Yoshini Bailung
Curriculum Vitae

Personal Details

Designation:	Ph.D. Student
Address:	Department of Physics,
	Indian Institute of Technology Indore, Simrol, MP-453552, India
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Education

2019-present	Ph.D. in Physics at **Indian Institute of Technology Indore**
Thesis Title:	*"Charm production in proton–proton collisions with ALICE at the LHC and light nuclei synthesis via coalescence in heavy-ion collisions"*
	Date of thesis submission: 31st July 2024
	Expected date of defense: 30th November 2024
Supervisor:	Prof. Ankhi Roy
2017-2019	Master of Science (M.Sc.) in Physics from **Gauhati University**
Thesis Title:	*"Cabibbo motivated 3+1 Neutrino Mixing"*
Supervisor:	Dr. Subhankar Roy
2014-2017	Bachelor of Science (B.Sc.) in Physics from **SGTB Khalsa College, University of Delhi**

Research Activities

1. **Experimental Data Analysis with ALICE@CERN:**
   Focused on measuring heavy flavour hadron production in pp collisions at $\sqrt{s} =$ 13 TeV using LHC Run-2 data. Contributed to the development of the code within the analysis framework of the experiment for extracting charm yields via D-meson reconstruction from their hadronic decay channels. The analyses targeted **D^0**, **D$^+$**, and **D^{*+}** meson production, studying their production as a function of charged-particle multiplicity and transverse spherocity in pp collisions at $\sqrt{s} =$ 13 TeV. In particular, I focused on the optimization of the reconstruction and selection of the **D^0** meson, the evaluation of the corrections for the measurement and the estimation of the relevant systematic uncertainties. Additionally, I contributed to the Monte Carlo comparison study on the final results with PYTHIA8. The results of these studies were approved as preliminary results and presented at multiple international conferences. These analysis procedures used, and the results are also part of my PhD thesis. The analysis is almost finalized and will be published soon as a paper of the ALICE Collaboration.

2. **Phenomenology of Heavy-Ion Collisions:**
   Led studies on light-nuclei production using the coalescence mechanism. Developed a coalescence afterburner, initially using a simplified box approach, later refined with quantum mechanical wave functions. Additionally, contributed to a paper on heavy flavour phenomenology. Lead author of three papers on the

coalescence as a primary mechanism of light-nuclei formation and co-author of one paper on heavy flavour phenomenology:

- *"Exploring light nuclei production at RHIC and LHC energies with A Multi-Phase Transport model and a coalescence afterburner"* [Nucl. Phys. A **1037**, 2023] – implemented a box coalescence model to explain light-nuclei yields in heavy-ion collisions.

- *"Searching for enhancement in coalescence of in-jet (anti-)deuterons in proton–proton collisions"* [Phys. Rev. C **109**, 2024] – developed a Wigner coalescence model, integrated into PYTHIA8 along with a nucleon emission source model, focusing on in-jet deuteron production.

- *"Probing coalescence of light nuclei via femtoscopy and azimuthal anisotropies"* [arXiv:2407.17962] – used a correlation afterburner (CRAB) to study momentum correlations between nuclei clusters, estimating emission sources, formation times and anisotropic flow coefficients.

- *"Jet Fragmentation via Azimuthal Correlations of Electrons from Heavy Flavor Decay"* [Phys. Rev. C **107**, 2023], analyzing electron-hadron angular correlations in various collision systems with PYTHIA8+Angantyr. Concluded that multi-parton interactions (MPI) contribute to underlying events, while initial and final state radiations (ISR and FSR) influence jet features.

3. **Machine Learning:**

- Involved in ALICE service work with the Zero Degree Calorimeter (ZDC) team - developed code to predict and reconstruct truncated ZDC signals using Machine Learning (ML) algorithms.

- Developed models with artificial neural networks for identification and reconstruction of muon tracks from J/ψ decays.

- Instructor in "Machine Learning Using Python" workshop, organized by MNIT Jaipur; undertook tutorials on implementing ML techniques.

4. **Other activities:**

- Gained expertise in the usage of ML algorithms thanks to the involvement in ALICE service work.

- Contributed to ALICE Data Processing Group's (DPG) asynchronous quality control (QC) of Global Tracks.

- Participation in the Run 3 data-taking activities as shifter for the ALICE Experimental Control System (ECS) and Shift Leader in Matter of Safety (SLIMOS).

- Participation in the institutional reviewer committee for three ALICE publications.

- Mentor of 4 Master's students with thesis on different topics as described below.

- Active in outreach activities related to scientific communication.

PUBLICATIONS

Co-author of 195 publications InspireHEP
h-index: 33
Citations: 3,711
Selected summary of publications where I am a primary contributor.

1. **Yoshini Bailung**, Sudhir P. Rode, Neha Shah, Ankhi Roy; *"Probing coalescence of light nuclei via femtoscopy and azimuthal anisotropies"*; *Under review*; [arXiv]

2. **Yoshini Bailung**, Neha Shah, Ankhi Roy; *"Searching for enhancement in coalescence of in-jet (anti-)deuterons in proton–proton collisions"*; Published in Physical Review C; [doi:10.1103/PhysRevC.109.044908]

3. **Yoshini Bailung**, Neha Shah, Ankhi Roy; *"Exploring light nuclei production at RHIC and LHC energies with A Multi-Phase Transport model and a coalescence afterburner"*; Published in **Nuclear Physics A**; [10.1016/j.nuclphysa.2023.122701]

4. Ravindra Singh, **Yoshini Bailung**, Sumit Kumar Kundu, Ankhi Roy; *"Jet fragmentation via azimuthal angular correlations of electrons from heavy flavor decay in pp, p-Pb, and Pb-Pb collisions using PYTHIA8+Angantyr calculations"*; Published in **Physical Review C**; [10.1103/PhysRevC.107.024911]

5. Sumit Kumar Kundu, **Yoshini Bailung**, Sudhir Pandurang Rode, Partha Pratim Bhaduri, Ankhi Roy; *"Effect of various particlization scenarios on anisotropic flow and particle production using UrQMD hybrid model"*; Published in **Nuclear Physics A**; [10.1016/j.nuclphysa.2022.122574]

6. Ravindra Singh, **Yoshini Bailung**, Ankhi Roy; *"Dynamics of particle production in Pb–Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV using PYTHIA8 Angantyr model"*; Published in **Physical Review C**; [10.1103/PhysRevC.105.035202]

7. Sumit Kumar Kundu, **Yoshini Bailung**, Sudhir Pandurang Rode, Partha Pratim Bhaduri, Ankhi Roy; *"Dependence on beam energy and nuclear equation of state of anisotropic flow and particle production in low-energy heavy-ion collisions"*; Published in **Physical Review C**; [10.1103/PhysRevC.104.024907]

ALICE ANALYSIS NOTES

1. Marco Giacalone, **Yoshini Bailung**, Randhir Singh ; *"Measurement of D-meson (D^0, D^+, D^{*+}) production as a function of event shapes in proton–proton collisions at $\sqrt{s} = 13$ TeV"*; ALICE Analysis Note; ID number: 1240; [Link to contribution]

2. Marco Giacalone, **Yoshini Bailung**, Randhir Singh ; *"Measurement of D-meson (D^0, D^+, D^{*+}) production versus charged particle multiplicity in proton-proton collisions at $\sqrt{s} = 13$ TeV"*; ALICE Analysis Note; ID number: ANA-1167; [Link to contribution]

CONFERENCE PROCEEDINGS

1. **Yoshini Bailung**, on behalf of ALICE Collaboration; *"Heavy-flavour production as a function of charged-particle multiplicity with ALICE at the LHC"*; Submitted to **MDPI Proceedings Series for Hot Quarks 2022, 11 – 17 October 2022** [Under review]

2. **Yoshini Bailung**, Sudhir Pandurang Rode, Neha Shah, Ankhi Roy; *"Production of light nuclei in heavy-ion collisions via a coalescence mechanism"*; Published in

Proceedings of 67th DAE Symposium on Nuclear Physics, 9 - 13 December 2023 [proceedings/snp2023];

3. Sumit Kumar Kundu, **Yoshini Bailung**, Sudhir Pandurang Rode, Partha Pratim Bhaduri, Ankhi Roy; *"Dependence of anisotropic flow and particle production on particlization models and nuclear equation of state"*; Published in **Dynamics of HOT QCD Matter – Current status and Developments, International Journal of Modern Physics E, 12-14 May 2022**[proceedings/HotQCD2022]

4. Sumit Kumar Kundu, **Yoshini Bailung**, Sudhir Pandurang Rode, Partha Pratim Bhaduri, Ankhi Roy; *"Dependence of anisotropic flow of net-protons on particlization model for various nuclear equation of state"*; Published in **Proceedings of 65th DAE Nuclear Physics Symposium, 1-5 December 2021** [proceedings/snp2021]

5. **Yoshini Bailung**, on behalf of ALICE Collaboration; *"Measurements of heavy-flavor production as a function of multiplicity with ALICE at the LHC"*;**SciPost Physics Proceedings of the 50th International Symposium on Multiparticle Dynamics (ISMD2021), 12-16 July, 2021** [10.21468/SciPostPhysProc.10.033]

6. **Yoshini Bailung**, on behalf of ALICE Collaboration; *"Measurement of D-meson production as a function of charged-particle multiplicity in proton-proton collisions at $\sqrt{s} = 13$ TeV with ALICE at the LHC"*; Published in **Proceedings of the 9th Annual Large Hadron Collider Physics (LHCP2021) conference, 7 - 12 June, 2021** [pos.sissa.it/397/190]

TALKS

1. *"Searching for collective-like effects for heavy-flavour in small systems with ALICE"* at the **14 International Workshop on Multiple Parton Interactions at the LHC, MPI@LHC 2023**, University of Manchester, Manchester, United Kingdom, 20-24 November 2023; [Link to contribution] [Parallel]

2. *"Measurement of heavy-flavour production as a function of charge-particle multiplicity with ALICE at the LHC"* at the **4th Heavy Flavour Meet 2023**, IIT Goa, Goa, India, 2-4 November 2023; [Link to contribution] [Parallel]

3. *"Measurement of heavy-flavor production as a function of charge-particle multiplicity with ALICE at the LHC"* at the **9th edition of the Workshop for Young Scientists on the Physics of Ultra-relativistic Nucleus-Nucleus Collisions (Hot Quarks 2022)**, Colorado, USA, 11-17 October 2022; [Link to contribution] [Parallel]

4. *"Measurements of heavy-flavor production as a function of multiplicity with ALICE at the LHC"* at the **50th International Symposium on Multiparticle Dynamics (ISMD2021)**, virtual, 12-16 July, 2021; [Link to contribution] [Parallel]

POSTERS

1. **Yoshini Bailung**, Sudhir Pandurang Rode, Neha Shah, Ankhi Roy; *"Production of light nuclei in heavy-ion collisions via a coalescence mechanism"* at the **67th DAE Symposium on Nuclear Physics, 9 - 13 December 2023, IIT Indore, Indore, India**

2. Swapnesh Khade, Ravindra Singh, **Yoshini Bailung**, Ankhi Roy; *"Influence of parton distribution functions on $D^0 - \overline{D}^0$ azimuthal angular correlations"* at the **4th Heavy Flavour Meet, 2 - 4 November 2023, IIT Goa, Goa, India**

3. Sumit K. Kundu, **Yoshini Bailung**, Ravindra Singh, Sudhir P. Rode, Ankhi Roy;

"Deuteron production using UrQMD model via a coalescence afterburner at SPS energies" at the **ICPAQGP, 7 - 10 February 2023, Puri, Odisha, India**

4. **Yoshini Bailung**, on behalf of ALICE Collaboration;
   "Measurement of D-meson production as a function of charged-particle multiplicity in proton-proton collisions at $\sqrt{s} = 13$ TeV with ALICE at the LHC" at the **29**th **International Conference on Ultra-relativistic Nucleus-Nucleus Collisions (Quark Matter), 4 - 10 April, 2022, Krakow, Poland**; [Link to contribution]

5. **Yoshini Bailung**, on behalf of ALICE Collaboration;
   "Measurement of D-meson production as a function of charged-particle multiplicity in proton-proton collisions at $\sqrt{s} = 13$ TeV with ALICE at the LHC" at the **9th Annual Large Hadron Collider Physics (LHCP2021) conference, 7 - 12 June, 2021**; [Link to contribution]

MENTORING

1. Rohit Kaundal [Masters Student 2023 - 2024]
   Thesis Title: *"Investigating two-particle correlations in ep photoproduction and assessing the resolution and efficiency of the ePIC detector"*

2. Shankar Nair [Masters Student 2022 - 2023]
   Thesis Title : *"Simulation studies of π^0, η and ω meson reconstruction performance in pp collisions at $\sqrt{s} = 14$ TeV in Forward Calorimeter (FoCal), ALICE"*

3. Anurag [Masters Student 2022 - 2023]
   Thesis Title: *"Flavour-dependent study of effects of multiple parton interactions and colour reconnection on the jets"*

4. Diksha Sharma [Masters Student 2021 - 2022]
   Thesis Title : *"Feasibility Study of Exotic Particle X(3872) with ATHENA in EIC Experiment and its Possible Structures"*

TEACHING ASSISTANT-SHIP

1. Bachelor in Technology Courses: Undergraduate Physics Lab [Practicals], Electrodynamics [Theory]

2. Master of Science Courses: Numerical Methods [Practicals], Mathematical Physics [Theory]

TECHNICAL AND PERSONAL SKILLS

Operating Systems: Linux, macOS, WINDOWS
Programming Languages: C/C++, python, FORTRAN, Bash, GDScript
Scientific Packages/Frameworks: ROOT, Mathematica
Specialised Packages/Frameworks: AliPhysics, PYTHIA, AMPT, UrQMD, SMASH
TypeSetting/ Web Development: LaTeX, HTML, CSS, Hugo
Spoken Languages: English, Hindi, Assamese (Mother tongue)