

Shohini Bhattacharya

✉ shohinib@uconn.edu

🌐 Faculty Web page

🌐 Group Web page

🔗 Inspire HEP

Education and Professional Appointments

01/2025 – Present	📖 Assistant Professor of Physics, University of Connecticut
02/2024 – 01/2025	📖 J. Robert Oppenheimer Fellow, Los Alamos National Laboratory
10/2021 – 02/2024	📖 Postdoctoral Research Associate, Brookhaven National Laboratory (BNL) and RIKEN BNL Research Center
08/2021 – 10/2021	📖 Adjunct Research Assistant Professor, Temple University
08/2015 – 08/2021	📖 Ph.D., Temple University, Theoretical Nuclear Physics Thesis: <i>A comprehensive study of the proton structure: From PDFs to Wigner Functions</i>
2014 – 2015	📖 Visiting Scholar, Vivekananda University
2012 – 2014	📖 M.Sc. Physics, Indian Institute of Technology (IIT) Delhi
2009 – 2012	📖 B.Sc. Physics, University of Calcutta

Research Focus and Proficiencies

Research Focus	📖 Quantum Chromodynamics (QCD); Electron-Ion Collider physics; Hadron spin & mass structure; Perturbative QCD; QCD factorization; Higher twist effects; Phenomenology of lepton- and hadron-induced scattering processes; Multi-dimensional imaging of hadrons; Developing formalisms to calculate various non-perturbative quantities in Lattice QCD and establish connections to phenomenology; Investigating anomalies in field theories; Testing of Standard Model and fundamental symmetries; Global analysis of data
Proficiencies	📖 Python (Pandas, Matplotlib, Jupyter, Numpy, Scipy, data analysis/visualization), Mathematica, $\LaTeX$, Microsoft Office, Operating Systems: Linux (Ubuntu), Windows

Research Grants

2026–2029	📖 National Science Foundation (NSF) Research Grant, Principal Investigator, <i>Advancing the Multidimensional Partonic Landscape of the Nucleon in the EIC Era</i> , Award period: August 1, 2026–July 31, 2029
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Awards and Honors

2024	📖 Recipient of the prestigious Oppenheimer Distinguished Postdoctoral Fellowship , a 3-year award granted by Los Alamos National Laboratory
2022	📖 Awarded the Gary McCartor Fellowship Award by the International Light Cone Advisory Committee, Inc. (ILCAC)
2021	📖 Awarded Doctoral Dissertation Completion Grant for the Summer 2021 term by the Graduate Board Fellowship Committee of Temple University
2020	📖 Recipient of the 2020 Outstanding Research by a Graduate Student in the College of Science and Technology, Temple University
2019–2020	📖 Recipient of the Peter Havas Humanitarian Scholarship for Outstanding Graduate Students from the Physics Department, Temple University

Awards and Honors (continued)

- 2018  Awarded **First Best Student Talk** at the 33rd annual Hampton University Graduate Studies (HUGS 2018) Program held at Jefferson Lab for the talk titled “*Accessing Parton Orbital Angular Momentum through Generalized TMDs*”
- 2017  Received the **HUGS Fellowship** for the 33rd annual HUGS Program held at Jefferson Lab
- 2017  Recipient of the 2017 **Outstanding Teaching by a Graduate Student** in the College of Science and Technology, Temple University

Mentoring

Ph.D. students at University of Connecticut

- 2024-Present  David DeAngelo
-  Angelo Patrizi

Undergraduate students at University of Connecticut

- 2026  Alexander Sang Yi

Postdoctoral researchers at University of Connecticut

-  Brandon Manley

Research Publications

I have authored **33 original papers** published in peer-reviewed scientific journals, such as Physical Review D, Physical Review Letters, Physical Review C, Physics Letters B, and Journal of High Energy Physics. Furthermore, I have played an active role in shaping **4 community white papers**, and my research has been showcased in **27 publications featured in the proceedings of prominent conferences, 8 of which underwent peer review**. A comprehensive list of my publications is provided below.

Journal Articles

- 1 Bhattacharya, S., He, C.-Q., Kang, Z.-B., Padilla, D., & Penttala, J. (2026a, May). *Matching collinear factorization with color-glass condensate for inclusive and exclusive deep inelastic scattering*. (Submitted for publication in JHEP). arXiv: [2605.14092 \[hep-ph\]](#)
- 2 Bhattacharya, S., DeAngelo, D., Yang, L., Zheng, D., & Zhou, J. (2026, January). *Gluon Generalized TMD signatures at the EIC from exclusive heavy (axial-)vector meson production*. (Accepted for publication in PRD). arXiv: [2601.17506 \[hep-ph\]](#)
- 3 Bhattacharya, S., Boussarie, R., Pire, B., & Szymanowski, L. (2026). *Revealing chiral-odd two-meson generalized distribution amplitudes in $e-e^+\rightarrow(\pi\pi)(\pi\pi)$ reactions*.  doi:[10.1103/r15q-5h2n](#). arXiv: [2507.23529 \[hep-ph\]](#)
- 4 Bhattacharya, S., He, C.-Q., Kang, Z.-B., Padilla, D., & Penttala, J. (2026b). *Parton distributions in the shockwave formalism*.  doi:[10.1007/JHEP04\(2026\)079](#). arXiv: [2510.02254 \[hep-ph\]](#)
- 5 Bhattacharya, S., Kang, Z.-B., Padilla, D., & Penttala, J. (2025, April). *Probing the Sivvers Asymmetry with Transverse Energy-Energy Correlators in the Small- x Regime*. (Submitted for publication). arXiv: [2504.10475 \[hep-ph\]](#)
- 6 Bhattacharya, S., Boussarie, R., & Hatta, Y. (2025). *Exploring orbital angular momentum and spin-orbit correlations for gluons at the Electron-Ion Collider*.  doi:[10.1103/PhysRevD.111.034019](#). arXiv: [2404.04209 \[hep-ph\]](#)

- 7 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Miller, J., Petreczky, P., & Steffens, F. (2025). *Generalized parton distributions from lattice QCD with asymmetric momentum transfer: Tensor case*. [doi:10.1103/tlkb-ykgp](https://doi.org/10.1103/tlkb-ykgp). arXiv: 2505.11288 [hep-lat]
- 8 Bhattacharya, S., Fuyuto, K., Mereghetti, E., & Richardson, T. R. (2025). *Toward the determination of CP-odd pion-nucleon couplings*. [doi:10.1103/fhm8-flsg](https://doi.org/10.1103/fhm8-flsg). arXiv: 2504.01105 [hep-ph]
- 9 Bhattacharya, S., Hatta, Y., & Schoenleber, J. (2025). *Nonlocal chiral anomaly and generalized parton distributions*. [doi:10.1103/PhysRevD.111.014013](https://doi.org/10.1103/PhysRevD.111.014013). arXiv: 2411.07024 [hep-ph]
- 10 Bhattacharya, S., Tomalak, O., & Vitev, I. (2025). *QED nuclear medium effects at EIC energies*. [doi:10.1103/PhysRevD.112.033001](https://doi.org/10.1103/PhysRevD.112.033001). arXiv: 2502.06943 [nucl-th]
- 11 Chu, M.-H., Colaço, M., Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., & Steffens, F. (2025). *Generalized parton distributions from lattice QCD with asymmetric momentum transfer: Unpolarized quarks at nonzero skewness*. [doi:10.1103/ts5s-hvb1](https://doi.org/10.1103/ts5s-hvb1). arXiv: 2508.17998 [hep-lat]
- 12 Bhattacharya, S., Cichy, K., Constantinou, M., Gao, X., Metz, A., Miller, J., ... Zhao, Y. (2024, October). *Moments of Axial-Vector GPD from Lattice QCD: Quark Helicity, Orbital Angular Momentum, and Spin-Orbit Correlation*. [doi:10.1007/JHEP01\(2025\)146](https://doi.org/10.1007/JHEP01(2025)146). arXiv: 2410.03539 [hep-lat]
- 13 Bhattacharya, S. et al. (2024). *Generalized parton distributions from lattice QCD with asymmetric momentum transfer: Axial-vector case*. [doi:10.1103/PhysRevD.109.034508](https://doi.org/10.1103/PhysRevD.109.034508). arXiv: 2310.13114 [hep-lat]
- 14 Bhattacharya, S., Boussarie, R., & Hatta, Y. (2024). *Spin-orbit entanglement in the Color Glass Condensate*. [doi:10.1016/j.physletb.2024.139134](https://doi.org/10.1016/j.physletb.2024.139134). arXiv: 2404.04208 [hep-ph]
- 15 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Nurminen, N., & Steffens, F. (2024). *Generalized parton distributions from the pseudodistribution approach on the lattice*. [doi:10.1103/PhysRevD.110.054502](https://doi.org/10.1103/PhysRevD.110.054502). arXiv: 2405.04414 [hep-lat]
- 16 Bhattacharya, S., Zheng, D., & Zhou, J. (2024a). *Accessing the gluon GTMD $F_{1,4}$ in exclusive π^0 production in ep collisions*. [doi:10.1103/PhysRevD.109.096029](https://doi.org/10.1103/PhysRevD.109.096029). arXiv: 2304.05784 [hep-ph]
- 17 Bhattacharya, S., Zheng, D., & Zhou, J. (2024b). *Probing the Quark Orbital Angular Momentum at Electron-Ion Colliders Using Exclusive π^0 Production*. [doi:10.1103/PhysRevLett.133.051901](https://doi.org/10.1103/PhysRevLett.133.051901). arXiv: 2312.01309 [hep-ph]
- 18 Bhattacharya, S., Cichy, K., Constantinou, M., Dodson, J., Metz, A., Scapellato, A., & Steffens, F. (2023). *Chiral-even axial twist-3 GPDs of the proton from lattice QCD*. [doi:10.1103/PhysRevD.108.054501](https://doi.org/10.1103/PhysRevD.108.054501). arXiv: 2306.05533 [hep-lat]
- 19 Bhattacharya, S., Cichy, K., Constantinou, M., Gao, X., Metz, A., Miller, J., ... Zhao, Y. (2023). *Moments of proton GPDs from the OPE of nonlocal quark bilinears up to NNLO*. [doi:10.1103/PhysRevD.108.014507](https://doi.org/10.1103/PhysRevD.108.014507). arXiv: 2305.11117 [hep-lat]
- 20 Bhattacharya, S., Hatta, Y., & Vogelsang, W. (2023b). *Chiral and trace anomalies in deeply virtual Compton scattering*. [doi:10.1103/PhysRevD.107.014026](https://doi.org/10.1103/PhysRevD.107.014026). arXiv: 2210.13419 [hep-ph]
- 21 Bhattacharya, S., Hatta, Y., & Vogelsang, W. (2023c). *Chiral and trace anomalies in deeply virtual Compton scattering. II. QCD factorization and beyond*. [doi:10.1103/PhysRevD.108.014029](https://doi.org/10.1103/PhysRevD.108.014029). arXiv: 2305.09431 [hep-ph]
- 22 Bhattacharya, S., Boussarie, R., & Hatta, Y. (2022). *Signature of the Gluon Orbital Angular Momentum. (DOE Highlight)*. [doi:10.1103/PhysRevLett.128.182002](https://doi.org/10.1103/PhysRevLett.128.182002). arXiv: 2201.08709 [hep-ph]
- 23 Bhattacharya, S., Cichy, K., Constantinou, M., Dodson, J., Gao, X., Metz, A., ... Zhao, Y. (2022). *Generalized parton distributions from lattice QCD with asymmetric momentum transfer: Unpolarized quarks. (DOE Highlight)*. [doi:10.1103/PhysRevD.106.114512](https://doi.org/10.1103/PhysRevD.106.114512). arXiv: 2209.05373 [hep-lat]

- 24 Bhattacharya, S., Kang, Z.-B., Metz, A., Penn, G., & Pitonyak, D. (2022b). *First global QCD analysis of the TMD g_{1T} from semi-inclusive DIS data*. [doi:10.1103/PhysRevD.105.034007](https://doi.org/10.1103/PhysRevD.105.034007). arXiv: 2110.10253 [hep-ph]
- 25 Bhattacharya, S., & Metz, A. (2022). *Burkhardt-Cottingham-type sum rules for light-cone and quasi-PDFs*. [doi:10.1103/PhysRevD.105.054027](https://doi.org/10.1103/PhysRevD.105.054027). arXiv: 2105.07282 [hep-ph]
- 26 Bhattacharya, S., Metz, A., Ojha, V. K., Tsai, J.-Y., & Zhou, J. (2022). *Exclusive double quarkonium production and generalized TMDs of gluons*. [doi:10.1016/j.physletb.2022.137383](https://doi.org/10.1016/j.physletb.2022.137383). arXiv: 1802.10550 [hep-ph]
- 27 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2021). *Parton distribution functions beyond leading twist from lattice QCD: The $h_L(x)$ case*. [doi:10.1103/PhysRevD.104.114510](https://doi.org/10.1103/PhysRevD.104.114510). arXiv: 2107.02574 [hep-lat]
- 28 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2020a). *Insights on proton structure from lattice QCD: The twist-3 parton distribution function $g_T(x)$* . (**Editor's Suggestion**). [doi:10.1103/PhysRevD.102.111501](https://doi.org/10.1103/PhysRevD.102.111501). arXiv: 2004.04130 [hep-lat]
- 29 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2020b). *One-loop matching for the twist-3 parton distribution $g_T(x)$* . [doi:10.1103/PhysRevD.102.034005](https://doi.org/10.1103/PhysRevD.102.034005). arXiv: 2005.10939 [hep-ph]
- 30 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2020c). *The role of zero-mode contributions in the matching for the twist-3 PDFs $e(x)$ and $h_L(x)$* . [doi:10.1103/PhysRevD.102.114025](https://doi.org/10.1103/PhysRevD.102.114025). arXiv: 2006.12347 [hep-ph]
- 31 Bhattacharya, S., Cocuzza, C., & Metz, A. (2020b). *Exploring twist-2 GPDs through quasidistributions in a diquark spectator model*. [doi:10.1103/PhysRevD.102.054021](https://doi.org/10.1103/PhysRevD.102.054021). arXiv: 1903.05721 [hep-ph]
- 32 Bhattacharya, S., Cocuzza, C., & Metz, A. (2019a). *Generalized quasi parton distributions in a diquark spectator model*. [doi:10.1016/j.physletb.2018.09.061](https://doi.org/10.1016/j.physletb.2018.09.061). arXiv: 1808.01437 [hep-ph]
- 33 Bhattacharya, S., Metz, A., & Zhou, J. (2017a). *Generalized TMDs and the exclusive double Drell-Yan process*. [Erratum: Phys.Lett.B 810, 135866 (2020)]. [doi:10.1016/j.physletb.2017.05.081](https://doi.org/10.1016/j.physletb.2017.05.081). arXiv: 1702.04387 [hep-ph]

Community White papers

- 1 Boër, M. et al. (2025, December). *Three-dimensional imaging of hadrons with hard exclusive reactions: advances in experiment, theory, phenomenology, and lattice QCD*. arXiv: 2512.15064 [hep-ph]
- 2 Boer, D. et al. (2025). *Physics case for quarkonium studies at the Electron Ion Collider*. **Note:** In this article, I contributed by authoring a section that provides a comprehensive review of the current state of observables sensitive to Wigner functions. Additionally, I explored potential avenues and prospects for accessing these functions through quarkonia-pair production at the Electron-Ion Collider. [doi:10.1016/j.pnpnp.2025.104162](https://doi.org/10.1016/j.pnpnp.2025.104162). arXiv: 2409.03691 [hep-ph]
- 3 Chapon, E. et al. (2022). *Prospects for quarkonium studies at the high-luminosity LHC*. **Note:** In this article, I made a contribution by authoring a section that extensively reviewed the current state of observables sensitive to Wigner functions. Furthermore, I discussed the potential avenues and prospects for accessing these functions through quarkonia-pair production at the high-luminosity LHC. [doi:10.1016/j.pnpnp.2021.103906](https://doi.org/10.1016/j.pnpnp.2021.103906). arXiv: 2012.14161 [hep-ph]
- 4 Abdul Khalek, R. et al. (2021, March). *Science Requirements and Detector Concepts for the Electron-Ion Collider: EIC Yellow Report*. **Note:** In this article, my substantial contributions encompassed editing the section on Wigner functions and compiling comprehensive tables that sought to elucidate the connections between Electron-Ion collider science and various categories of measurements. Furthermore, I took on the task of standardizing all mathematical notations throughout the document

to ensure consistency with those used in the White Paper and the NAS Report. arXiv: [2103.05419](https://arxiv.org/abs/2103.05419) [physics.ins-det]

Peer-reviewed Conference Proceedings

- 1 Bhattacharya, S., Kang, Z.-B., Metz, A., Penn, G., & Pitonyak, D. (n.d.). First global extraction of the worm-gear tmd. In *Proceedings of the 24th international spin symposium (spin2021)*.
doi:[10.7566/JSPCP.37.020125](https://doi.org/10.7566/JSPCP.37.020125). eprint:
<https://journals.jps.jp/doi/pdf/10.7566/JSPCP.37.020125>
- 2 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2022a). Relating Euclidean correlators and light-cone correlators beyond leading twist. (Vol. LATTICE2021, p. 105).
doi:[10.22323/1.396.0105](https://doi.org/10.22323/1.396.0105)
- 3 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2022b). Twist-3 partonic distributions from lattice QCD. (Vol. 8, p. 057). doi:[10.21468/SciPostPhysProc.8.057](https://doi.org/10.21468/SciPostPhysProc.8.057).
arXiv: [2107.12818](https://arxiv.org/abs/2107.12818) [hep-lat]
- 4 Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2022c). Zero modes and matching for the twist-3 PDFs. (p. 56). doi:[10.21468/SciPostPhysProc.8.056](https://doi.org/10.21468/SciPostPhysProc.8.056)
- 5 Bhattacharya, S., Kang, Z.-B., Metz, A., Penn, G., & Pitonyak, D. (2022a). Extraction of the worm-gear TMD g_{1T} from COMPASS, HERMES and JLab data on semi-inclusive DIS. (Vol. PANIC2021, p. 361).
doi:[10.22323/1.380.0361](https://doi.org/10.22323/1.380.0361)
- 6 Constantinou, M., Bhattacharya, S., Cichy, K., Metz, A., Scapellato, A., & Steffens, F. (2022). First study of twist-3 PDFs for the proton from lattice QCD. (Vol. LATTICE2021, p. 391).
doi:[10.22323/1.396.0391](https://doi.org/10.22323/1.396.0391). arXiv: [2111.01056](https://arxiv.org/abs/2111.01056) [hep-lat]
- 7 Bhattacharya, S., Cocuzza, C., & Metz, A. (2020a). What can we learn about twist-2 GPDs through quasi-distributions? (Vol. 1643, p. 012183). doi:[10.1088/1742-6596/1643/1/012183](https://doi.org/10.1088/1742-6596/1643/1/012183)
- 8 Bhattacharya, S., Metz, A., Ojha, V. K., Tsai, J.-Y., & Zhou, J. (2018). Accessing generalized TMDs through double Drell-Yan and double η_Q production processes. (Vol. DIS2018, p. 149).
doi:[10.22323/1.316.0149](https://doi.org/10.22323/1.316.0149)

Not peer-reviewed Conference Proceedings

- 1 Bhattacharya, S. (2025). Hadron structure via Generalized Parton Distributions, *LATTICE2024*, 013.
doi:[10.22323/1.466.0013](https://doi.org/10.22323/1.466.0013). arXiv: [2502.00481](https://arxiv.org/abs/2502.00481) [hep-lat]
- 2 Bhattacharya, S., Zheng, D., & Zhou, J. (2025). Probing quark orbital angular momentum in electron-proton collisions, *DIS2024*, 241. doi:[10.22323/1.469.0241](https://doi.org/10.22323/1.469.0241)
- 3 Bhattacharya, T., Bhattacharya, S., Cirigliano, V., Gupta, R., Mereghetti, E., Park, S., ... Yoon, B. (2025). Gradient Flow of the Weinberg Operator, *LATTICE2024*, 344. doi:[10.22323/1.466.0344](https://doi.org/10.22323/1.466.0344). arXiv: [2502.00460](https://arxiv.org/abs/2502.00460) [hep-lat]
- 4 Miller, J., Bhattacharya, S., Cichy, K., Constantinou, M., Gao, X., Metz, A., ... Zhao, Y. (2024, March). Proton Helicity GPDs from Lattice QCD. arXiv: [2403.05282](https://arxiv.org/abs/2403.05282) [hep-lat]
- 5 Constantinou, M., Bhattacharya, S., Cichy, K., Dodson, J., Metz, A., Steffens, F., & Scapellato, A. (2024). Twist-3 axial GPDs of the proton from lattice QCD, *LATTICE2023*, 315. doi:[10.22323/1.453.0315](https://doi.org/10.22323/1.453.0315)
- 6 Nurminen, N., Bhattacharya, S., Chomicki, W., Cichy, K., Constantinou, M., Metz, A., & Steffens, F. (2024). Unveiling Generalized Parton Distributions through the Pseudo-Distribution Approach, *LATTICE2023*, 318. doi:[10.22323/1.453.0318](https://doi.org/10.22323/1.453.0318). arXiv: [2311.18502](https://arxiv.org/abs/2311.18502) [hep-lat]
- 7 Bhattacharya, S., Hatta, Y., & Vogelsang, W. (2023a, August). Unraveling anomalies in Deeply Virtual Compton Scattering. *30th International Workshop on Deep-Inelastic Scattering and Related Subjects*. arXiv: [2308.15377](https://arxiv.org/abs/2308.15377) [hep-ph]

- 8 Bhattacharya, S., Boussarie, R., & Hatta, Y. (2023). Probing the Gluon Orbital Angular Momentum at the EIC, *16.7*, 7–A16. [doi:10.5506/APhysPolBSupp.16.7-A16](https://doi.org/10.5506/APhysPolBSupp.16.7-A16)
- 9 Bhattacharya, S., Cichy, K., Constantinou, M., Dodson, J., Gao, X., Metz, A., ... Zhao, Y. (2023). GPDs in asymmetric frames. *Proceedings of the 39th international symposium on lattice field theory — pos(lattice2022)*, 430, 095. [doi:10.22323/1.430.0095](https://doi.org/10.22323/1.430.0095)
- 10 Cichy, K. et al. (2023). Generalized Parton Distributions from Lattice QCD, *16.7*, 7–A6. [doi:10.5506/APhysPolBSupp.16.7-A6](https://doi.org/10.5506/APhysPolBSupp.16.7-A6). arXiv: 2304.14970 [hep-lat]
- 11 Constantinou, M., Bhattacharya, S., Cichy, K., Dodson, J., Gao, X., Metz, A., ... Zhao, Y. (2023). Accessing proton GPDs in asymmetric frames: Numerical implementation. *Proceedings of the 39th international symposium on lattice field theory — pos(lattice2022)*, 430, 096. [doi:10.22323/1.430.0096](https://doi.org/10.22323/1.430.0096)
- 12 Bhattacharya, S. (2022, September). Observable for gluon orbital angular momentum. [doi:10.5281/zenodo.7103955](https://doi.org/10.5281/zenodo.7103955)
- 13 Dodson, J., Bhattacharya, S., Cichy, K., Constantinou, M., Metz, A., Scapellato, A., & Steffens, F. (2022). First Lattice QCD Study of Proton Twist-3 GPDs, *LATTICE2021*, 054. [doi:10.22323/1.396.0054](https://doi.org/10.22323/1.396.0054). arXiv: 2112.05538 [hep-lat]
- 14 Hatta, Y. et al. (2020, February). Proceedings, Probing Nucleons and Nuclei in High Energy Collisions: Dedicated to the Physics of the Electron Ion Collider: Seattle (WA), United States, October 1 - November 16, 2018. [doi:10.1142/11684](https://doi.org/10.1142/11684). arXiv: 2002.12333 [hep-ph]
- 15 Bhattacharya, S., Cocuzza, C., & Metz, A. (2020c). Model Calculations of Euclidean Correlators. *Probing Nucleons and Nuclei in High Energy Collisions: Dedicated to the Physics of the Electron Ion Collider*, 55–58. [doi:10.1142/9789811214950_0011](https://doi.org/10.1142/9789811214950_0011)
- 16 Bhattacharya, S., Cocuzza, C., & Metz, A. (2019b). Going off the light-cone - a model study of quasi-GPDs, *LC2019*, 027. [doi:10.22323/1.374.0027](https://doi.org/10.22323/1.374.0027)
- 17 Bhattacharya, S., Cocuzza, C., & Metz, A. (2019c). Studying twist-2 GPDs through quasi-distributions in a scalar diquark model, *DIS2019*, 169. [doi:10.22323/1.352.0169](https://doi.org/10.22323/1.352.0169)
- 18 Bhattacharya, S., Metz, A., & Zhou, J. (2018). Generalized TMDs in the exclusive double Drell-Yan process, *DIS2017*, 238. [doi:10.22323/1.297.0238](https://doi.org/10.22323/1.297.0238)
- 19 Bhattacharya, S., Metz, A., & Zhou, J. (2017b). Observables for Generalized TMDs of Quarks, *QCDEV2017*, 006. [doi:10.22323/1.308.0006](https://doi.org/10.22323/1.308.0006)

Talks

I have disseminated my research findings through a total of **90 talks, seminars, and lectures**. Among them, **67 were invited talks and seminars** at conferences, workshops, national laboratories, and universities, both within and outside the United States. An additional **22 were valuable contributed talks** that I presented at both national and international conferences. **1 was an invited lecture at a summer school**.

Invited Talks/Seminars

- 2026 ■ TBD - New Frontiers in QCD 2026
October 12- November 13, 2026 - Yukawa Institute for Theoretical Physics (YITP), Kyoto University, Japan
- Gluon GTMDs in heavy-meson production at the EIC - Towards improved hadron tomography with hard exclusive reactions
July 22, 2026 - University of Virginia, USA

Talks (continued)

- Orbital angular momentum from exclusive meson production - Light Cone 2026: Applications at EIC era
 June 23, 2026 - Stony Brook University, USA
- Parton orbital dynamics from exclusive vector meson production - The Impact of Vector Mesons on the Studies of the 3D Structure of the Nucleon
 June 17, 2026 - CERN, Geneva, Switzerland
- Exclusive meson production as a probe of partonic orbital dynamics - CNF Seminar series
 May 21, 2026 - Center of Nuclear Femtography (CNF), Jefferson Lab, Virginia, USA
- Signatures of parton orbital dynamics in exclusive meson production - CLAS Collaboration Meeting
 April 8, 2026 - CLAS, Jefferson Lab, Virginia, USA
- 2025
■ Quantum anomaly and GPDs (**Plenary Talk**) - QCD Evolution workshop
 May 21, 2025 - Jefferson Lab, Virginia, USA
- Report on EIC Early Physics Workshop (Phenomenology) (talk) - 2025 RHIC & AGS Annual Users' Meeting
 May 20, 2025 - BNL, USA
- Key processes to access parton orbital angular momentum at the EIC (talk) - ePIC Early Science Workshop
 April 24, 2025 - CFNS, Stony Brook University, USA
- Probing Orbital Angular Momentum and Spin-Orbit Correlations at the EIC (talk) - Mechanical properties of hadrons: structure, dynamics, visualization
 April 3, 2025 - ECT*, Trento, Italy
- Quantum Anomalies and (Generalized) Parton Distributions (**Plenary Talk**) - 11th International Conference on Physics Opportunities at an Electron-Ion Collider (POETIC XI)
 February 26, 2025 - Florida International University, Miami, USA
- 2024
■ EIC Theory Overview (**Plenary Talk**) - Uncovering New Laws of Nature at the EIC
 November 20, 2024 - Brookhaven National Laboratory, Upton, USA
- Uncovering Anomalies in Parton Distributions (seminar) - T-2 seminar
 November 14, 2024 - Los Alamos National Laboratory, USA
- Connections between Quantum Anomalies and Generalized Parton Distributions (seminar) - Theory seminar
 October 30, 2024 - Ecole Polytechnique, France
- Computing GPDs in Asymmetric Frames: A New Perspective (talk) - Multidimensional Hadron Structure (MDHS) workshop
 October 24, 2024 - Institut Pascal of the Universite Paris-Saclay, France
- Exploring the Cosmic Core of Nucleons with the Electron-Ion Collider (seminar) - Graduate student seminar series
 October 18, 2024 - University of Connecticut, Storrs, USA
- Quantum Anomalies in (Generalized) Parton Distributions (seminar) - Pizza Lunch Seminar
 September 18, 2024 - University of California, Los Angeles, USA
- Lattice calculations of GPDs and higher-twist PDFs (talk) - Heavy Ion Physics in the EIC Era (INT-24-2b)
 August 12, 2024 - Seattle, Washington, USA
- Probing quark and gluon orbital angular momentum (talk) - Towards improved hadron tomography with hard exclusive reactions
 August 5, 2024 - ECT*, Trento, Italy
- Hadron structure via GPDs (**Plenary Talk**) - The 41st Lattice Conference
 August 2, 2024 - Liverpool, UK

Talks (continued)

- 2023

Recent advances in GPD calculations from Lattice QCD (**Plenary Talk**) - 10th International Conference on Quarks and Nuclear Physics (QNP2024)
July 11, 2024 - Institute of Cosmos Sciences of the University of Barcelona, Spain

Observables for Generalized TMDs (talk) - Transversity 2024 Workshop
June 5, 2024 - Trieste, Italy

State-of-the-art of observables for Generalized TMDs (talk) - QCD Evolution workshop
May 30, 2024 - University of Pavia, Pavia, Italy

Unraveling quantum anomalies in Generalized Parton Distributions (seminar) - Physics Division Seminar
April 15, 2024 - Argonne National Laboratory, Lemont, USA

Unveiling the "cosmic" interior of nucleons at the Electron-Ion Collider (colloquium) - Nuclear Theory talk
April 4, 2024 - New Mexico State University, New Mexico, USA

A comprehensive insight into nucleons at the Electron-Ion Collider (seminar) - Nuclear Physics Seminar
March 26, 2024 - University of Connecticut, Storrs, USA

Unveiling the "cosmic" interior of nucleons at the Electron-Ion Collider (colloquium) - Nuclear Theory talk
February 20, 2024 - Florida International University, Miami, USA

A comprehensive insight into nucleons at the Electron-Ion Collider (seminar) - CFNS Seminar
February 7, 2024 - CFNS, Stony Brook University, USA

A comprehensive insight into nucleons at the Electron-Ion Collider (seminar) - Nuclear Theory Seminar
February 2, 2024 - Temple University, Philadelphia, USA

Uncovering anomalies in Generalized Parton Distributions (seminar) - Nuclear Theory Seminar
November 9, 2023 - University of Maryland, College Park, Maryland, USA

Axial and trace anomalies in DVCS (talk) - EINN2023
November 1, 2023 - Athens, Greece, Europe

Generalized TMDs and GPDs: Recent Advances (seminar) - Hadron Ion Tea (HIT) Seminar Series
October 31, 2023 - Lawrence Berkeley National Laboratory, California, USA

Generalized Parton Distributions from Lattice QCD (talk) - 1st CFNS Postdoc Meet
October 19, 2023 - CFNS, Stony Brook University, USA

What are GPDs and how to access them on Lattice QCD? (**Plenary Talk**) - SPIN 2023
September 29, 2023 - Duke University, North Carolina, USA

Imprints of Chiral and Trace Anomalies in GPDs (talk) - Workshop: Precision QCD predictions for ep Physics at the EIC (11)
September 20, 2023 - CFNS, Stony Brook University, USA

Chiral and trace anomalies in Generalized Parton Distributions (seminar) - High Energy Theory Seminars
September 15, 2023 - Brookhaven National Laboratory, Upton, USA

Quark GPDs from non-symmetric frames (talk) - Lattice QCD and Probes of New Physics
August 8, 2023 - Santa Fe, New Mexico, USA

Calculating GPDs in Lattice QCD: Recent developments (talk) - International Workshop on Hadron Structure and Spectroscopy - 2023 (IWHSS-2023)
June 27, 2023 - Prague, Czechia

Talks (continued)

- Anomalies in Deep Virtual Compton Scattering (talk) - 10th International Conference on Physics Opportunities at an ElecTron-Ion Collider (POETIC 2023)
 May 5, 2023 - São Paulo, Brazil
- Manifestation of anomalies in Deep Virtual Compton Scattering (seminar) – Jefferson Lab Theory Seminars
 April 10, 2023 - Jefferson Lab, Virginia, USA
- Chiral and trace anomalies in DVCS (talk) - CFNS Monthly Postdoc Meetings
 March 10, 2023 - CFNS, Stony Brook University, USA
- Computing PDFs and GPDs in Lattice QCD: Recent Progress (seminar) - Center for Nuclear Theory seminar
 February 22, 2023 - Stony Brook University, USA
- Primary observables to access orbital angular momentum of partons (seminar) - Nuclear Physics Seminar
 February 13, 2023 - University of Illinois Urbana-Champaign, Illinois, USA
- Hunting for gluon orbital angular momentum at the EIC (talk) - XXIX Cracow Epiphany Conference on Physics at the EIC and Future Facilities
 January 18, 2023 - Cracow, Poland
- 2022
 Probing gluon orbital angular momentum through exclusive dijet production at the EIC (talk) – QCD with Electron Ion Collider workshop (QEIC 11)
 December 19, 2022 - IIT Delhi, New Delhi, India
- A full tomographic picture of hadronic matter at the Electron-Ion Collider (seminar) - Rising Researchers Seminar Series
 December 6, 2022 - Institute of Nuclear Physics/University of Washington, USA
- Generalized TMDs and parton Orbital Angular Momentum (seminar) - UCLA Nuclear Theory Group Seminar
 November 14, 2022 - ZOOM
- GTMDs and GPDs: Perspectives from experiments and lattice QCD (seminar) - T-2 Seminar
 September 27, 2022 - Los Alamos National Laboratory, USA
- Signature(s) of gluon orbital angular momentum (talk @ McCartor Award Session) - Light Cone 2022: Physics of Hadrons on the Light Front
 September 21, 2022 - ZOOM
- Lattice calculations of GPDs (talk) - INT 22-83 Workshop on Parton distributions and nucleon structure
 September 16, 2022 - Seattle, Washington, USA
- A novel approach to calculate GPDs from lattice QCD from non-symmetric frames (talk) - QNP2022 - The 9th International Conference on Quarks and Nuclear Physics
 September 5, 2022 - ZOOM (Florida State University)
- GTMDs and Wigner functions (talk) - International Workshop on Hadron Structure and Spectroscopy - 2022 (IWHSS-2022)
 August 30, 2022 - CERN, Geneva, Switzerland
- Global fit for g_{1T} TMD (talk) - Workshop: Precision QCD predictions for ep Physics at the EIC
 August 3, 2022 - CFNS, Stony Brook University, USA
- Exploring twist-3 PDFs and GPDs from lattice QCD (talk) - Towards improved hadron femtography with hard exclusive reactions
 July 21, 2022 - Virginia Tech, Virginia, USA
- Twist-3 PDFs from lattice QCD with a phenomenological component (talk) - CFNS Workshop: High Luminosity-EIC (EIC-Phase II)
 June 23, 2022 - CFNS, Stony Brook University, USA

Talks (continued)

- Global analysis of worm-gear function g_{1T} (talk) - TMD Collaboration Meeting
June 15, 2022 – ZOOM
- DSA as a simultaneous probe for gluon OAM and its helicity (talk) - EIC Jets meeting
June 6, 2022 – CFNS, Stony Brook University, USA
- GTMDs and Wigner distributions: Recent developments (talk) - Transversity 2022 Workshop
May 25, 2022 - Pavia, Italy
- A novel observable for gluon orbital angular momentum (talk) - QCD Evolution Workshop 2022
May 13, 2022 - University of Virginia, Virginia, USA
- First lattice study of twist-3 functions from quasi-PDF approach (seminar) - Virtual Lattice Field Theory Colloquium Series
April 14, 2022 – MIT, USA
- g_{1T} extraction (talk) – Correlations in Partonic and Hadronic Interactions workshop (CPHI-2022)
March 7, 2022 – ZOOM
- First global QCD analysis of the worm-gear TMD $g_{1T}(x, \vec{k}_\perp^2)$ (seminar) – RIKEN BNL Research Center (RBRC) Seminars/ Nuclear Theory (NT) Seminars
February 3, 2022 – Brookhaven National Laboratory, Upton, USA
- 2021 ■ An exploratory study of twist-3 PDFs using quasi-PDF approach (seminar) - Jefferson Lab Theory Seminars
May 17, 2021 – Jefferson Lab, Virginia, USA
- Exploring twist-3 PDFs $g_T(x)$, $e(x)$, and $h_L(x)$ in lattice QCD using quasi-PDF approach (seminar) – The International Light Cone Advisory Committee (ILCAC) Seminar
February 3, 2021 – ZOOM
- 2020 ■ Exclusive double quarkonium production and generalized TMDs of gluons (talk) – Quarkonia as Tools 2020
January 14, 2020 – Centre Paul Langevin, Aussois, France
- 2019 ■ Quasi-distribution approach to unveil GPDs: A discussion within and beyond models (seminar) – Department Seminar
September 24, 2019 – University of Pavia, Pavia, Italy
- Quasi-GPDs for quarks: Model results and beyond (seminar) – Jefferson Lab Theory Seminars
July 15, 2019 – Jefferson Lab, Virginia, USA

Contributed Talks

- 2025 ■ Unveiling chiral-odd dimeson generalized distribution amplitudes - 11th International Conference on Physics Opportunities at an Electron-Ion Collider (POETIC XI)
February 24, 2025 - Florida International University, Miami, USA
- 2024 ■ Probing quark orbital angular momentum in ep collisions - 31st International Workshop on Deep Inelastic Scattering and Related Subjects
April 9, 2024 - Maison MINATEC, Grenoble, France
- 2023 ■ Anomalies in GPDs - QGT Collaboration meeting
September 9, 2023 - Temple University, Philadelphia, USA
- A new approach for computing GPDs from asymmetric frames - The 40th International Symposium on Lattice Field Theory
August 3, 2023 - Fermilab, Batavia, Illinois, USA
- A novel approach for calculating GPDs from asymmetric frames - The 2023 Meeting on Lattice Parton Physics from Large Momentum Effective Theory (LaMET2023)
July 26, 2023 - University of Regensburg, Germany

Talks (continued)

- Theoretical aspects of a Lorentz-invariant decomposition for GPDs - QGT Collaboration meeting
June 9, 2023 - ZOOM
- Unraveling anomalies in Deep Virtual Compton Scattering - 30th International Workshop on Deep Inelastic Scattering and Related Subjects
March 28, 2023 - Michigan State University, Michigan, USA
- 2022 ■ GPDs in non-symmetric frames - The 39th International Symposium on Lattice Field Theory
August 11, 2022 - Hörsaalzentrum Poppelsdorf, Germany
- Observable for gluon orbital angular momentum – 29th International Workshop on Deep Inelastic Scattering and Related Subjects
May 5, 2022 - Santiago de Compostela, Spain
- Global analysis of g_{1T} TMD – APS April Meeting 2022
April 10, 2022 - ZOOM
- 2021 ■ First global extraction of the worm-gear TMD – 24th International Spin Symposium (SPIN 2021)
October 22, 2021 - ZOOM
- Role played by the zero modes in the matching for the twist-3 PDFs – 24th International Spin Symposium (SPIN 2021)
October 21, 2021 – ZOOM
- Extraction of the worm-gear TMD $g_{1T}(x, \vec{k}_\perp^2)$ COMPASS, HERMES and JLab data on semi-inclusive DIS – Particles and Nuclei International Conference (PANIC) 2021
September 8, 2021 – ZOOM
- Zero modes and Matching for the twist-3 PDFs – 28th International Workshop on Deep Inelastic Scattering and Related Topics
April 14, 2021 – ZOOM
- Non-trivialities in the Matching for the twist-3 PDFs – 9th workshop of the APS topical Group on Hadronic Physics
April 13, 2021 – ZOOM
- 2020 ■ Matching for the twist-3 PDFs $g_T(x)$, $e(x)$, and $h_L(x)$: Success or failure? – The 2020 Meeting on Lattice Parton Physics from Large-Moment Effective Theory (LaMET2020)
September 11, 2020 – ZOOM
- 2019 ■ Going off the light-cone – a model study of quasi-GPDs – Light Cone 2019
September 18, 2019 – Ecole Polytechnique, Palaiseau, France
- What can we learn about twist-2 GPDs through quasi-distributions? – International Nuclear Physics Conference (INPC) 2019
July 30, 2019 – Scottish Event Campus, Glasgow, UK
- Studying twist-2 GPDs through quasi-distributions in a scalar diquark model – 27th International Workshop on Deep Inelastic Scattering and Related Topics
April 10, 2019 – University of Torino, Torino, Italy
- 2018 ■ Generalized TMDs in hadronic collisions – Light Cone 2018
May 17, 2018 – Jefferson Lab, Virginia, USA
- Accessing Generalized TMDs through double Drell-Yan and double charmonium production processes – 26th International Workshop on Deep Inelastic Scattering and Related Topics
April 19, 2018 – Kobe University Convention Center, Kobe, Japan
- 2017 ■ Generalized TMDs in the exclusive double Drell-Yan process – 25th International Workshop on Deep Inelastic Scattering and Related Topics
April 5, 2017 – University of Birmingham, Birmingham, UK

Research Spotlight: Media Coverage and DOE Highlights

- 2023  [Calculations Reveal High-Resolution View of Quarks Inside Protons](#)
-  [Theory Offers a High-Resolution View of Quarks Inside Protons](#)
- 2022  [Theorists Propose a Novel Way to Measure Gluons' Orbital Motion](#)

Teaching Experience

Course Instruction at University of Connecticut

- 2026-2027  **Mathematical Methods for Physics**
Designed and delivered lectures for an *undergraduate-level* course in mathematical methods for physics.
- 2025-2026  **Theoretical Mechanics**
Designed and delivered lectures for a *graduate-level* course on Theoretical Mechanics.

Invited Lectures

- 2025  Invited to deliver lectures on Generalized Parton Distributions (GPDs) and Generalized Transverse Momentum Distributions (GTMDs) as part of the [QCD and Hadronic Structure summer school](#) at IJCLAB (7-11 July). These lectures provided a deep dive into theoretical frameworks and their implications in hadronic structure research.

Synergistic Endeavors

Academic Engagement

- 2027  Organizer of the '*The D-term: experimental and theoretical prospects at the EIC and JLab*' (Feb 2027) at Stony Brook University
- 2025  Member, APS Dissertation and Thesis Award Committee for the Hadronic Physics Group
-  Organizer of the '*QCD at LHC*' (8-12 September) at Stony Brook University
-  Organizer of the '*11th Biennial Workshop of the APS Topical Group on Hadronic Physics (GHP2025)*' (14-16 March) in Anaheim, California
- 2024  Organizer of the workshop on '*From quarks and gluons to the internal dynamics of hadrons*' (15-17 May) at the CFNS, Stony Brook University
-  Organizer of the workshop on '*Generalized parton distributions for nucleon tomography in the EIC era*' (17-19 January) at BNL
- 2023  Organizer of the workshop on '*TMDs: Towards a Synergy between Lattice QCD and Global Analyses*' (21-23 June) at the CFNS, Stony Brook University
-  Scientific Reviewer for Physical Review Letters, Physical Review D, Physics Letters B, European Physical Journal C, European Physical Journal Plus, Nuclear Physics A
- 2021 – 2024  Organizer of seminars for the Center for Frontiers in Nuclear Science (CFNS) at Stony Brook University

Synergistic Endeavors (continued)

Diversity, Equity, and Inclusion and Outreach Initiatives

- Jan. 24-26, 2025  The *Conference for Women and Gender Minorities in Physics (CU*IP)* at the University of Connecticut, held from January 24-26, 2025, was an inspiring event dedicated to advancing DEI in physics. I had the privilege of participating as a local organizer and panelist, engaging in dynamic discussions and answering questions about career paths in physics for underrepresented groups.
- Jan. 8, 2024  I received an invitation to deliver a presentation on my career journey to the 2024 summer interns at BNL. This audience comprised underrepresented undergraduate students from around the world. The title of my talk was '*My Career in Physics and Beyond*', with my primary goal being to inspire and motivate them to pursue STEM.
- Nov. 15, 2023  I presented a talk titled '*Engaging the Next Generation in Science*' at the Office of Educational Programs at BNL. During this presentation, I engaged with undergraduate Fall interns from around the world, discussing my career journey, the factors that ignited my interest in STEM, the path that eventually brought me to BNL, and introducing them to my research. My primary aim was to inspire them, with a particular emphasis on underrepresented groups, to consider STEM as a future pursuit.
- Nov. 11, 2023  The Women in Science and Engineering (WISE) Program at Stony Brook University is dedicated to increasing the representation of individuals from underrepresented groups in STEM fields through outreach, recruitment, and retention initiatives. As part of my commitment to WISE, I instructed sophomore participants in the program on the fundamentals of QCD and guided them through one of my research projects conducted at BNL. The selected project was titled '*Decoding Nature's Blueprints: Unveiling Quarks through Data Analysis*'. This hands-on project focused on extracting crucial parton distribution functions, particularly those of quarks, from experimental data. I taught them how to employ advanced data analysis and modeling techniques with the goal of uncovering the intricate quark patterns within protons and neutrons. My initiative was spotlighted in an article by the [BNL Media and Communications Office](#), as well as by the [Stony Brook University News](#). This initiative was also highlighted in the [DOE Office of Science Research News](#).