

Abdualazem Ebrahim, PhD

✉ Abdualazem.Fadol@nju.edu.cn 📞 +86188131721881
🌐 <https://orcid.org/0000-0002-5003-1919>
🌐 <http://www.linkedin.com/in/Abdualazem-Fadol>
🌐 <https://www.researchgate.net/profile/Abdualazem-Ebrahim>
🌐 <https://github.com/Abdualazem/>

Education

- 2018 – 2022 📖 **PhD in Particle & Nuclear Physics**, University of Chinese Academy of Sciences, Beijing, China
2016 – 2018 📖 **MSc in Physics**, University of the Witwatersrand, Johannesburg, South Africa
2014 – 2015 📖 **MSc in Mathematical Sciences**, African Institute for Mathematical Sciences, Arusha, Tanzania
2007 – 2012 📖 **BSc (Honours) in Physics**, University of Khartoum, Khartoum, Sudan

Research Experience

- 2025 – ... 📖 **Research Associate** with Prof Zhang Rui, Nanjing University.
• *Developing a machine learning tagger for neutral particle at the BESIII experiment*
- 2022 – 2025 📖 **Post-doctoral Fellow** with Prof Fang Yaquan, Institute of High Energy Physics, Chinese Academy of Sciences.
• *Building Quantum Machine Learning algorithms and study their future application in High Energy Physics*
- 2018 – 2022 📖 **Graduate Students** (PhD) with Prof Fang Yaquan, Institute of High Energy Physics, University of Chinese Academy of Sciences.
• *Search for heavy resonances in the 4ℓ final state in association with missing transverse energy*
• *Search for non-resonant Higgs boson pair production in final states with four leptons*
• *The off-shell Higgs boson production and the Higgs boson total width in $ZZ \rightarrow 4\ell$*
• *The performance of missing transverse energy in the ATLAS experiment (for the ATLAS authorship qualification)*
• *The multi-lepton anomalies at the LHC and their compatibility with new physics*
• *The Higgs differential cross-section measurements in the Future Circular Electron Positron Collider*
- 2016 – 2018 📖 **Graduate Students** (MSc in Physics) with Prof Bruce Mellado and Dr Xifeng Ruan, University of the Witwatersrand.
• *Search for Higgs boson pair production in the $WW\gamma\gamma$ channel at the ATLAS experiment*
• *The impact of additional scale bosons beyond the standard model in explaining the multi-leptons anomalies in the LHC*
- 2014 – 2015 📖 **Graduate Students** (MSc in Mathematical Sciences) with Prof Timothy Burns from Swansea University, UK for the African Institute for Mathematical Sciences, Arusha.
• *The theory behind Dalitz plots and the use of EVTGEN generator*

Collaborations

- 2016 – 2024 📖 **The ATLAS Experiment at CERN**
I worked in the ATLAS experiment as an MSc and a PhD student. In addition, I was involved in the following:
• *ATLAS Distributed Computing Operations Shifts: Monitoring and reporting the performance of the ATLAS experiment computing sites as a senior shifter (during the PhD period).*
• *ATLAS Detector Operation: Data Quality validator (During the MSc for two weeks).*

Skills

- Languages 📖 English and Arabic (native tongue)
Coding 📖 C++, PYTHON, ROOT, BASH, PYTORCH, QISKIT
Frameworks 📖 TREXFITTER, WORKSPACECOMBINER, PYTHIA, MADGRAPH, and DELPHAS
Machine Learning Algorithms Bulding 📖 SUPPORT-VECTOR MACHINE, TRANSFORMER, QUANTUM TRANSFORMER for High Energy Physics applications

Teaching Experience





- 2017 – 2018 📖 **Teaching Assistant**, School of Physics, University of the Witwatersrand
First year engineering students: Physics and Physics Lab
Second year physics students: Physics Labs
Third year physics students: Physics Labs, co-supervised three students on their research projects
- 2013 – 2014 📖 **Teaching Assistant**, Faculty of the Foundation, Nile University
First year Medical students: Physics, Physics Labs and Mathematics
- 2012 – 2014 📖 **Teaching Assistant**, Department of Physics, University of Khartoum
First - fourth year physics students: Physics Labs
Second year physics students: Multivariable calculus

Fellowships and Awards












Fellowships

- 2018 – 2022 📖 **CAS-TWAS President's Fellowship Programme**, Chinese Academy of Sciences
2014 – 2015 📖 **AIMS Postgraduate Scholarship**, the African Institute for Mathematical Sciences








Awards

- 2025  **Breakthrough Prize in Fundamental Physics** ATLAS Collaboration (CERN), Certificate recognising individual contributions to the success of the ATLAS Run-2 physics programme.
- 2017  **The Postgraduate Merit Award**, the University of the Witwatersrand
- 2016  **The Wits research office's bursary**, the University of the Witwatersrand
- 2015  **The Post-AIMS Bursary**, the African Institute for Mathematical Sciences

Conference and workshop talks

- August 5, 2024  **Quantum Computing and Machine Learning Workshop 2024, Jilin, China.**
Talk title: Integration of quantum computing into transformer architectures for High Energy Physics
- December 3, 2023  **2023 BenchCouncil International Symposium of Intelligent Computers, Algorithms, and Applications, Sanya, China.**
Talk title: The prospect of quantum machine learning algorithms in High Energy Physics
- July 16, 2023  **Workshop on Computation in Experimental Particle Physics, Shanghai, China.**
Talk title: The prospect of quantum machine learning algorithms in High Energy Physics
- February 14, 2023  **IAS Program on High Energy Physics (HEP 2023), Hong Kong**
Talk title: Quantum computing for CEPC/HEP—virtual
- December 17, 2022  **Miami 2022 Physics Conference, Miami, United States.**
Talk title: Searches for heavy resonances in ATLAS—virtual on behalf of the ATLAS collaboration
- May 23, 2022  **Joint Workshop of the CEPC Physics, Software and New Detector Concept**
Talk title: Application of Quantum Computing to Physics Analysis at the CEPC Experiment—virtual
- March 23, 2022  **First Pan-African Astro-Particle and Collider Physics Workshop. Organised by the University of Witwatersrand and the University of Mohammed V**
Talk title: The off-shell Higgs production and measurement of its decay width with the ATLAS experiment—virtual
- August 29, 2021  **Higgs potential and BSM opportunity, Nanjing, China**
Talk title: The multilepton anomalies at the LHC and the prospect of new physics at the EW scale
- July 29, 2021  **South African Institute of Physics Conference (SAIP 2021), Johannesburg, South Africa**
Talk title: Search for the non-resonant Higgs-pair production in $\ell^+\ell^-\ell^+\ell^-$ final state at $\sqrt{s} = 13$ TeV in the ATLAS detector
- April 16, 2021  **Joint Workshop of the CEPC Physics, Software and New Detector Concept**
Talk title: Application of Quantum Computing at Higgs measurement
- July 3, 2019  **The 1st CEPC Physics Workshop toward Physics Whitepaper and TDR, Beijing, China**
Talk title: Higgs differential cross-section measurements

Research Publications

- 1 ATLAS Collaboration. (2024). Search for heavy resonances in final states with four leptons and missing transverse momentum or jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector. *JHEP*, 10, 130.  doi:10.1007/JHEP10(2024)130. arXiv: 2401.04742
- 2 **Abdualazem Fadol**, Qiuyu Sha, Yaquan Fang, Zhan Li, Sitian Qian, Yuyang Xiao, Yu Zhang and Chen Zhou. (2024). Application of quantum machine learning in a Higgs physics study at the CEPC. *Int. J. Mod. Phys. A*, 39(01), 2450007.  doi:10.1142/S0217751X24500076. arXiv: 2209.12788 [hep-ex]
- 3 ATLAS collaboration. (2023). Evidence of off-shell Higgs boson production from ZZ leptonic decay channels and constraints on its total width with the ATLAS detector. *Phys. Lett. B*, 846, 138223.  doi:10.1016/j.physletb.2023.138223. arXiv: 2304.01532
- 4 Qiuyu Sha, **Abdualazem Fadol**, Fangyi Guo, Gang Li, Yaquan Fang, Jiayin Gu and Xinchou Lou. (2022). Probing Higgs CP properties at the CEPC in the $e^+e^- \rightarrow ZH \rightarrow \ell^+\ell^-H$ using optimal variables. *Eur. Phys. J. C*, 82(11), 981. [Erratum: *Eur.Phys.J.C* 83, 62 (2023)].  doi:10.1140/epjc/s10052-022-10926-5. arXiv: 2203.11707
- 5 Stefan von Buddenbrock, Alan S. Cornell, Yaquan Fang, **Abdualazem Fadol**, Mukesh Kumar, Bruce Mellado and Kehinde G. Tomiwa. (2019). The emergence of multi-lepton anomalies at the LHC and their compatibility with new physics at the EW scale. *JHEP*, 10, 157.  doi:10.1007/JHEP10(2019)157. arXiv: 1901.05300
- 6 ATLAS collaboration. (2018). Search for Higgs boson pair production in the $\gamma\gamma WW^*$ channel using pp collision data recorded at $\sqrt{s} = 13$ TeV with the ATLAS detector. *Eur. Phys. J. C*, 78(12), 1007.  doi:10.1140/epjc/s10052-018-6457-x. arXiv: 1807.08567
- 7 Stefan von Buddenbrock, Alan S. Cornell, **Abdualazem Fadol**, Mukesh Kumar, Bruce Mellado and Xifeng Ruan. (2018). Multi-lepton signatures of additional scalar bosons beyond the Standard Model at the LHC. *J. Phys. G*, 45(11), 115003.  doi:10.1088/1361-6471/aae3d6. arXiv: 1711.07874

References

▀ **Professor Zhang Rui**

Professor of Experimental Particle Physics

Nanjing University

✉ rui.zhang@cern.ch

☎ +8615905187015

Relationship: Principal Investigator

▀ **Professor Bruce Mellado**

Professor of Experimental Particle Physics

The University of the Witwatersrand (Wits)

✉ Bruce.Mellado@Wits.ac.za

☎ +27117176889

Relationship: Wits MSc supervisor and research collaborator

▀ **Doctor Mukesh Kumar**

Lecturer

The University of the Witwatersrand

✉ Mukesh.Kumar@wits.ac.za

☎ +27117176858

Relationship: Research collaborator (Phenomenology)

▀ **Doctor Theodota Lagouri**

Research Scientists

Yale University

✉ Theodota.Lagouri@cern.ch

☎ +41227676977

Relationship: Research collaborator (search for heavy resonances in the 4ℓ channel, and the total Higgs width measurements)