DR. JUSTIN CAMMAROTA

Lexington, VA

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EDUCATION

University of Kentucky *September 2025-Present*
Postdoctoral Scholar

William & Mary *August 2019 - August 2025*
Doctorate of Philosophy in Physics *Advisor Dr. Jianwei Qiu, Defended June 2025*
Master of Science in Physics *January 2021*

Lebanon Valley College *August 2015 - May 2019*
Bachelor of Science in Physics Summa Cum Laude
Bachelor of Science in Mathematics Summa Cum Laude

RESEARCH EXPERIENCE

University of Kentucky September 2025-Present
Postdoctoral Scholar *Lexington KY*

Exploring limits on axion-like particles using the hybrid QCD and QED factorization. PI: Dr. Susan Gardner

William & Mary SIDIS and DIS Research Summer 2020-August 2025
Graduate Student Researcher *Williamsburg VA*

Completed the first calculation of next-to-leading order (NLO) factorized QED contributions to the short-distance hard coefficients of inclusive lepton-hadron deep inelastic scattering (DIS) in a joint QCD and QED factorization approach [PoS DIS2024 (2024) 064 (arXiv2408.08377), PRD 112:056007 (arXiv2505.23487)]. Unlike the traditional radiative correction (RC) approach to handle the collision-induced QED contributions to lepton-hadron DIS, QED radiation from all charged leptons and quarks are treated equally and their collinear sensitivities are systematically factorized into corresponding universal lepton and parton distribution functions. Our full NLO factorized QED contribution calculated in the joint QCD and QED factorization approach is completely infrared safe without the need of any parameters in the traditional RC approach other than the standard factorization scale. Our results and the new joint factorization approach will impact the reliability and precision for extracting partonic information from lepton-hadron DIS and semi-inclusive DIS at the future EIC. Our on-going effort to extend this joint factorization approach to the NLO contribution to parity-violating DIS (PVDIS) will impact the reach and discovery potential of new physics from future high luminosity PVDIS measurements at SoLID and EIC. Research Advisor and Collaborator: Dr. Jianwei Qiu, Dr. Jia-Yue Zhang

DOE SCGSR and JSA/Jefferson Lab Grant Research Summer 2022-Summer 2024
Graduate Student Researcher *Newport News VA*

Developed the first software package to implement the new QED and QCD factorization formalism to extract important hadronic structure functions. Research Advisor and Collaborators: Dr. Jianwei Qiu, Dr. Wally Melnitchouk, and Dr. Nobuo Sato

Lebanon Valley College Senior Physics Research Fall 2018-Spring 2019
Student Researcher *Annville PA*

Created Python code and Jupyter Notebooks to model asymmetries from proton structure experiments with the JAM3D collaboration. Research Advisor: Dr. Dan Pitonyak

European Organization for Nuclear Research (CERN) Summer 2018
Summer Research Intern *Geneva CH*

Extracted first moment of spin-dependent distribution functions from asymmetry data collected by the COMPASS collaboration, through the University of Michigan CERN REU. Research Advisor: Dr. Bakur Parsamyan

Fermi National Accelerator Laboratory Summer 2017
Summer Research Intern *Batavia IL*

Modeled modifications to the delivery ring as part of REDTOP's proposal phase to demonstrate effects of altered quadrupoles and sextupoles, through the SULI program. Research Advisors: Dr. Corrado Gatto and Dr. Michael Syphers

Lebanon Valley College Mathematical Physics Research Group Summer 2016
Summer Research Intern *Annville PA*

Investigated the Werner Basis Conjecture to prove linear independence of the collection of Werner Diagram States over the space of Werner States. Research Advisors: Dr. David Lyons and Dr. Scott Walck

PAPERS

1. Justin Cammarota, Jian-Wei Qiu, Kazuhiro Watanabe, and Jia-Yue Zhang. Factorized qed and qcd contribution to deeply inelastic scattering. *Phys. Rev. D*, 112:056007, Sep 2025
2. Justin Cammarota, Jian-Wei Qiu, Kazuhiro Watanabe, and Jia-Yue Zhang. Factorized qed contribution to lepton-hadron dis, 2024
3. Justin Cammarota, Leonard Gamberg, Zhong-Bo Kang, Joshua A. Miller, Daniel Pitonyak, Alexei Prokudin, Ted C. Rogers, and Nobuo Sato. Origin of single transverse-spin asymmetries in high-energy collisions. *Phys. Rev. D*, 102:054002, Sep 2020

IN PREPARATION

1. Justin Cammarota, Wally Melnitchouk, Jian-Wei Qiu, and Nobuo Sato, Joint QCD and QED Factorization for Lepton-Hadron Semi-Inclusive DIS and Extraction of TMDs

AWARDED GRANTS

Jefferson Science Associates/Jefferson Lab Graduate Fellowship, "Extracting Polarized Hadron Structure from SIDIS in terms of QED and QCD Factorization" $12000, 1 year starting July 2023.

Jefferson Science Associates Travel Grant, QCD Evolution Workshop, $1000, May 2023.

Department of Energy Office of Science Graduate Student Research "Extracting Hadron Structure Functions in terms of Lepton-Hadron Scattering from QED and QCD Factorization" $36000, 1 year starting June 13, 2022.

ACADEMIC ACHIEVEMENTS

Cypher Award	April 2025
Rolf G. Winter Memorial Physics Award for Teaching Excellence	December 2021
Outstanding Achievement Award in Physics	April 2019
Outstanding Senior Award in Mathematics	April 2019
Inducted into Sigma Pi Sigma (SPS), Physics Honor Society	April 2017
Inducted into Pi Mu Epsilon (PME), Math Honor Society	April 2017
Mathematical Achievement Award	April 2017
First Year Achievement Award in Physics	April 2016
First Year Leadership and Success Award	April 2016
Allwein Scholar at Lebanon Valley College	September 2015

CONFERENCES AND WORKSHOPS

PLENARY TALKS

New opportunities for beyond-the-Standard Model searches at the EIC July 2025
Invited Talk *Stony Brook NY*

QCD Evolution Workshop May 2023
Presented *Orsay France*

PARALLEL TALKS

APS Division of Nuclear Physics and the Physical Society of Japan Fall Meeting November 2023
Presented *Waikoloa Village HI*

DIS2023: International Workshop on Deep-Inelastic Scattering and Related Subjects March 2023
Presented *East Lansing MI*

APS Division of Nuclear Physics Fall Meeting October 2022
Presented *New Orleans LA*

QCD Evolution Workshop May 2022
Attended *Charlottesville VA*

PRESENTATIONS

"QCD and QED Radiation in Lepton-Hadron Scattering: A Joint Factorization Approach" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N., Watanabe, K., Zhang, J-Y.
-University of Kentucky Nuclear Seminar (Oral Presentation).
"Joint Factorization of QCD and QED Radiation in Lepton-Hadron Scattering" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N., Watanabe, K., Zhang, J-Y.
-Presented at CFNS Workshop: New Opportunities for beyond-the-Standard Model searches at the EIC, Stony Brook, NY. July 23, 2025. (Invited Oral Presentation)
"Impact of QED Effects in SIDIS: A New Hybrid Factorization Approach" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N.
-Presented at APS Division of Nuclear Physics and the Physical Society of Japan Fall Meeting, Waikoloa Village, HI. November 29 2023. (Oral Presentation)
"The Impact of QED Effects in SIDIS" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N.
-Theory Seminar at Jefferson Lab, Newport News, VA. May 31, 2023 (Oral Presentation)
"Factorizing Lepton Radiation in SIDIS" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N.
-Presented at QCD Evolution, Orsay, France. May 22, 2023 (Oral Presentation)
"Factorization of Lepton Radiation in SIDIS" Cammarota, J., Melnitchouk, W., Qiu, J., Sato, N.
-Presented at DIS2023, East Lansing, MI. March 30, 2023 (Oral Presentation)
-Presented at APS Division of Nuclear Physics Fall Meeting, New Orleans, LA. October 29, 2022 (Oral Presentation)
-Presented at HUGS student poster session, JLAB, Newport News, VA. June 16, 2021 (Poster Presentation)
"Accelerating into Graduate School" Cammarota, J.
-Plenary talk at the 10th Disappearing Boundaries Summer Research Meeting, Lebanon Valley College, Annville, PA. July 17, 2019. (Oral Presentation)
"Extraction of first k_T moment of Sivers and $g_{1T}^{\perp}$ PDFs from COMPASS Proton 2010 data"
Cammarota, J., Parsamyan, B.
-Presented at the annual Lebanon Valley College Inquiry, Lebanon Valley College, Annville, PA, April 25, 2019. (Poster Session)
-Presented at the University of Michigan CERN REU Summer Student Program at CERN, Meyrin CH, August 16, 2018. (Oral Presentation)
-Presented at the COMPASS Analysis Meeting at CERN, Meyrin CH, August 9, 2018. (Oral Presentation)
"REDTOP Beam Modeling for Raised Transition Energy and Third Integer Resonance Extraction"
Cammarota, J., Gatto, C., Syphers, M.J.
-Presented at the annual Lebanon Valley College Inquiry, Lebanon Valley College, Annville, PA, April 26, 2018. (Poster Session)
-Presented as part of the SULI program at Fermilab, FNAL, Batavia IL, August 9-10, 2017. (Oral Presentation and Poster Session)
"Investigation of the Werner Basis Conjecture" Cammarota, J., Lyons, D.W., Walck, S.N.
-Presented at the annual Lebanon Valley College Inquiry, Lebanon Valley College, Annville, PA, April 27, 2017. (Poster Session)
-Presented at the 31st annual Moravian Student Mathematics Conference, Moravian College, Bethlehem, PA, February 25, 2017. (Oral Presentation)

REPORTS

1. Justin Cammarota. Extraction of first transverse moments of sivers and $g_{1T}^{\perp}$ tmd pdfs from polarized sidis compass data. Unpublished Manuscript, LVC Physics Honors Thesis, 2019
2. Justin Cammarota. Investigating the werner basis conjecture. Unpublished Manuscript, LVC Math Honors Thesis, 2019

3. Justin Cammarota and Bakur Parsamyan. Extraction of first transverse moments of sivers and $g_{1T}^{\perp}$ tmd pdfs from polarized sidis compass data. Unpublished Manuscript, CERN Document Server, 2018

4. Justin Cammarota, Corrado Gatto, and Michael Syphers. Redtop beam modeling for raised transition energy and third integer resonance extraction. Unpublished Manuscript, Beam Docs Archive, 2017

PROFESSIONAL DEVELOPMENT

Quantum Computing Bootcamp June 2023
Attended *Newport News VA*

Nuclear Physics on the Hill Day April 2023
Met with Congressional staff *Washington, DC*

CTEQ Summer School July 2022
Attended *Pittsburgh PA*

TMD Winter School January 2022
Attended *Santa Fe NM*

Hampton University Gradaute School Summer 2021
Attended Virtually *Newport News VA*

WORK EXPERIENCE

William & Mary Physics Department 2019-2021
Teaching Assistant

Taught and graded undergraduate physics labs for non-major students.

Lebanon Valley College Physics Department 2016-2019
Lab Assistant

Worked in undergraduate physics labs with students to help them understand important topics.

Lebanon Valley College Tutoring Center 2016-2019
Tutor and Study Pod Leader

Provided one-on-one and group tutoring in physics and math subjects.

COMPUTER SKILLS

Programming Languages	C/C++, C#, GAP, Haskell, HTML5/CSS3, Java, MAD-X, Mathematica, Python, R, ROOT
Software	LaTeX, Graphical Analysis, PASCO Capstone

EXTRA-CIRRICULAR

Midwest Theory Get Together Organizing Committee 2025
W & M Graduate and Honors Research Symposium Organizing Committee 2024
-Volunteer Coordinator and Session Chair
W & M Graduate Council 2022-2024
-Leadership Positions: President (2023-2024)
W & M Graduate Student Association 2020-2025
-Leadership Positions: Vice-Dean's Advisory Committee (2024-2025), President (2022-2023), Secretary (2021-2022), Journal Club Co-Executive (2020-2021), Treasurer (2020-2021)
W & M Physics Graduate Student Association 2019-2025
-Leadership Positions: Graduate Student Representative to Graduate Studies Committee (2021-2023)