Black Hole Thermodynamic , Particle Physics
Cosmology (Theoretical/Experimental)

PUBLICATIONS

- M. Ebrahimi Khuzani, B. Mirza and M. Tavakoli Kachi, '(In press)' ,"*Thermodynamic Geometry of Pure Lovelock Black Holes*", Int. J. Mod. Phys. D, doi: 10.1142/S0218271822500973.

- M. Tavakoli, **M. Ebrahimi Khuzani**, R. B. Mann "*Joule-Thomson Expansion **** *", 2021. (In Prep.)

- **M. Ebrahimi Khuzani**, B. Mirza and M. Tavakoli Kachi "*First Law of Thermodynamic *****", 2021. (To be Submitted)

- **M. Ebrahimi Khuzani**, B. Mirza "*Joule-Thomson Expansion **** *", 2021. (In Prep.)

AWARDS AND HONORS

Achieved 1st Ranked Among Graduating Class   2020
Isfahan University of Technology

Awarded Full Scholarship From Isfahan University of Technology   2018

Ranked Within The Top 2% Among More Than 20,000 Participant   2018
In Iranian university entrance exam for Masters degree in physics

Selected as The Most Active Student in Science and Teamwork   2016
Semnan University

Ranked Within The Top 5% Among More Than 300,0000 Participant   2013
In Iranian university entrance exam for Bachelors degree in physics

Succeeded as 5$^{\text{th}}$ ranked in Router Robot   2009
Provincial competition

Awarded 1$^{\text{st}}$ Ranked in Painting Art, Watercolor   2006
Provincial competition

EXPERIENCES   **Research Experience**
- Developed **Machine learning** code with python to identify the   2021
  Signal and Background using ATLAS experiment's data
  (CERN public datasets)
  ○ github.com/mohammadreza-ebrahimi/ATLAS-Higgs-Train
- Optimized **Machine learning** code to predict the electron   2021
  invariant mass
  (CERN public datasets)
  ○ github.com/mohammadreza-ebrahimi/CERN-collision-data
- Investigated 1D-Ising model to minimize MSE for predicting   2021
  the spins interactions by **machine learning**
  ○ github.com/mohammadreza-ebrahimi/1D-Ising-model
- Reviewed datasets of chemical compounds properties to predict   2021
  the G_0W_0 band-gaps by developing **machine learning** code
  ○ github.com/mohammadreza-ebrahimi/band-gap
- Implemented an **xAct** code to derive 5-d and 4-d   2021
  Schwarzschild and BTZ solution
  ○ github.com/mohammadreza-ebrahimi/Schwarzschild-xAct
- Data analyze with Python and ROOT, M. Ebrahimi Khuzani,   2021
  Dr. M. Tavakoli
- Discovered anisotropic temperature and cosmological horizon in   2020
  anisotropic cosmology
- Analyzed higher dimension rotating black holes solution by novel   2020
  theory of deriving rotational black holes metric, M. Ebrahimi Khuzani
  and A. Aghababei.
- Investigated the first law of thermodynamic in Bianchi Type I   2020
  cosmology
- Examined holographic equipartition in Binachi Type I cosmology   2019

Teaching Experience

- Lectured xAct, diffgeo and grTensor package for almost 20 researcher in 4 sessions. (IUT-MEET) 2019 - Now
- Guided Mathematica and MAPLE for 3 general relativity projects 2019 - Now
- English language, physics and mathematics 2018 - 2019

Work Experience

- Assistant director of Semnan physics association, holding *Physics Day* with about 200 participant, experiments instructor 2014 - 2015
- Managed 80 percent of iOS software fixing 2013 - 2015
- Created artwork on wood as handicrafts 2005 - 2010

SKILLS

Computer and Technical Skills

Programming

Python, Shell & Bash scripting, C/C++ Professional

Software

MadGraph5, Mathematica, xAct and diffgeo (3 years of experience), MAPLE and grTensorIII, PowerPoint, Office Word Professional

Notation, Computation and Quantized Hamilton Dynamics package in Quantum-Mathematica Intermediate

Operating System

Unix/Linux, Windows, Mac OS, iOS, Android Professional

Version Control System (VCS)

Git, GitHub Professional

Notebooks

Jupyter-Notebook, Kaggle Professional

Document Preparation

LaTeX, Excel, Microsoft Office Word, PowerPoint Professional

Languages Skills

Persian: Native

English: Professional

Arabic: Limited Working Proficiency

Data Science and Machine Learning Skills

I have created a portfolio for introduction to machine learning here.
Data Analysis, Simulation & Visualization

Python: NumPy, Pandas, SciPy, Matplotlib, Seaborn
C++: ROOT
Mathematica, Maple, MadGraph5

Data Visualization
Matplotlib (Python), Seaborn (Python), Mathematica, Maple

Machine Learning and Deep Learning
Scikit-learn, PyTorch, TensorFlow

Machine Learning Algorithms
Linear regression, Ridge regression, LASSO regression, Elastic Net, Decision tree regressor and classifier, Random forest regressor and classifier, Stochastic Gradient Descend (SGD), k-Nearest Neighbors (kNN), Principal Component Analysis (PCA), Batch GD, k-Means, t-distributed Stochastic Neighbor Embedding (t-SNE), Mini Batch GD, Support Vector Machine (SVM), Logestic Regression, Softmax Regression, Deep Neural Network (DNN), Neural Network (NN), Convolutional Neural Networks (CNN), Bayesian Neural Network, GANs, Advanced GANs

Machine Learning Concepts
Linear algebra, Calculus, Supervised learning, Unsupervised learning, Reinforcement learning, Loss function, Cost function, Data engineering, Optimizer, Adam optimizer, Gradient descent, Gradient Descent (GD), Singular Value Decomposition (SVD), Hyperparameter optimization, SVM kernel, Metrics, Precision, Recall, F1 score, Confusion matrix, Sparse matrix

ACADEMIC PROJECTS	Mohammadreza Ebrahimi, *"Holographic Equipartition and Friedman Equations"*, Prof. Behrouz Mirza, Isfahan University of Technology, Winter 2019
	Mohammadreza Ebrahimi, *"Mind Effects on Matter"*, Prof. Mehrdad Ghomi Nejad, Semnan University, Fall 2016
	Mohammadreza Ebrahimi, *"Developed and implemented a random number creator for investigating experimental mind effects."*, Prof. Mehrdad Ghomi Nejad, Semnan University, Fall 2016
	Mohammadreza Ebrahimi, *"Investigated Philosophical Concepts of Physics and Quantum, Analyzed 5 books"*, Semnan University, Fall 2015
	Mohammadreza Ebrahimi and N.Tajick, *"Condensed Matter and Thin Film"*, Dr. Fatemeh Shariatmadar Tehrani, Semnan University, Spring 2017
WORKSHOPS & SEMINARS	Virtual Visit of **CMS experiments at LHC** 21st Sep Prof. A. Jafari, Prof. H. Bakhshian, and Prof. R. Goldouzian
	Sixteenth **Marcel Grossmann Meeting** 5th-10th July 2021

Online

Workshop of **Introduction to Git and GitHub**   23rd Feb-9th Mar 2021
Dr. J. Ebadi, IPM, Tehran, Iran

Workshop of **Machine Learning and Data Analysis**   1st Jan-30th Mar-2021
Dr. M. Alaei, Isfahan University of Technology, Isfahan, Iran

Seminar on **Where is CERN and What is LHC?**   5th-10th Feb 2017
Dr. A. Khorramian, Semnan University, Semnan, Iran

SELECTED
COURSES

General Relativity (18.3/20)	Physics Laboratory I (17.6/20)
Adv. Particle Physics I (18/20)	Physics Laboratory I (19.5/20)
Adv. Particle Physics II (17.5/20)	Optic Laboratory (17/20)
Electrodynamics (17.2/20)	Quantum Mechanic (18.5/20)
Adv. Quantum Mechanics (17.5/20)	General Chemistry (17/25/20)
Seminar (19/20)	English Language (20/20)
Fundamental Physics (18/20)	Family and Population (20/20)

REFERENCES   **Behrouz Mirza**
Professor, Physics Department, Isfahan University of Technology, Isfahan, Iran
Email: b.mirza@iut.ac.ir

Ahmad Shirzad
Associate Professor, Physics Department, Isfahan University of Technology, Isfahan,
Iran
Email: shirzad@theory.ipm.ac.ir

Mehrdad Ghominejad
Associate Professor, Physics Department, Semnan University, Semnan, Iran
Email: mghominejad@semnan.ac.ir

Masoumeh Tavakoli
Researcher, Isfahan University of Technology, Isfahan, Iran
Email: tavakoli.phy@gmail.com