Meisam **Ghasemi Bostanabad**

HIGH ENERGY PHYSICIST · MACHINE LEARNING ENTHUSIAST

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"The good thing about science is that it's true whether or not you believe in it. (Neil Tyson)"

Summary

I am an experimental particle physicist involved with the ATLAS and CMS collaborations at the particle group in IPM. My research focuses on searching for signs of physics beyond the Standard Model, with a particular interest in Electroweak and Strong Supersymmetry with hadronic final states. I am also passionate about classical and quantum machine learning applications in accelerators and detectors, boosted object reconstructions, and data quality in ATLAS sub-detectors. When I am not busy trying to prove the existence of SUSY, I spend time developing web applications with new front-end frameworks such as React.

Education

University of Victoria — *Victoria, Canada*

PH.D. HIGH ENERGY PHYSICS, JUSTIN ALBERT AND MAXIMILIAN SWIATLOWSKI — *Jan. 2015 - May. 2021*

- Dissertation: Search for Supersymmetry in final states with multiple bottom quarks with the ATLAS detector. CERN Document Server record: 2727954.

Sharif University of Technology, Institute for Research in Fundamental Sciences (IPM) — *Tehran, Iran*

M.S. HIGH ENERGY PHYSICS, HESSAMADDIN ARFAEI AND SAEID PAKTINAT — *Mar. 2012 - Aug. 2014*

- Dissertation: Multijet background estimation using M_{T2} method in third generation Supersymmetry search.

University of Tehran — *Tehran, Iran*

B.S. NUCLEAR PHYSICS, HAMIDREZA MOSHFEGH — *Jan. 2008 - July. 2012*

Research Interests

High Energy Physics, Physics Beyond the Standard Model, Classical and quantum Machine Learning application in analysis and hardware, Strong Inclusive and Electroweak Supersymmetry, Reconstruction of Boosted Object and Higgs Boson„ Hadronic Final States, Detector Data Quality, Web Front-end Developing.

Professional Experience

Institute for Research in Fundamental Sciences (IPM) - Postdoc — *Tehran, Iran*

RESEARCHER, HIGH ENERGY PHYSICS, MOJTABA MOHAMMADI — *April. 2022- Present*

- Performing machine learning analysis for discovery of top quark neutral currents flavor-changing. Several machine learning classifiers with tuned hyperparameters used to discriminate signal and backgrounds. Statistical packages are then applied to compute 95% confidence level upper limits on the new physics scale. Signal and background events are generated within the CERN grid via Monte-carlo simulations. Github link
- Applying classical and quantum machine learning models for jet discrimination. The research involves developing advanced algorithms like convolutional neural network, quantum support vector, and variational quantum classifier to improve the identification and classification of jets in high-energy physics experiments. Github link
- Conducting anomaly detection for Dynamic Aperture simulations. Using machine learning models to recognize and flag anomalies in the Iranian Light Source Facility, helping accelerator operators optimize beam parameters. The models rely on data from particle tracking simulations and include information on particle positions and momenta.
- Predicting the factors affecting students' GPA and tuition-paying in the higher education system using machine learning algorithms (optimized regression and classification models). The statistical population in this research consists of all students from the top 10 universities in Tehran over the last five years. Github link

University of Victoria - PhD
Victoria, Canada

PH.D. HIGH ENERGY PHYSICS, JUSTIN ALBERT
Jan. 2015 - May. 2021

- Deployed a preliminary BDT tau reconstruction algorithm in new physics search for SUSY with stop to stau decay. SUSY stop to stau analysis contact member to deliver and deploy recommendations from tau combined performance group.
- Main analyzer for physics search in strong inclusive SUSY with multiple b-jets. Worked on trigger efficiency, analysis data-MC request, QCD estimation, theory systematic estimation for the dominant backgrounds, unblinded fit results in cut-and-count approach, and comparison study of truth- and reconstructed-level of Neural-net weights.
- Analyzer for physics search in electroweak SUSY with multiple b-jets. Worked on Higgs reconstruction technique using b-jet properties, development of analysis framework, implementation of different M_{T2} variables in analysis ntuple, truth-level study, and theory systematic estimation for the dominant backgrounds.
- Developer of python framework to monitor offline conditional and unconditional noisy channels in ATLAS runs. This framework is updated in order to connect with the LTTNK (Liquid Argon trigger tower noise killer) package and provide fully noisy channel report (both offline and online).
- Done 6 blocks of ATLAS Calo desk shift and 2 blocks of Calo software on-call during ATLAS 2017 data taking.
- Editor of internal supporting documentations for the SUSY strong and SUSY electroweak multi-b analyses for full ATLAS run2.
- One of the core instructors for the virtual ATLAS-Canada Masterclass in 2021. The annual ATLAS-Canada Masterclass event includes both presentation and analysis portions which tutors are supposed to guide students to analyse ATLAS datasets (including Higgs decay to $b\bar{b}$ events).

Sharif University of Technology - M.S.
Tehran, Iran

M.S. HIGH ENERGY PHYSICS, HESSAMADDIN ARFAEI, SAEID PAKTINAT
Jun. 2017 - May. 2018

- Performing physics studies for SUSY stop to top jet analysis. Worked on M_{T2} interpretation and ABCD method to compute multi-jet background. The results are shown in M.S. dissertation.

Teaching Assistant

COURSES

2020	**PHYS 321A,** Classical Mechanics I		*Fall Term*
2019	**PHYS 326,** Electricity and Magnetism		*Winter Term*
2019	**PHYS 314,** Nuclear Physics and Radioactivity		*Fall Term*
2018	**PHYS 111,** Introductory Physics II		*Fall Term*
2016	**PHYS 323,** Quantum Mechanics I		*Fall Term*

Selected Talks and Posters

⚲ ATLAS Canada Workshop
Ottawa, Canada

SEARCH FOR SUSY IN STOP TO STAU DECAY CHANNEL WITH FULLY HADRONIC FINAL STATE
May. 2016

⚲ ATLAS Liquid Argon Week
CERN

DEVELOPMENT OF THE UPD AND LTTNK PACKAGES (OFFLINE AND ONLINE NOISE TAGGERS)
Jul. 2017

⚲ Canadian Association of Physics Conference (poster)
Vancouver, Canada

SEARCH FOR STRONG AND ELECTROWEAK SUSY WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS
June. 2019

⚲ International Symposium on Lepton Photon (poster)
Toronto, Canada

SEARCH FOR SUSY WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS (79 fb^{-1})
August. 2019

⚲ Canadian Association of Physics Conference
Virtual Platform

SEARCH FOR SUPERSYMMETRY WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS (139 fb^{-1})
June. 2020

⚲ SUSY Week
Virtual Platform

DEVELOPMENT OF CUT-AND-COUNT APPROACH IN SUSY ANALYSES
June. 2020

⚲ 40th International Conference on High Energy Physics

SEARCH FOR SUSY WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS IN ATLAS (139 fb^{-1})) *July. 2021*

Selected Papers

⚲ Journal of Instrumentation

THE ATLAS EXPERIMENT AT THE CERN LARGE HADRON COLLIDER: A DESCRIPTION OF THE DETECTOR CONFIGURATION FOR RUN 3 *May. 2023*

⚲ The European Physical Journal C

SEARCH FOR SUPERSYMMETRY IN FINAL STATES WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS IN PROTON-PROTON COLLISIONS AT $\sqrt{s} = 13$ TeV WITH THE ATLAS DETECTOR *November. 2022*

⚲ PHYSICAL REVIEW D

SEARCH FOR BOTTOM-SQUARK PAIR PRODUCTION IN PROTON-PROTON COLLISION EVENTS AT $\sqrt{s} = 13$ TeV WITH HADRONICALLY DECAYING τ LEPTONS, BB-JETS AND MISSING TRANSVERSE MOMENTUM USING THE ATLAS DETECTOR *Aug. 2021*

⚲ The European Physical Journal C

SEARCH FOR SUPERSYMMETRY IN FINAL STATES WITH MISSING TRANSVERSE MOMENTUM AND THREE OR MORE B-JETS IN 139 fb^{-1} OF PROTON-–PROTON COLLISIONS AT $\sqrt{s} = 13$ TeV WITH THE ATLAS DETECTOR *Nov. 2022*

⚲ PHYSICAL REVIEW D

SEARCH FOR ELECTROWEAK SUPERSYMMETRY IN FINAL STATES WITH MISSING TRANSVERSE MOMENTUM AND MULTIPLE B-JETS IN PROTON-PROTON COLLISIONS AT $\sqrt{s} = 13$ TeV WITH THE ATLAS DETECTOR (139 fb^{-1}). (ANALYSIS IS IN THE SECOND DRAFT CIRCULATION) *2024*

⚲ I am an ATLAS author and a full list of publications is available in INSPIRE.

Languages

Persian (fluent), Turkish (fluent), Arabic (elementary), English (advance), French (elementary - A1 level).

Programming Languages

C, C++, Python, Matlab, Qiskit, LATEX, HTML, CSS, MySQL, PHP, JavaScript, JSON, Continuous Integration, Version Control, GitHub/GitLab.

Computing Packages

ROOT, NumPy, SciPy, pyhf, uproot, root numpy, rootpy, PyROOT, HistFitter, Matplotlib, pandas, Keras, scikit-learn, TensorFlow, Qiskit Machine Learning, Docker, Git, NodeJS, jQuery, Bootstrap, React.

Skills

Effective communication, public speaking, collaboration, project management, mentoring, adaptability, flexibility, cooking, fitness.