Hammad
Rasheed

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"The only way to do great work is to love what you do." - Steve Jobs

Education

- **2021 - In Progress**: PhD in Elementary Particle Physics, Faculty of Physics, University of Bucharest, Magurele, Romania
- **2018 - 2021**: Master of Philosophy (M.Phil) in High Energy Physics, Center for High Energy Physics, University of the Punjab, Lahore, Pakistan
- **2016 - 2018**: Master of Science (M.Sc.) in Computational Physics, Center for High Energy Physics, University of the Punjab, Lahore, Pakistan

Research Activities

PhD Research

- **ATLAS Performance Studies**
  1. **ATLAS Qualification Task: Electron reconstruction efficiencies measurements**
     - I applied the established measurement methodology for electron reconstruction efficiency within the new Tag and Probe framework for Run 3, performing detailed measurements using both reprocessed Run 2 data and initial Run 3 data. Additionally, I contributed to the development of common software for measuring electron efficiencies, including identification, with 72 commits made to the Tag and Probe Git repository, facilitating improved accuracy and consistency in electron efficiency measurements across different datasets.
  2. **Rate of fake tracks in dense environments**
     - I completed the measurements of the fake tracks for the entire Run 2 dataset, thoroughly verifying and finalizing the associated statistical uncertainties. In addition to this, I contributed to the maintenance of the common software used in our analysis by fixing bugs, improving various scripts, and enhancing the visual quality of the plots, ensuring smoother and more accurate data representation.

- **Physics Analyses**
  1. **Constraining the 19D pMSSM over full Run2 SUSY analyses**
     - I contributed to this analysis by first generating models sensitive to both strong and electroweak SUSY. I also did a detailed constraints study to identify the most recent results and relevant constraint ranges; I executed the scan in multiple stages, submitting grid jobs and ensuring smooth execution by addressing any errors. I refined the models to their final form and generated exclusion plots. Furthermore, I compiled and integrated the results into the official ATLAS internal note.
  2. **Expanding the gluino exclusion limits using events with one highly energetic final state jet and missing transverse momentum**
     - I contributed extensively to the analysis and writing of the research article. My role involved coding for detailed data analysis, conducting a cut-and-count study of the events, and generating the final exclusion plot with uncertainties examination.

M.Phil. Research

Analyzed multi-lepton signals in proton-proton collision data collected by the CMS detector at the Large Hadron Collider, focusing on the leptonic decay of the Z boson and top quark in the final state. Applied machine learning technique (Boosted Decision Tree) using kinematic properties of selected events to separate the tZq signal from major backgrounds like WZ and fake leptons. This research is of significant importance in measuring the cross-section of the signal process. Its importance is raised because it is one of the fundamental backgrounds to many necessary searches at LHC, such as supersymmetry multi-lepton searches.

M.Sc. Research

In collaboration with 3 more fellows, I employed the Variational method to estimate the approximate ground state energy of mesons (charmonium) and simple harmonic oscillators. We extensively compared the approximate results and exact analytical solutions using computational algebra systems to validate the method's accuracy. Additionally, we analyzed and compared the wave functions and their corresponding Hamiltonian (ψ and $\hat{H}\psi$) across different cases. This research provided a useful understanding of the Variational method's precision and application to quantum systems.

Oral Talks

- **2024:** "ATLAS searches for electroweak supersymmetry with compressed spectra" at XIII International Conference on New Frontiers in Physics, Kolymbari, Crete, Greece, https://indi.to/VQK4V
- **2023:** "Phenomenological Minimal Supersymmetry Scan using Run 2 ATLAS searches (139 fb^{-1} AT $\sqrt{s} = 13\ TeV$)" at 21st International Balkan Workshop on Applied Physics and Materials Science, Constanta, Romania, https://ibwap.ro/wp-content/uploads/2024/03/book-abstracts-ibwap-2023.pdf

Publications & ATLAS Internal Notes

- **2024: Hammad Rasheed**, Ioana Duminica, "Expanding the gluino exclusion limits using events with one highly energetic final state jet and missing transverse momentum", Romanian Journal of Physics 69 (7-8), 404 (2024) https://rjp.nipne.ro/RomJPhys.2024.69.404
- **2023: Hammad Rasheed**, Otilia Anamaria Ducu, and Julien Maurer, "Rate of fake tracks in dense environments (Rel22/23)", ATL-COM-PHYS-2023-423, 2023. https://cds.cern.ch/record/2859907
- **2022: Hammad Rasheed**, "Electron reconstruction efficiency and scale factors measurements for reprocessed Run-2 and early Run-3 data", ATL-COM-PHYS-2022-1025, 2022. https://cds.cern.ch/record/2839210

Training and Schools

- **2023:** Hadron Collider Summer School, GEORG-AUGUST University, Gottingen, Germany
- **2022:** 11th School on Large Hadron Collider Physics, National Center for Physics, Islamabad, Pakistan
- **2021:** 4th International Workshop on Tracking Detectors in High Energy Physics, National Center for Physics, Islamabad, Pakistan
- **2020:** 3rd International Workshop on Tracking Detectors in High Energy Physics, National Center for Physics, Islamabad, Pakistan
- **2020:** 9th School on Large Hadron Collider Physics, National Center for Physics, Islamabad, Pakistan
- **2020:** A Workshop on Computing with Python, Pakistan Institute of Nuclear Science and Technology, Islamabad, Pakistan
- **2019:** 8th School on Large Hadron Collider Physics, National Center for Physics, Islamabad, Pakistan

Fellowships/Awards

- **2018 – Top Academic Achievement Award:** Received a laptop recognizing good results during my M.Sc. program.
- **2017 – Merit Scholarship:** Granted a Merit Scholarship for achieving the highest academic scores in the 1st semester of my M.Sc. program.

Experiences

- **2021 - 2024**: Scientific Research Assistant, Department of Elementary Particle Physics, IFIN-HH, Magurele, Romania
- **2021**: Physics Visiting Lecturer, Center for Geographic Information System- (GIS), University of the Punjab, Lahore, Pakistan
- **2019 - 2020**: Hosted Researcher, Department of Experimental High Energy Physics, National Center for Physics, Islamabad, Pakistan

- **2018**: Teaching Assistant, Center for High Energy Physics, University of the Punjab, Lahore, Pakistan
- **2015 - 2017**: Physics & Maths School Teacher, The Educators, Kamoke, Gujranwala

Computer Skills

- **Languages**: C++, Python, Bash Scripting
- **Software**: Root, TMVA, Mathematica

Language Proficiency

- **Punjabi**: Mother tongue
- **Urdu**: Fluent
- **English**: Fluent
- **Romanian**: Basics