

Kirtiman Ghosh

Associate Professor

Institute of Physics (IoP), Bhubaneswar

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Employment History

- 2023 – present **Associate Professor**, IoP, Bhubaneswar and HBNI, Mumbai.
- 2017 – 2022 **Reader F**, IoP, Bhubaneswar and HBNI, Mumbai.
- 2016 – 2017 **INSPIRE Faculty Fellow**, University of Delhi
- 2012 – 2015 **Postdoctoral Fellow**, Oklahoma State University.
- 2011 – 2012 **Postdoctoral Fellow**, Helsinki Institute of Physics.
- 2010 – 2011 **Postdoctoral Fellow**, Harish-Chandra Research Institute.

Education

- 2006 – 2009 **Ph.D. in Theoretical Physics**, University of Calcutta, Kolkata, India.
Thesis title: *Quest for Physics at TeV Scale in the Era of LHC.*
- 2005 – 2006 **Post M.Sc. in Physics**, Saha Institute of Nuclear Physics, Kolkata, India.
Specialization: High Energy Physics
- 2003 – 2005 **M.Sc. in Physics**, University of Calcutta, Kolkata, India.
Specialization: High Energy Physics
- 2000 – 2003 **B.Sc. in Physics**, Presidency College, University of Calcutta, Kolkata, India.
Major: Physics; Minors: Chemistry and Mathematics.

Awards and Achievements

Awards and Honors

- 2020 – 2023 **Selected as Associate**,
Indian Academy of Sciences (IASc).
- 2020 – **Appointed as Visiting Faculty**,
Indian Institute of Science Education and Research, Berhampur.
- 2016 – 2021 **INSPIRE Faculty Fellowship**,
Department of Science and Technology (DST), Government of India (GoI).
- 2006 – 2010 **NET Research Fellowship**,
Council of Scientific and Industrial Research (CSIR), GoI.
- 2005 – 2006 **Post M.Sc. Associateship**,
Saha Institute of Nuclear Physics, Department of Atomic Energy (DAE), GoI.
- 2006 **Professor A. P. Patro Memorial Award**, Saha Institute of Nuclear Physics, DAE, GoI.
- 2003 **Gold Medal**,
Indian Association of Physics Teachers (IAPT)
- 2000 and 1998 **National Scholarship**, GoI.

Awards and Achievements (continued)

Research Fundings

- 2020 – 2023  **Principal Investigator**, SERB-sponsored CORE research project titled "*Exploring Radiative Neutrino Mass Models through Dark Matter and Collider Experiments*"
CRG/2019/006831 [Total Project Cost: INR 17,43,120.00].
- 2023 – 2026  **Principal Investigator**, SERB-sponsored MATRICS research project titled "*Exploring Next-to-Minimal Realizations of Universal Extra-Dimension Scenarios*"
MTR/2022/000989, [Total Project Cost: INR 6,00,000.00].
- 2024 – 2027  **Co-Principal Investigator**, SERB-sponsored CORE research project titled "*Systemic probes of hitherto unexplored supersymmetric parameter space.*"
CRG/2023/008570, [Total Project Cost: INR 26,00,000.00].

Research Guidance

Ph.D. Students (Completed)

- 2024  **Dr. Saiyad Ashanujjaman**
 <https://inspirehep.net/authors/1845955>
Thesis Title: *Exploring Neutrino Mass and Dark Matter Motivated TeV Scale Scenarios at the Collider Experiments.* [currently pursuing postdoctoral research at Karlsruhe Institute of Technology, Germany.]
-  **Dr. Avnish**
 <https://inspirehep.net/authors/2127651>
Thesis Title: *Exploring Neutrino Mass and Dark Matter Motivated TeV Scale Scenarios at the Collider Experiments.* [currently pursuing postdoctoral research at Hyderabad Central University, India.]

Ph.D. Students (Ongoing)

- 2025 (Expected)  **Ms. Vandana Sahadeb**
 <https://inspirehep.net/authors/1808359>
Thesis Title: *Beyond the Standard Model Phenomenology with Exotic Fermions and Scalars.*
-  **Mr. Rameswar Sahu**
 <https://inspirehep.net/authors/2770311>
Research Area: *Machine Learning-Based Search Strategies at the LHC.*
- 2027 (Expected)  **Mr. Debabrata Sahoo**
 <https://inspirehep.net/authors/2870208>
Research Area: *Next-to-Minimal Extra-Dimensional Scenarios in the Context of Neutrino Masses and Mixing, Dark Matter, and Collider Signatures.*

Teaching Experience

Current Courses

- Spring 2025  **Quantum Field Theory**, IISER Berhampur, BS-MS students [Optional].

Teaching Experience (continued)

Recent Courses

Fall 2024	■ Advanced Quantum Mechanics , IoP pre-doctoral batch 24-25 [Core].
Spring 2024	■ Quantum Field Theory , IISER Berhampur, BS-MS students [Optional].
Fall 2023	■ Electrodynamics , IISER Berhampur, BS-MS students [Core].
Spring 2023	■ Particle Physics , IoP pre-doctoral batch 22-23 [Optional].
Spring 2022	■ Particle Physics , IoP pre-doctoral batch 22-23 [Optional].
Fall 2021	■ Advanced Quantum Mechanics , IoP pre-doctoral batch 21-22 [Core].
Fall 2020	■ Advanced Quantum Mechanics , IoP pre-doctoral batch 20-21 [Core]. ■ Thermodynamics , IISER Berhampur, BS-MS students [Optional].
Spring 2020	■ Statistical Mechanics , IISER Berhampur, BS-MS students [Core].
Fall 2019	■ Advanced Quantum Mechanics , IoP pre-doctoral batch 19-20 [Core].
Spring 2018	■ Particle Physics , IoP pre-doctoral batch 19-20 [Optional].
September 2018	■ Particle Physics and the Standard Model , SERC Preparatory School, University of Hyderabad [Guest Faculty].
Spring 2016	■ Radiation Theory , University of Delhi, M.Sc. students [Core].
Fall 2016	■ Classical Mechanics , University of Delhi, M.Sc. students [Core].

Research Publications

Submitted for Publication

- 1 D. Sahoo, R. Sahu, and K. Ghosh, *A Comprehensive Search for Leptoquarks Decaying into Top- τ Final States at the Future LHC*, Jan. 2025. arXiv: 2501.07543 [hep-ph].
- 2 R. Sahu, D. Sahoo, and K. Ghosh, *Advancing Higgsino Searches by Integrating ML for Boosted Object Tagging and Event Selection*, Jan. 2025. arXiv: 2501.07491 [hep-ph].
- 3 R. Baruah, A. Choudhury, K. Ghosh, S. Mondal, and R. Sahu, *Probing sub-TeV Higgsinos aided by a ML-based top tagger in the context of Trilinear RPV SUSY*, Dec. 2024. arXiv: 2412.11862 [hep-ph].

Published

- 1 Avnish and K. Ghosh, "Radiative neutrino mass with electroweak scale Majorana dark matter in the Scotogenic model," *Nucl. Phys. B*, vol. 1002, p. 116 524, 2024.  DOI: 10.1016/j.nuclphysb.2024.116524. arXiv: 2302.03634 [hep-ph].
- 2 K. Ghosh, K. Huitu, and R. Sahu, "Revisiting the LHC Constraints on Gauge-Mediated Supersymmetry Breaking Scenarios," *Accepted in Phys. Rev. D*, Nov. 2024. arXiv: 2411.09650 [hep-ph].
- 3 K. Ghosh, K. Huitu, and R. Sahu, "Revisiting Universal Extra-Dimension Model with Gravity Mediated Decays," *Accepted in JHEP*, Dec. 2024. arXiv: 2412.09344 [hep-ph].
- 4 U. Patel, Avnish, S. Patra, and K. Ghosh, "Multipartite dark matter in a gauge theory of leptons," *Accepted in JHEP*, Jul. 2024. arXiv: 2407.06737 [hep-ph].
- 5 R. Sahu, S. Ashanujjaman, and K. Ghosh, "Unveiling the secrets of new physics through top quark tagging," *Eur. Phys. J. ST*, vol. 233, no. 15-16, pp. 2465-2495, 2024.  DOI: 10.1140/epjs/s11734-024-01257-5. arXiv: 2409.12085 [hep-ph].
- 6 R. Sahu and K. Ghosh, "ML-based top taggers: Performance, uncertainty and impact of tower & tracker data integration," *SciPost Phys.*, vol. 17, no. 6, p. 166, 2024.  DOI: 10.21468/SciPostPhys.17.6.166. arXiv: 2309.01568 [hep-ph].

- 7 Taramati, R. Sahu, U. Patel, K. Ghosh, and S. Patra, "Singlet-doublet fermionic dark matter in gauge theory of baryons," Aug. 2024.  DOI: 10.1007/JHEP01(2025)159. arXiv: 2408.12424 [hep-ph].
- 8 S. Ashanujjaman, K. Ghosh, and R. Sahu, "Low-mass doubly charged Higgs bosons at the LHC," *Phys. Rev. D*, vol. 107, no. 1, p. 015 018, 2023.  DOI: 10.1103/PhysRevD.107.015018. arXiv: 2211.00632 [hep-ph].
- 9 S. Ashanujjaman, D. Choudhury, and K. Ghosh, "Search for exotic leptons in final states with two or three leptons and fat-jets at 13 TeV LHC," *JHEP*, vol. 04, p. 150, 2022.  DOI: 10.1007/JHEP04(2022)150. arXiv: 2201.09645 [hep-ph].
- 10 S. Ashanujjaman and K. Ghosh, "Revisiting type-II see-saw: present limits and future prospects at LHC," *JHEP*, vol. 03, p. 195, 2022.  DOI: 10.1007/JHEP03(2022)195. arXiv: 2108.10952 [hep-ph].
- 11 S. Ashanujjaman and K. Ghosh, "Type-III see-saw: Search for triplet fermions in final states with multiple leptons and fat-jets at 13 TeV LHC," *Phys. Lett. B*, vol. 825, p. 136 889, 2022.  DOI: 10.1016/j.physletb.2022.136889. arXiv: 2111.07949 [hep-ph].
- 12 S. Ashanujjaman, K. Ghosh, and K. Huitu, "Type-II see-saw: searching the LHC elusive low-mass triplet-like Higgses at e^-e^+ colliders," *Phys. Rev. D*, vol. 106, no. 7, p. 075 028, 2022.  DOI: 10.1103/PhysRevD.106.075028. arXiv: 2205.14983 [hep-ph].
- 13 S. Parashar, A. Karan, Avnish, P. Bandyopadhyay, and K. Ghosh, "Phenomenology of scalar leptoquarks at the LHC in explaining the radiative neutrino masses, muon g-2, and lepton flavor violating observables," *Phys. Rev. D*, vol. 106, no. 9, p. 095 040, 2022.  DOI: 10.1103/PhysRevD.106.095040. arXiv: 2209.05890 [hep-ph].
- 14 S. Ashanujjaman and K. Ghosh, "A genuine fermionic quintuplet seesaw model: phenomenological introduction," *JHEP*, vol. 06, p. 084, 2021.  DOI: 10.1007/JHEP06(2021)084. arXiv: 2012.15609 [hep-ph].
- 15 S. Ashanujjaman and K. Ghosh, "Type-III see-saw: Phenomenological implications of the information lost in decoupling from high-energy to low-energy," *Phys. Lett. B*, vol. 819, p. 136 403, 2021.  DOI: 10.1016/j.physletb.2021.136403. arXiv: 2102.09536 [hep-ph].
- 16 Avnish, K. Ghosh, T. Jha, and S. Niyogi, "Minimal and non-minimal Universal Extra Dimension models in the light of LHC data at 13 TeV," *Phys. Rev. D*, vol. 103, p. 115 011, 2021.  DOI: 10.1103/PhysRevD.103.115011. arXiv: 2012.15137 [hep-ph].
- 17 S. K. Agarwalla, K. Ghosh, N. Kumar, and A. Patra, "Same-sign multilepton signatures of an $SU(2)_R$ quintuplet at the LHC," *JHEP*, vol. 01, p. 080, 2019.  DOI: 10.1007/JHEP01(2019)080. arXiv: 1808.02904 [hep-ph].
- 18 K. Ghosh, D. Karabacak, and S. Nandi, "Universal Extra Dimension models with gravity mediated decays after LHC Run II data," *Phys. Lett. B*, vol. 788, pp. 388–395, 2019.  DOI: 10.1016/j.physletb.2018.11.035. arXiv: 1805.11124 [hep-ph].
- 19 D. Choudhury, K. Ghosh, and S. Niyogi, "Probing nonstandard neutrino interactions at the LHC Run II," *Phys. Lett. B*, vol. 784, pp. 248–254, 2018.  DOI: 10.1016/j.physletb.2018.07.053. arXiv: 1801.01513 [hep-ph].
- 20 D. Das, K. Ghosh, M. Mitra, and S. Mondal, "Probing sterile neutrinos in the framework of inverse seesaw mechanism through leptoquark productions," *Phys. Rev. D*, vol. 97, no. 1, p. 015 024, 2018.  DOI: 10.1103/PhysRevD.97.015024. arXiv: 1708.06206 [hep-ph].
- 21 K. Ghosh, S. Jana, and S. Nandi, "Neutrino Mass Generation at TeV Scale and New Physics Signatures from Charged Higgs at the LHC for Photon Initiated Processes," *JHEP*, vol. 03, p. 180, 2018.  DOI: 10.1007/JHEP03(2018)180. arXiv: 1705.01121 [hep-ph].

- 22 S. Kumar Agarwalla, K. Ghosh, and A. Patra, “Sub-TeV Quintuplet Minimal Dark Matter with Left-Right Symmetry,” *JHEP*, vol. 05, p. 123, 2018.  DOI: 10.1007/JHEP05(2018)123. arXiv: 1803.01670 [hep-ph].
- 23 S. Chakdar, K. Ghosh, V. Hoang, P. Q. Hung, and S. Nandi, “The search for electroweak-scale right-handed neutrinos and mirror charged leptons through like-sign dilepton signals,” *Phys. Rev. D*, vol. 95, no. 1, p. 015 014, 2017.  DOI: 10.1103/PhysRevD.95.015014. arXiv: 1606.08502 [hep-ph].
- 24 S. Chakdar, K. Ghosh, V. Hoang, P. Q. Hung, and S. Nandi, “Search for mirror quarks at the LHC,” *Phys. Rev. D*, vol. 93, no. 3, p. 035 007, 2016.  DOI: 10.1103/PhysRevD.93.035007. arXiv: 1508.07318 [hep-ph].
- 25 S. Chakdar, K. Ghosh, and S. Nandi, “Superworld without Supersymmetry,” *Phys. Lett. B*, vol. 754, pp. 162–166, 2016.  DOI: 10.1016/j.physletb.2016.01.019. arXiv: 1508.00885 [hep-ph].
- 26 D. Choudhury and K. Ghosh, “Bounds on Universal Extra Dimension from LHC Run I and II data,” *Phys. Lett. B*, vol. 763, pp. 155–160, 2016.  DOI: 10.1016/j.physletb.2016.10.010. arXiv: 1606.04084 [hep-ph].
- 27 S. Bhattacharya, S. Chakdar, K. Ghosh, and S. Nandi, “Non-universal SUGRA at LHC: Prospects and Discovery Potential,” *Phys. Rev. D*, vol. 89, no. 1, p. 015 004, 2014.  DOI: 10.1103/PhysRevD.89.015004. arXiv: 1309.0036 [hep-ph].
- 28 B. Bhattacharjee, A. Choudhury, K. Ghosh, and S. Poddar, “Compressed supersymmetry at 14 TeV LHC,” *Phys. Rev. D*, vol. 89, no. 3, p. 037 702, 2014.  DOI: 10.1103/PhysRevD.89.037702. arXiv: 1308.1526 [hep-ph].
- 29 S. Chakdar, K. Ghosh, and S. Nandi, “A predictive model of Dirac Neutrinos,” *Phys. Lett. B*, vol. 734, pp. 64–68, 2014.  DOI: 10.1016/j.physletb.2014.05.036. arXiv: 1403.1544 [hep-ph].
- 30 S. Chakdar, K. Ghosh, and S. Nandi, “Parallel Universe, Dark Matter and Invisible Higgs Decays,” *Phys. Lett. B*, vol. 732, pp. 343–348, 2014.  DOI: 10.1016/j.physletb.2014.03.024. arXiv: 1311.2543 [hep-ph].
- 31 K. Ghosh, D. Karabacak, and S. Nandi, “Constraining Bosonic Supersymmetry from Higgs results and 8 TeV ATLAS multi-jets plus missing energy data,” *JHEP*, vol. 09, p. 076, 2014.  DOI: 10.1007/JHEP09(2014)076. arXiv: 1402.5939 [hep-ph].
- 32 S. Chakdar, K. Ghosh, S. Nandi, and S. K. Rai, “Collider signatures of mirror fermions in the framework of a left-right mirror model,” *Phys. Rev. D*, vol. 88, no. 9, p. 095 005, 2013.  DOI: 10.1103/PhysRevD.88.095005. arXiv: 1305.2641 [hep-ph].
- 33 K. Ghosh, K. Huitu, J. Laamanen, L. Leinonen, and J. Laamanen, “Top Quark Jets as a Probe of the Constrained Minimal Supersymmetric Standard Model with a Degenerate Top Squark and Lightest Supersymmetric Particle,” *Phys. Rev. Lett.*, vol. 110, no. 14, p. 141 801, 2013.  DOI: 10.1103/PhysRevLett.110.141801. arXiv: 1207.2429 [hep-ph].
- 34 D. Choudhury, A. Datta, D. K. Ghosh, and K. Ghosh, “Exploring two Universal Extra Dimensions at the CERN LHC,” *JHEP*, vol. 04, p. 057, 2012.  DOI: 10.1007/JHEP04(2012)057. arXiv: 1109.1400 [hep-ph].
- 35 K. Ghosh and K. Huitu, “Constraints on Universal Extra Dimension models with gravity mediated decays from ATLAS diphoton search,” *JHEP*, vol. 06, p. 042, 2012.  DOI: 10.1007/JHEP06(2012)042. arXiv: 1203.1551 [hep-ph].
- 36 B. Bhattacharjee and K. Ghosh, “Search for the minimal universal extra dimension model at the LHC with $\sqrt{s}=7$ TeV,” *Phys. Rev. D*, vol. 83, p. 034 003, 2011.  DOI: 10.1103/PhysRevD.83.034003. arXiv: 1006.3043 [hep-ph].
- 37 K. Ghosh, B. Mukhopadhyaya, and U. Sarkar, “Signals of an invisibly decaying Higgs in a scalar dark matter scenario: a study for the Large Hadron Collider,” *Phys. Rev. D*, vol. 84, p. 015 017, 2011.  DOI: 10.1103/PhysRevD.84.015017. arXiv: 1105.5837 [hep-ph].

- 38 D. Choudhury, A. Datta, and K. Ghosh, “Deciphering Universal Extra Dimension from the top quark signals at the CERN LHC,” *JHEP*, vol. 08, p. 051, 2010.  DOI: 10.1007/JHEP08(2010)051. arXiv: 0911.4064 [hep-ph].
- 39 K. Ghosh, S. Mukhopadhyay, and B. Mukhopadhyaya, “Discrimination of low missing energy look-alikes at the LHC,” *JHEP*, vol. 10, p. 096, 2010.  DOI: 10.1007/JHEP10(2010)096. arXiv: 1007.4012 [hep-ph].
- 40 K. Ghosh, “Probing two Universal Extra Dimension model with leptons and photons at the LHC and ILC,” *JHEP*, vol. 04, p. 049, 2009.  DOI: 10.1088/1126-6708/2009/04/049. arXiv: 0809.1827 [hep-ph].
- 41 K. Ghosh and A. Datta, “Phenomenology of spinless adjoints in two Universal Extra Dimensions,” *Nucl. Phys. B*, vol. 800, pp. 109–126, 2008.  DOI: 10.1016/j.nuclphysb.2008.03.012. arXiv: 0801.0943 [hep-ph].
- 42 K. Ghosh and A. Datta, “Probing two Universal Extra Dimensions at International Linear Collider,” *Phys. Lett. B*, vol. 665, pp. 369–373, 2008.  DOI: 10.1016/j.physletb.2008.06.042. arXiv: 0802.2162 [hep-ph].

Conference Proceedings

- 1 S. Parashar, P. Bandyopadhyay, A. Karan, R. Mandal, Avnish, and K. Ghosh, “Phenomenology of Scalar Leptoquarks: Neutrino Mass, $g - 2$, and B-Anomalies,” vol. 304, 2024, pp. 919–921.  DOI: 10.1007/978-981-97-0289-3_240.
- 2 S. Parashar, P. Bandyopadhyay, A. Karan, R. Mandal, Avnish, and K. Ghosh, “Searching for Scalar Leptoquarks at the LHC/FCC and a Muon Collider,” vol. LHCP2023, 2024, p. 240.  DOI: 10.22323/1.450.0240.
- 3 Taramati, U. Patel, R. Sahu, S. Patra, and K. Ghosh, “Singlet-Doublet Fermionic Dark Matter in Gauge Theory of Baryons,” vol. 304, 2024, pp. 875–877.  DOI: 10.1007/978-981-97-0289-3_226.
- 4 D. K. Ghosh *et al.*, “Working group report: Physics at the Large Hadron Collider,” A. S. Joshipura, S. Mohanty, and S. D. Rindani, Eds., vol. 76, 2011, pp. 707–723.  DOI: 10.1007/s12043-011-0080-9.

Articles and Reports on ArXiv

- 1 Avnish and K. Ghosh, *Multi-charged TeV scale scalars and fermions in the framework of a radiative seesaw model*, Jul. 2020. arXiv: 2007.01766 [hep-ph].
- 2 S. K. Agarwalla, K. Ghosh, and A. Patra, *LHC diphoton excess in a left-right symmetric model with minimal dark matter*, Jul. 2016. arXiv: 1607.03878 [hep-ph].
- 3 D. Choudhury and K. Ghosh, *The LHC Diphoton excess at 750 GeV in the framework of the Constrained Minimal Supersymmetric Standard Model*, Apr. 2016. arXiv: 1605.00013 [hep-ph].
- 4 K. Ghosh, S. Jana, and S. Nandi, *Neutrino Mass Generation and 750 GeV Diphoton excess via photon-photon fusion at the Large Hadron Collider*, Jul. 2016. arXiv: 1607.01910 [hep-ph].
- 5 S. Chakdar, K. Ghosh, and S. Nandi, *A model for Dirac neutrino mass matrix with only four parameters*, May 2014. arXiv: 1405.2328 [hep-ph].
- 6 S. Chakdar, K. Ghosh, and S. Nandi, *Dark Matter, Parallel Universe and Multiple Higgs Signals at the ILC*, Oct. 2014. arXiv: 1410.7331 [hep-ph].
- 7 L. Bhattacharya, K. Ghosh, and K. Huitu, *Top anti-top pairs at the LHC heavy ion collision: a new interesting probe of quark gluon plasma*, Oct. 2012. arXiv: 1210.0116 [hep-ph].
- 8 B. Bhattacharjee and K. Ghosh, *Degenerate SUSY search at the 8 TeV LHC*, Jul. 2012. arXiv: 1207.6289 [hep-ph].

- 9 G. Aarons *et al.*, *ILC Reference Design Report Volume 1 - Executive Summary*, J. Brau, Y. Okada, and N. Walker, Eds., Aug. 2007. arXiv: 0712.1950 [physics.acc-ph].
- 10 G. Aarons *et al.*, *ILC Reference Design Report Volume 3 - Accelerator*, N. Phinney, N. Toge, and N. J. Walker, Eds., Dec. 2007. arXiv: 0712.2361 [physics.acc-ph].
- 11 G. Aarons *et al.*, *ILC Reference Design Report Volume 4 - Detectors*, T. Behnke, C. Damerell, J. Jaros, and A. Miyamoto, Eds., Dec. 2007. arXiv: 0712.2356 [physics.ins-det].
- 12 G. Aarons *et al.*, *International Linear Collider Reference Design Report Volume 2: Physics at the ILC*, A. Djouadi, J. Lykken, K. Moenig, Y. Okada, M. Oreglia, and S. Yamashita, Eds., Sep. 2007. arXiv: 0709.1893 [hep-ph].