Vishvas Pandey

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Research Interests

My research interests and expertise span experimental as well as theoretical efforts in the following areas:

Neutrino Interaction Cross Sections: electroweak interactions, neutrino-nucleus scattering, electron-nucleus scattering, coherent elastic neutrino-nucleus scattering (CEvNS)

Neutrino Properties: neutrino masses and hierarchy, mixing angles, CP violation phase

Beyond the Standard Model Physics: light sterile neutrinos, non-standard neutrino interactions, sub-GeV dark matter

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Work Experience

Current Position

May 2019 - present: Postdoctoral Research Associate, Department of Physics, University of Florida, Gainesville, Florida, USA. Full time based at Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

Previous Position

October 2016 - May 2019: Postdoctoral Research Associate, Center for Neutrino Physics, Virginia Tech, Blacksburg, Virginia, USA.

Visiting Researcher at

August 2019 - present: Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

December 2019 [1 week]: Los Alamos National Laboratory, Los Alamos, NM 87545, USA.

May - August 2019 [12 weeks]: Los Alamos National Laboratory, Los Alamos, NM 87545, USA.

September - October 2018 [3 weeks]: European Organization for Nuclear Research (CERN), Geneva, Switzerland.

May - July 2018 [8 weeks]: European Organization for Nuclear Research (CERN), Geneva, Switzerland.

January 2018 [2 weeks]: Thomas Jefferson National Accelerator Facility, Newport News, Virginia, USA.

July 2017 [2 weeks]: Department of Physics and Astronomy, Ghent University, Ghent, Belgium.

June 2017 [1 week]: Department of Physics, Sapienza University of Rome, Rome, Italy.

April - May 2017 [3 weeks]: Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

February - April 2017 [7 weeks]: Thomas Jefferson National Accelerator Facility, Newport News, Virginia, USA.

November - December 2016 [4 weeks]: Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

April - September 2016: Department of Physics and Astronomy, Ghent University, Ghent, Belgium.

Education

March 2016: Ph.D. in theoretical physics, Ghent University, Ghent, Belgium. [July 2010 - March 2016]
Ph.D. position full time funded by prestigious European Commission's Erasmus Mundus Ph.D. scholarship [2010-2013], and funding from Belgian Science Policy Office [2014-2015].
Ph.D. Thesis: Modeling electroweak quasielastic scattering off nuclei in kinematics relevant for accelerator-based neutrino-oscillation experiments.
Advisors: Prof. Dr. Natalie Jachowicz and Prof. Dr. Jan Ryckebusch.
Thesis Committee: Prof. Juan Antonio Caballero, Dr. Marco Martini, Prof. Riccardo Raabe, Prof. Didar Dobur, Dr. Wim Cosyn, Dr. Raúl González Jiménez, and Prof. Christophe Detavernier.

May 2010: M.Sc. Physics, specialization in nuclear and particle physics, Indian Institute of Technology Roorkee, Roorkee, India. [July 2008 - May 2010]
Master's Thesis: Neutrino masses in large volume compactifications in string theory framework.
Advisor: Prof. Dr. Aalok Misra.

May - July 2009: Summer research project as a 'Young Scientist Research Fellow', Raja Ramanna Centre for Advanced Technology, Indore, India.
Thesis: A theoretical study of stimulated Raman scattering in one dimensional Mott-Hubbard systems.
Advisors: Dr. Haranath Ghosh and Dr. Rama Chari.

May 2007: B.Sc. Physics and Mathematics, M. J. P. Rohilkhand University, India. [July 2004 - May 2007]

Grants and Scholarships

Awarded Grants and Scholarships

June 2017: Fellowship awarded by the European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*, Trento, Italy) for the attendance at Doctoral Training Program on Microscopic Theories of Nuclear Structure, Dynamics and Electroweak Currents.

2014 - 2015: PhD position/research full-time funded by a research grant from Interuniversity Attraction Poles Program initiated by the Belgian Science Policy Office.

2010 - 2013: Prestigious PhD scholarship awarded by the European Commission's initiative Erasmus Mundus External Cooperation Window (EMECW) lot 13 project.

April - June 2011: Scholarship awarded by the European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*, Trento, Italy) for the Doctoral Training Program on Neutrinos in Nuclear and Particle Physics.

June 2010: Junior Research Fellowship awarded by the Council for Scientific and Industrial Research (CSIR, India) after qualifying the Nationwide Joint CSIR-UGC National Eligibility Test (NET) with high national ranking. *(Declined)*

August 2009 - May 2010: Scholarship during M.Sc. awarded by the Indian Institue of Technology Roorkee, India.

May - July 2009: 'Young Scientist Research Fellowship' awarded by the Indian Department of Atomic Energy's Raja Ramanna Centre for Advanced Technology, Indore, India.

Contribution to PIs Grant Proposals

Fall 2019: Contributed to the development of the University of Florida PI's successful DOE grant proposal.

Fall 2018: Contributed to the development of the Virginia Tech PI's successful DOE grant proposal.

Collaboration Memberships and Roles

SBND Collaboration (Fermilab) [May 2019 - present]
Installation: L3 manager of the photon detection (PD) system installation and commissioning. Coordinating efforts of both (PMT and ARAPUCA) PD systems across various universities/national labs. Overseeing the integration of the whole PD system with the SBND detector. Working with the project team and supporting the project in various efforts including technical and director's reviews. In this role, I also routinely work with technical staff and engineering at FNAL. Running biweekly SBND-PDS meetings.
Physics: Exploring off-axis capabilities of SBND detector [SBND-PRISM] in extracting low-energy neutrino-nucleus cross sections, electron- and muon-neutrino cross section differences, and in extracting exotic new physics signals.
Other:
Speaker's Committee: Serving on the three-member Speaker's Committee.
Code of Conduct Committee: Serving as the chair of the Code of Conduct Committee.

Coherent CAPTAIN-Mills (CCM) Collaboration (Los Alamos National Laboratory) [May 2019 - present]
Coordinating CCM's photon detection system's integration into the SBND experiment.
Physics: Low-energy CC/NC inelastic neutrino-nucleus scattering simulation and analysis and exploiting its synergy with DUNE's supernova program. Evaluating coherent elastic neutrino-nucleus scattering (CEvNS) event rates, inelastic light dark matter and non-standard interactions sensitivity.

Electron-Argon Scattering Experiment [E12-14-012] (Jefferson Lab Hall A) [February 2017 - present]
Roles until April 2019:
Analysis Coordinator: Served as analysis coordinator. Organized and ran weekly analysis meetings, and annual analysis workshops. Worked with a team of graduate students performing physics analysis. Investigated physics reach of the experiment. Performed ancillary calculations, e.g., charge-symmetry background cross section.
Physics Output: Led the first two physics measurements of the experiment including the first ever electron-argon cross section measurement at JLab. Corresponding author of the first two PRC papers and first two conference proceedings of the experiment.
Other: Served as a run coordinator of Hall A. Set up and maintained DocDB (and wiki) for the collaboration. Presented collaboration results and status at various international conferences.

MicroBooNE Collaboration (Fermilab) [November 2016 - April 2019]
Local activity: Set up and maintained MicroBooNE remote control room at Virginia Tech.
Expert role in data and Monte-Carlo production group ($\sim$ 6 months).
Participation in cross section and systematics groups.

PLAFOND/Neutrino Platform (CERN) [November 2017 - April 2019]
(Invited) Team leader of the Virginia Tech team. Cross sections, theory and generators working group.

protoDUNE (CERN) [Non-member] [May 2018 - October 2018]
Co-led the installation and commissioning of the entire cosmic ray tagger system of the single-phase proto-DUNE experiment.

ICARUS (Fermilab) [Non-member] [April 2017 - May 2017]
Trained the team at Fermilab in installing bottom cosmic ray taggers.

Theory-Experiment Collaboration

Neutrino Scattering Theory Experiment Collaboration (NuSTEC) [December 2020 - present]
(Invited) Board member of the NuSTEC.

Publications

[Summary: 35 Refereed Journal Articles + 13 Conference Proceedings + 1 Featured Magazine Article]
[** Theoretical/Phenomenological papers]
[* Experimental papers as corresponding author]

Refereed Journal Articles

35. A. A. Aguilar-Arevalo *et al.* [CCM Collaboration], "First Dark Matter Search Results From Coherent CAPTAIN-Mills," [arXiv:2105.14020 [hep-ex]].

34. D. Abrams *et al.* [Jefferson Lab Hall A MARATHON Collaboration], "Measurement of the Nucleon F_2^n / F_2^p Structure Function Ratio by the Jefferson Lab MARATHON Tritium/Helium-3 Deep Inelastic Scattering Experiment," [arXiv:2104.05850 [hep-ex]].

33. L. Gu *et al.* [Jefferson Lab Hall A Collaboration], "Measurement of the Ar(e,e′p) and Ti(e,e′p) cross sections in Jefferson Lab Hall A," Phys. Rev. C **103**, 034604 (2021) [arXiv:2012.11466 [nucl-ex]].

32. R. Acciarri *et al.* [SBND Collaboration], "Cosmic Background Removal with Deep Neural Networks in SBND," [arXiv:2012.01301 [physics.data-an]].

31. ** O. Tomalak, P. Machado, **V. Pandey** and R. Plestid, "Flavor-dependent radiative corrections in coherent elastic neutrino-nucleus scattering," JHEP **02** 097 (2021) [arXiv:2011.05960 [hep-ph]].

30. ** A. Nikolakopoulos, **V. Pandey**, J. Spitz and N. Jachowicz, "Quasielastic interactions of monoenergetic kaon decay-at-rest neutrinos," Phys. Rev. C **103**, 064603 (2021) [arXiv:2010.05794 [nucl-th]].

29. ** N. Van Dessel, **V. Pandey**, H. Ray and N. Jachowicz, "Nuclear Structure Physics in Coherent Elastic Neutrino-Nucleus Scattering," submitted to Phys. Rev. C [arXiv:2007.03658 [nucl-th]].

28. P. Abratenko *et al.* [MicroBooNE Collaboration], "Vertex-Finding and Reconstruction of Contained Two-track Neutrino Events in the MicroBooNE Detector", JINST **16**, no.02, P02017 (2021) [arXiv:2002.09375 [physics.ins-det]].

27. R. Acciarri *et al.* [SBND Collaboration], "Construction of precision wire readout planes for the Short-Baseline Near Detector (SBND)", JINST **15**, no.06, P06033 (2020) [arXiv:2002.08424 [physics.ins-det]].

26. R. Cruz-Torres *et al.* [Jefferson Lab Hall A Tritium Collaboration], "Probing few-body nuclear dynamics via ^{3}H and ^{3}He $(e,e'p)$pn cross-section measurements", Phys. Rev. Lett. **124**, no.21, 212501 (2020) [arXiv:2001.07230 [nucl-ex]].

25. P. Abratenko *et al.* [MicroBooNE Collaboration], "Search for heavy neutral leptons decaying into muon-pion pairs in the MicroBooNE detector", Phys. Rev. D **101**, no.5, 052001 (2020) [arXiv:1911.10545 [hep-ex]].

24. C. Adams *et al.* [MicroBooNE Collaboration], "Reconstruction and Measurement of $\mathcal{O}(100)$ MeV Energy Electromagnetic Activity from $\pi^0 \to \gamma\gamma$ Decays in the MicroBooNE LArTPC", JINST **15**, no.02, P02007 (2020) [arXiv:1910.02166 [hep-ex]].

23. C. Adams *et al.* [MicroBooNE Collaboration], "A Method to Determine the Electric Field of Liquid Argon Time Projection Chambers Using a UV Laser System and its Application in MicroBooNE", JINST **15**, no.07, P07010 (2020) [arXiv:1910.01430 [physics.ins-det]].

22. M. Murphy *et al.* [The Jefferson Lab Hall A Collaboration], "Measurement of the cross sections for inclusive electron scattering in the E12-14-012 experiment at Jefferson Lab", Phys Rev. C**100**, 054606 (2019) [arXiv:1908.01802 [hep-ex]].

21. C. Adams *et al.* [MicroBooNE Collaboration], "Calibration of the Charge and Energy Response of the MicroBooNE Liquid Argon Time Projection Chamber using Muons and Protons", JINST **15**, no.03, P03022 (2020) [arXiv:1907.11736 [physics.ins-det]].

20. C. Adams *et al.* [MicroBooNE Collaboration], "First Measurement of Inclusive Muon Neutrino Charged Current Differential Cross Sections on Argon at $E_\nu \sim 0.8\ GeV$ with the MicroBooNE Detector", Phys. Rev. Lett. **123**, 131801 (2019), [arXiv:1905.09694 [hep-ex]].

19. R. Cruz-Torres *et al.* [Jefferson Lab Hall A Tritium Collaboration], "Comparing proton momentum distributions in $A = 3$ nuclei via ^3He and $^3H(e,e'p)$ measurements", Phys. Lett. B**797**, 134890 (2019) [arXiv:1902.06358 [nucl-ex]].

18. ** A. Nikolakopoulos, N. Jachowicz, N. Van Dessel, K. Niewczas, R. González-Jiménez, J. Manuel Udías, **V. Pandey**, "Electron versus muon neutrino induced cross sections in charged current quasi-elastic processes", Phys. Rev. Lett. **123**, 052501 (2019) [arXiv:1901.08050 [nucl-th]].

17. C. Adams *et al.* [MicroBooNE Collaboration], "Design and construction of the MicroBooNE Cosmic Ray Tagger system", JINST 14, P04004 (2019), [arXiv:1901.02862 [physics.ins-det]].

16. C. Adams *et al.* [MicroBooNE Collaboration], "Rejecting cosmic background for exclusive neutrino interaction studies with Liquid Argon TPCs; a case study with the MicroBooNE detector", Eur. Phys. J. C**79**, 673 (2019) [arXiv:1812.05679 [physics.ins-det]].

15. S. N. Santiesteban *et al.* "Density Changes in Low Pressure Gas Targets for Electron Scattering Experiments", Nucl. Instrum. Meth. A**940**, 351 (2019) [arXiv:1811.12167 [physics.ins-det]].

14. C. Adams *et al.* [MicroBooNE Collaboration], "First Measurement of ν_μ Charged-Current π^0 Production on Argon with the MicroBooNE detector", Phys. Rev. D**99**, 091102 (2019) [arXiv:1811.02700 [hep-ex]].

13. * H. Dai, M. Murphy, **V. Pandey** *et al.* [The Jefferson Lab Hall A Collaboration], "First Measurement of the Ar(e,e')X Cross Section at Jefferson Lab", Phys. Rev. C**99**, 054608 (2019) [arXiv:1810.10575 [nucl-ex]].

12. C. Adams *et al.* [MicroBooNE Collaboration], "A Deep Neural Network for Pixel-Level Electromagnetic Particle Identification in the MicroBooNE Liquid Argon Time Projection Chamber", Phys. Rev. D**99**, 092001 (2019) [arXiv:1808.07269 [physics.ins-det]].

11. C. Adams *et al.* [MicroBooNE Collaboration], "Comparison of ν_μ-Ar multiplicity distributions observed by MicroBooNE to GENIE model predictions", Eur. Phys. J. C**79**, 248 (2019) [arXiv:1805.06887 [hep-ex]].

10. C. Adams *et al.* [MicroBooNE Collaboration], "Ionization Electron Signal Processing in Single Phase LArTPCs II. Data/Simulation Comparison and Performance in MicroBooNE", JINST **13**, no. 07, P07007 (2018) [arXiv:1804.02583 [physics.ins-det]].

9. * H. Dai, M. Murphy, **V. Pandey** *et al.* [The Jefferson Lab Hall A Collaboration], "First Measurement of the Ti(e,e')X Cross Section at Jefferson Lab", Phys. Rev. C**98**, 014617 (2018) [arXiv:1803.01910 [nucl-ex]].

8. C. Adams *et al.* [MicroBooNE Collaboration], "Ionization Electron Signal Processing in Single Phase LArTPCs I. Algorithm Description and Quantitative Evaluation with MicroBooNE Simulation", JINST **13**, no. 07, P07006 (2018) [arXiv:1802.08709 [physics.ins-det]].

7. ** N. Van Dessel, N. Jachowicz, R. González-Jiménez, **V. Pandey**, and T. Van Cuyck, "A-dependence of quasielastic charged-current neutrino-nucleus cross sections", Phys. Rev. C**97**, 044616 (2018) [arXiv:1704.07817 [nucl-th]].

6. ** R. González Jiménez, N. Jachowicz, K. Niewczas, J. Nys, **V. Pandey**, T. Van Cuyck, and N. Van Dessel, "Electroweak single-pion production off the nucleon: from threshold to high invariant masses", Phys. Rev. D**95**, 113007 (2017) [arXiv:1612.05511 [nucl-th]].

5. ** **V. Pandey**, N. Jachowicz, M. Martini, R. González Jiménez, J. Ryckebusch, T. Van Cuyck, and N. Van Dessel, "Impact of low-energy nuclear excitations on neutrino-nucleus scattering at MiniBooNE and T2K kinematics", Phys. Rev. C**94**, 054609 (2016) [arXiv:1607.01216 [nucl-th]].

4. ** T. Van Cuyck, N. Jachowicz, R. González Jiménez, M. Martini, **V. Pandey**, J. Ryckebusch, and N. Van Dessel, "Influence of short-range correlations in neutrino-nucleus scattering", Phys. Rev. C**94**, 024611 (2016) [arXiv:1606.00273 [nucl-th]].

3. ** M. Martini, N. Jachowicz, M. Ericson, **V. Pandey**, T. Van Cuyck, and N. Van Dessel, "Electron-neutrino scattering off nuclei from two different theoretical perspectives", Phys. Rev. C**94**, 015501 (2016) [arXiv:1602.00230 [nucl-th]].

2. ** **V. Pandey**, N. Jachowicz, T. Van Cuyck, J. Ryckebusch, and M. Martini, "Low-energy excitations and quasielastic contribution to electron- and neutrino-nucleus scattering in the continuum random phase approximation", Phys. Rev. C**92**, 024606 (2015) [arXiv:1412.4624 [nucl-th]].

1. ** **V. Pandey**, N. Jachowicz, J. Ryckebusch, T. Van Cuyck, and W. Cosyn, "Quasielastic contribution to antineutrino-nucleus scatterings", Phys. Rev. C**89**, 024601 (2014) [arXiv:1310.6885 [nucl-th]].

Conference Proceedings

13. J. Barrow *et al.*,"Summary of Workshop on Common Neutrino Event Generator Tools," [arXiv:2008.06566 [hep-ex].

12. A. Nikolakopoulos, N. Jachowicz, R. González-Jiménez, J. M. Udías, K. Niewczas and **V. Pandey**, "Non-trivial differences between charged current ν_e and ν_μ induced interactions with nuclei," PoS NuFact2019, 048 (2020).

11. **V. Pandey**, H. Dai, M. Murphy, and D. Abrams, "Electron-argon scattering studies at Jefferson Lab", PoS NUFACT2018, 017 (2019).

10. K. Niewczas, N. Jachowicz, A. Nikolakopoulos, J. Nys, N. Van Dessel, R. González Jiménez, and **V. Pandey**, "Modeling neutrino-nucleus interactions in the few-GeV region", PoS NUFACT2018, 031 (2019).

9. A. Dell'Acqua *et al.*, "Future Opportunities in Accelerator-based Neutrino Physics", [arXiv:1812.06739 [hep-ex]]

8. **V. Pandey** *et al.*, "Probing electron-argon scattering for liquid-argon based neutrino-oscillation program", Bled Workshops in Physics, Vol. 18, No. 3 (2018) [arXiv:1711.01671 [nucl-ex]].

7. R. González Jiménez, N. Jachowicz, A. Nikolakopoulos, J. Nys, T. Van Cuyck, N. Van Dessel, K. Niewczas, and **V. Pandey**, "Modeling neutrino-nucleus interaction at intermediate energies", PoS NUFACT2017, 072 (2017) .

6. N. Van Dessel, N. Jachowicz, R. González Jiménez, **V. Pandey**, and T. Van Cuyck, "Quasielastic neutrino-argon cross sections in a CRPA approach", Acta Phys. Polon. Supp. 9, 811 (2016).

5. N. Jachowicz, **V. Pandey**, M. Martini, R. González Jiménez, T. Van Cuyck, and N. Van Dessel, "CRPA calculations for neutrino-nucleus scattering: From very low energies to the quasielastic peak", JPS Conf. Proc. 12, 010018 (2016).

4. T. Van Cuyck, **V. Pandey**, N. Jachowicz, R. González Jiménez, M. Martini, J. Ryckebusch, and N. Van Dessel, "Correlations in neutrino-nucleus scattering", (proceedings NuFact15) SLAC-econf-C1508102 (2016) [arXiv:1606.08636 [nucl-th]].

3. R. González Jiménez, T. Van Cuyck, N. Van Dessel, **V. Pandey**, and N. Jachowicz, "Neutrino-Induced 1-π Production", proceedings NuInt15, JPS Conf. Proc. 12, 010047 (2016) [arXiv:1602.05096 [nucl-th]].

2. **V. Pandey**, N. Jachowicz, T. Van Cuyck, J. Ryckebusch, and M. Martini, "Quasielastic electron- and neutrino-nucleus scattering in a continuum random phase approximation approach", PoS NUFACT2014, 055 (2015) [arXiv:1501.04018 [nucl-th]].

1. N. Jachowicz, and **V. Pandey**, "Low-energy neutrino-nucleus interactions and beta-beam neutrino", AIP Conf. Proc. 1663, 050003 (2015).

Featured Magazine Article

1. **V. Pandey**, and N. Jachowicz, "Modeling neutrino-nucleus interactions for accelerator-based neutrino-oscillations experiments", featured article, BPhy - Belgian Physical Society Magazine - 02/2015.

Talks, Seminars and Posters

[Summary: 20 Invited Talks + 2 Conference Summary Talks + 29 Conference Talks/Seminars]
[** Invited or Conference Summary Talks]

51. ** September 2021: *(Upcoming Invited Talk)* "The influence of cross section uncertainties on oscillation analyses", NuFact 2021, 22nd International Workshop on Neutrinos from Accelerators, Cagliari, Italy.

50. ** September 2021: *(Upcoming Invited Colloquium)* "Neutrino interactions and the quest for new and precision physics searches in neutrino experiments", University of Minnesota Duluth.

49. June 2021: *(Seminar)* "SBND-PRISM: Sampling Multiple Off-Axis Fluxes with the Same Detector", NuSTEC Cross Experimental Working Group Meeting [Virtual].

48. ** May 2021: *(Invited Talk)* "Neutrino Cross-Section Opportunities at FPF at CERN", 2nd Forward Physics Facility (FPF) Meeting [Virtual].

47. ** March 2021: *(Invited Talk)* "Low-energy neutrino-nucleus interactions: theory and generators", New Directions in Neutrino-Nucleus Scattering NuSTEC Workshop [Virtual].

46. February 2021: *(Seminar)* "Neutrino interactions and the quest for new and precision physics searches in neutrino experiments", Particle Physics Seminar, Brookhaven National Laboratory, Upton, NY, USA [Virtual].

45. ** February 2021: *(Invited Talk)* "Synergy between nuclear physics in CEvNS experiments and long-baseline oscillation experiments", First Workshop of The BSM-Nu Project (P2IO labex, Saclay) [Virtual].

44. ** December 2020: *(Invited Talk)* "Coherent elastic and inelastic neutrino-nucleus scattering at stopped-pion sources", NuSTEC board annual meeting 2020 [Virtual].

43. December 2020: *(Collaboration Meeting)* "Theoretical Motivation: CEvNS, NSI and inelastic CC/NC neutrino-nucleus scattering physics prospects in CCM", CCM collaboration meeting [Virtual].

42. ** November 2020: *(Invited Talk)* "Coherent Elastic and Inelastic Neutrino-Nucleus Scattering Within a Many-Body Nuclear Theory Approach", Magnificent CEvNS 2020 [Virtual].

41. ** October 2020: *(Invited Seminar)* "Nuclear Physics Aspects of Coherent Elastic Neutrino-Nucleus Scattering", Nuclear Physics Seminar, University of Kentucky, Lexington, Kentucky, USA [Virtual].

40. ** September 2020: *(Invited Seminar)* "Nuclear Physics Aspects of Coherent Elastic Neutrino-Nucleus Scattering", SBN-Theory meetings, Fermi National Accelerator Laboratory, Batavia, Illinois, USA [Virtual].

39. ** August 2020: *(Invited Talk)* "The influence of cross section uncertainties on oscillation analyses", NUFACT 2020, 22nd International Workshop on Neutrinos from Accelerators, Cagliari, Italy [Conference postponed due to Covid-19].

38. July 2020: *(Conference)* "Constraining Nuclear Structure Physics in Coherent Elastic Neutrino-Nucleus Scattering", New Perspectives 2020, Fermi National Accelerator Laboratory, Batavia, Illinois, USA [Virtual].

37. March 2020: *(Seminar)* "Lepton-nucleus scattering within Hartree-Fock and continuum Random Phase Approximation approach", Neutrino Joint Theory-Experiment WG Meeting, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

36. March 2020: *(Seminar)* "Low-energy neutrino-nucleus cross section calculations and prospects of measuring them in SBND", SBND meeting, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

35. ** November 2019: *(Invited Talk)* "Short-Baseline Neutrino Program at Fermi National Accelerator Laboratory", 86th annual meeting of the Southeastern Section of the American Physical Society (SESAPS) 2019, Wrightsville Beach, North Carolina, USA.

34. September 2019: *(Seminar)* "Low-energy lepton-nucleus scattering: nue, numu cross section", MicroBooNE oscillations meeting, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

33. July 2019: *(Seminar)* "Lepton-nucleus scattering and the search for new and precision physics in neutrino experiments", P-25 Seminar, Los Alamos National Laboratory, Los Alamos, New Mexico, USA.

32. July 2019: *(Collaboration Meeting)* "Neutrino-argon cross sections and non-standard neutrino interactions in CCM", CCM collaboration meeting, Los Alamos National Laboratory, Los Alamos, New Mexico, USA.

31. June 2019: *(Collaboration Meeting)* "Low-energy neutrino-nucleus interactions: nue, numu cross section", SBND collaboration meeting, University of Michigan, Ann Arbor, Michigan, USA.

30. May 2019: *(Seminar)* "Neutrino-Nucleus Interactions and Recent Ar(e,e ′) Measurements at Jefferson Lab", Center for Neutrino Physics Research Day at Virginia Tech, Blacksburg, Virginia, USA.

29. January 2019: *(Seminar)* "Neutrino-oscillation and neutrino-interaction physics at Virginia Tech", research seminar presented to first year graduate students at Virginia Tech, Virginia, USA.

28. January 2019: *(Seminar)* "Lepton-nucleus scattering and its impact on the precision and new physics searches at the intensity frontier experiments", Theory Seminar, Physics Division, Argonne National Laboratory, Lemont, Illinois, USA.

27. ** December 2018: *(Invited Talk)* "Hartree-Fock & continuum RPA calculations of lepton-nucleus interactions, and recent Ar(e, e') measurements at Jlab", Physics Opportunities in the Near DUNE Detector Hall: PONDD, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

26. ** October 2018: *(Conference Summary Talk)* "Theory: Summary and Outlook", NuInt 18, 12th International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Gran Sasso Science Institute, L'Aquila, Italy.

25. ** October 2018: *(Invited Talk)* "Lepton-nucleus cross sections within Hartree-Fock and continuum random phase approximation approach", NuInt 18, 12th International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Gran Sasso Science Institute, L'Aquila, Italy.

24. ** August 2018: *(Conference Summary Talk)* "Summary and Outlook of Working Group 2 (Neutrino Scattering Physics)", NUFACT2018, 20th International Workshop on Neutrino Factories and Future Neutrino Facilities, Virginia Tech, Blacksburg, Virginia, USA.

23. ** August 2018: *(Invited Plenary Talk)* "Cross sections, electron scattering, and new results from electron-argon experiment at Jefferson Lab", NUFACT2018, 20th International Workshop on Neutrino Factories and Future Neutrino Facilities, Virginia Tech, Blacksburg, Virginia, USA.

22. ** June 2018: *(Invited Talk)* "An overview of neutrino cross sections and challenges", Workshop on near detector physics at neutrino experiments, European Organization for Nuclear Research (CERN), Geneva, Switzerland.

21. April 2018: *(Seminar)* "Nuclear physics of neutrino-oscillation endeavour", Center for Neutrino Physics seminar at Virginia Tech, Blacksburg, Virginia, USA.

20. March 2018: *(Conference)* "First cross section results from e-Ar experiment at Jefferson Lab", INT Program INT-18-1a, Nuclear ab initio Theories and Neutrino Physics, Institute for Nuclear Theory, Seattle, Washington, USA.

19. ** January 2018: *(Invited Talk)* "Status of electron scattering studies on argon and titanium nucleus at Jefferson Lab", Hall A Collaboration Meeting, Jefferson Lab, Newport News, Virginia, USA.

18. December 2017: *(Seminar)* "Neutrino-oscillation and neutrino-interaction physics", research seminar presented to first year graduate students at Virginia Tech, Virginia, USA.

17. July 2017: *(Seminar)* "Impact of nuclear effects on accelerator-based neutrino-oscillation physics", seminar at CEA, Saclay, France.

16. July 2017: *(Seminar)* "Impact of nuclear effects on accelerator-based neutrino-oscillation physics", seminar at Ghent University, Ghent, Belgium.

15. ** July 2017: *(Invited Talk)* "Study of argon and titanium nucleus at JLab and its impact on liquid argon based neutrino experiments", International Workshop on (e,e'p) Processes, Bled, Slovenia.

14. June 2017: *(Seminar)* "Impact of nuclear effects on accelerator-based neutrino-oscillation physics", Doctoral Training Program on Microscopic Theories of Nuclear Structure, Dynamics and Electroweak Currents, ECT*, Trento, Italy.

13. April 2017: *(Collaboration Meeting)* "What can we learn from electron scattering for neutrino scattering", MicroBooNE collaboration meeting, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

12. Dec 2016: *(Seminar)* "Neutrino interactions around quasielastic peak: What would theorists do?", MicroBooNE cross sections working group meeting, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

11. July 2016: *(Seminar)* "Modeling electron- and neutrino-nucleus scattering in kinematics relevant for accelerator-based neutrino-oscillation experiments", Particle Physics Seminar, Brookhaven National Laboratory, Upton, New York, USA.

10. ** July 2016: *(Invited Review Talk)* "A review on recent theoretical developments in neutrino interaction modeling at the quasielastic peak", NuTune2016, Workshop on Global Fits to Neutrino Scattering Data and Generator Tuning, University of Liverpool, England.

9. ** April 2016: *(Invited Talk)* "Low energy excitations to quasielastic scattering", Two-body current contributions in neutrino-nucleus scattering, ESNT, CEA Saclay, France.

8. May 2015: *(Conference)* "Quasielastic neutrino-nucleus scatterings at intermediate energies", BriX workshop, University of Liège, Liège, Belgium.

7. May 2015: *(Conference)* "Modeling quasielastic neutrino-nucleus scatterings in few-GeV region", Annual scientific meeting of the Belgian Physical Society, University of Liège, Liège, Belgium.

6. ** August 2014: *(Invited Talk)* "Quasielastic neutrino-nucleus scattering within a continuum random phase approximation approach", NUFACT2014, XVIth International Workshop on Neutrino Factories and Future Neutrino Facilities, Glasgow, Scotland.

5. October 2013: *(Seminar)* "Charged-current quasielastic neutrino-nucleus scattering for accelerator-based neutrino oscillation experiments", Fens inside-out (journal club), Ghent University, Ghent, Belgium.

4. March 2013: *(Conference)* "Modeling quasielastic neutrino-nucleus scattering at intermediate energies", Annual Brix-IAP workshop, Oostende, Belgium.

3. April 2010: *(Seminar)* "Neutrino masses in type IIB compactification on a Swiss-Cheese Calabi-Yau framework", seminar at Indian Institute of Technology (IIT) Roorkee, India.

2. March 2010: *(Seminar)* "Structures of proton rich nuclei", seminar at Indian Institute of Technology (IIT) Roorkee, India.

1. July 2009: *(Seminar)* "Stimulated Raman scattering studies in one dimensional Mott-Hubbard systems", seminar at Raja Ramanna Centre for Advanced Technology, Indore, India.

Posters

6. July 2020: "Nuclear Structure Physics in Coherent Elastic Neutrino-Nucleus Scattering", Neutrino 2020, The XXIX International Conference on Neutrino Physics and Astrophysics, Chicago, Illinois, USA [Virtual].
5. August 2017: "Recent study of argon and titanium nucleus at Jefferson Lab", New Extensions of Coherent scattering and other Lepton Interactions for new Physics Searches (νEclipse), University of Tennessee, Knoxville, Tennessee, USA.
4. May 2016: "Modeling neutrino-nucleus scatterings for accelerator-based neutrino-oscillation experiments", Annual scientific meeting of the Belgian Physical Society, Ghent University, Ghent, Belgium.
3. May 2014: "Inclusive quasielastic scattering in a CRPA approach", NuInt 14, 9th International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, London, UK.
2. May 2014: "CCQE contribution to (anti)neutrino-nucleus scatterings", NuInt 14, 9th International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, London, UK.
1. March 2014: "Modeling quasielastic neutrino-nucleus scattering for accelerator-based neutrino oscillation experiments", PhD Symposium, Ghent University, Belgium.

Teaching and Mentoring Experience

Teaching

Spring Semester 2019: Taught full-time big-auditorium ($\sim$180 students) General Physics Course (Phys-2206) to Life Science students at Virginia Tech, Virginia, USA. This included preparing and delivering lectures, recitations, homeworks, grading, assessment design, etc.

Spring Semester 2019: Taught full-time big-auditorium ($\sim$170 students) Introductory Physics Course (Phys-2306) to Engineering students at Virginia Tech, Virginia, USA. This included preparing and delivering lectures, recitations, homeworks, grading, assessment design, etc.

Spring Semester 2018: Taught two substitute lectures of Introduction to Quantum Mechanics (Phy-4455), and two substitute lectures of Foundation of Physics (Phy-2305), Virginia Tech, Virginia, USA.

Mentoring

September 2020 - present: Co-mentoring a graduate student of the group at University of Florida.

November 2019 - present: As an L3 manager of PDS installation and commissioning in SBND, I work with and mentor a number of students and post-docs visiting FNAL to work on the PDS system.

October 2016 - January 2019: Co-mentored three graduate students of the group at Virginia Tech, Virginia, USA.

Spring 2017: Mentored a group of four senior undergraduates working in particle/neutrino physics lab, Virginia Tech, Virginia, USA.

Professional Service

Reviewer

Reviewer of Physical Review C, Physical Review D, Physical Review Letters, and Reviews of Modern Physics.

Panel

March 2021: Invited to serve as a panelist in a discussion session at the “New Directions in Neutrino-Nucleus Scattering Workshop" [Virtual].

December 2020: Invited to a serve as a panelist in a discussion session at the “Low Energy Physics in Liquid Argon (LEPLAr) Workshop" organized by the DUNE collaboration [Virtual].

Snowmass 2021

July 2020 - present: Early career representative (co-leader) for the Neutrino Physics Frontier.

July 2020 - present: Early career liaison of the NF06 (Neutrino Interaction Cross Section) and TF11 (Theory of Neutrino Physics) topical groups.

July 2020 - October 2020: Member of the Program Committee of the Snowmass Community Planning Meeting held in October 2020.

See Symmetry Magazine article on my involvement in the frame of Snowmass 2021: Defining the next decade of US particle physics.

Scholarships Reviewer

Reviewer of undergraduate scholarships of College of Science (in 2017), Virginia Tech, Virginia, USA.

Organization

Conferences and Schools

March 2021: Co-organized “New Directions in Neutrino-Nucleus Scattering Workshop" [Virtual].

December 2020: Co-organized “Snowmass NF06 Electron Scattering Workshop" [Virtual].

October 2020: Co-organized “Snowmass Community Planning Meeting" [Virtual].

September 2020: Co-organized “Snowmass Mini-Workshop on Neutrino Theory" [Virtual].

November 2019: Chaired Particle Physics-I session of 86th annual meeting of the Southeastern Section of the American Physical Society (SESAPS) 2019, Wrightsville Beach, North Carolina, USA.

August 2018: (On-site) Convener of Working Group 2 (Neutrino Scattering Physics), NUFACT2018, 20th International Workshop on Neutrino Factories and Future Neutrino Facilities, Virginia Tech, Virginia, USA.

November 2017: Co-organized NuSTEC Training in Neutrino-Nucleus Scattering Physics 2017, Fermi National Accelerator Laboratory, Batavia, Illinois, USA.

Miscellaneous

July 2018: Volunteered at CineGlobe festival at CERN and ’La Nuit de la Science’ [’The Night of Science’] in Geneva, Switzerland.

July 2012 - July 2015: Co-organized TEDxGhent events in Ghent (Belgium), a non-profit organization where distinguished people present their ideas and work to the public. I co-organized six major events (with 500 attendees at three of those events) with significant contribution in event management, speaker selection, technical assistance, and recording/editing the videos of the talks.

February 2015: Co-organized Women in STEM event as part of TEDxGhent (Belgium), an event focused on bringing women who are reshaping the STEM’s world to TEDx stage.

July 2009 - May 2010: Served as general secretary of the Physics Association at Indian Institute of Technology Roorkee. I contributed to maintaining the journal club and organizing other departmental activities.

March 2009: Co-convener of the annual technical festival 'Cognizance' (one of the largest technical festivals in Asia), a three-day event focusing on science and technology, Department of Physics, Indian Institute of Technology Roorkee, Roorkee, India.

Outreach

Organization, Workshops, Demonstrations

February 2020: Volunteered at the workshops 'Ask a Scientist' and 'Fun with Magnets' at the Fermilab Open House which hosted more than 2,000 visitors.

November 2019 - present: Part of "Skype a Scientist" network, a program aimed to connect school students from all over the world with working scientists from various fields.

Spring 2018: Guided Neutrino Physics lab tours (including demonstrations, interactive seminar, etc.) to multiple groups of Virginia high school students and prospective undergraduate students, Virginia Tech, Virginia, USA.

Spring 2018: Guided Neutrino Physics lab tour (including demonstrations, interactive seminar, etc.) to faculty members and undergraduates of Emory and Henry College (Virginia), Virginia Tech, Virginia, USA.

January 2015: Co-organized a 'Kinderuniversiteit' ['Children's University'] workshop 'Diffraction and Spectroscopy' for primary school children during the 'Licht Festival Gent' ['Light Festival Ghent'] organized by city of Ghent in Ghent, Belgium.

Outreach Talks

July 2018: 'Unraveling mysteries of the Universe through neutrinos: The complexity/simplicity of details in approaching a research problem', presented to a group of Virginia high school teachers of QuarkNet network ,Virginia Tech, Virginia, USA

January 2018: 'The knowns and unknowns of our Universe and how do we know it', a public lecture at a local college, Uttar Pradesh, India.

November 2015: 'Neutrinos: Key to the mysteries of our Universe', a talk given at a public event 'Dag van de Wetenschap' ['Science Day'] in Ghent, Belgium.

July 2015: 'Neutrinos, you, and the Universe', performed in a stand-up science show organized by 'Let's talk science', a science communication initiative of Flemish universities in Belgium.

March 2015: 'Revealing secrets of the Universe through neutrinos', a talk given at a public event organized by TEDxGhent in Ghent, Belgium.

Other Selected Achievements

Qualified Competitive Nationwide Examinations/Eligibility Tests (India)

April 2010: Qualified with higher national ranking the Joint CSIR-UGC [Council for Scientific and Industrial Research - University Grant Commission] National Eligibility Test (NET) with Junior Research Fellowship (JRF), a reputed national examination conducted for the eligibility of university lectureship and to award additional fellowships (JRF) for the candidates who qualify with higher national ranking.

March 2010: Qualified the Graduate Aptitude Test in Engineering (GATE) conducted nationwide jointly by the reputed Indian Institutes of Technology (IITs) and Indian Institute of Sciences (IISc) to award fellowships and admissions in PhD or Masters program of IITs/IISc.

April 2008: Qualified the Joint Admission test for Masters (JAM), conducted nationwide jointly by the reputed Indian Institutes of Technology (IITs) for the admission in Master's (science) in IITs.

Computer Skills

Operating Systems: Unix/Linux, MacOS, Windows

Languages: Python, C, C++, Fortran

Analysis Softwares: ROOT, GEANT4, LArSoft, Mathematica

Event Generator Simulations: GENIE, MARLEY, SIMC

Other: LaTeX, shell scripting, gnuplot, Xmgrace, HTML

References

References available upon request.