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CONTACT INFORMATION	<p>Department of Physics, University of Maryland 3162 Physical Sciences Complex 4296 Stadium Dr, College Park, MD 20742, USA. <i>E-mail:</i> <a href="mailto:davoudi@umd.edu">davoudi@umd.edu</a></p>
EDUCATION	<p>Ph.D., Physics, University of Washington, Seattle, 2010-2014 Thesis title: <i>Formal Developments for Lattice QCD with Applications to Hadronic Systems</i>. Thesis advisor: Prof. Martin J. Savage.</p> <p>M.Sc., Physics, Sharif University of Technology, Tehran, Iran, 2007-2009.</p> <p>B.Sc., Physics, Sharif University of Technology, Tehran, Iran, 2003-2007.</p>
ACADEMIC APPOINTMENTS	<p>Assistant professor, University of Maryland, College Park, 2017-.</p> <p>Research fellow, RIKEN-Brookhaven Research Center, 2017-2020.</p> <p>Post-doctorate research associate, Center for Theoretical Physics, Massachusetts Institute of Technology, 2014-2017.</p>
AWARDS AND RECOGNITIONS	<p>Honored faculty at the <i>Maryland Research Excellence Celebration</i>, University of Maryland, College Park (2020).</p> <p><i>Sloan Research Fellowship</i>, Alfred Sloan Foundation (2019).</p> <p>Department of Energy Office of Science <i>Early Career Award</i> (2019).</p> <p>The 2018 <i>Kenneth Wilson Award</i> for Excellence in Lattice Field Theory. Award citation: “For fundamental contributions to lattice field theory in a finite volume that are essential for performing lattice simulations of complex systems” (2018).</p> <p>Invited participant at the <i>Rising Stars in Physics</i> workshop at MIT (2016).</p> <p><i>Sebastian Karrer prize</i> in physics for excellence of scholastic record and professional promise, University of Washington (2011).</p>
RESEARCH GRANTS	<p>The 2019 <i>Sloan Research Fellowship</i> for a project titled: “Computing Complex Hadronic Processes for Tests of the Standard Model and Searches for New Physics”, award amount: <b>\$70,000</b>, award period: 2019-2021.</p> <p>Department of Energy, Office of Science Early Career Award for a project titled: “Analog and Digital Quantum Simulations of Strongly Interacting Theories for Applications in Nuclear Physics”, award amount: <b>\$750,000</b>, award period: 2019-2024.</p> <p>Department of Energy’s ASCR Quantum Applications Teams for a project titled: “Software Stack and Algorithms for Automating Quantum-Classical Computing”, managed by the Oak Ridge National Laboratory, PI’s share of grant: <b>\$500,000</b>, award period: 2018-2022.</p> <p>Department of Energy’s ASCR program in Accelerated Research in Quantum Computing for a project titled: “Fundamental Algorithmic Research for Quantum Computing”, managed by Sandia National Laboratory and Oak Ridge National Laboratory, PI’s share of grant: <b>\$310,000</b>, award period: 2019-2024.</p>

Department of Energy’s Office of Science, Office of Nuclear Physics’s Program Quantum Horizons: QIS Research and Innovation for Nuclear Science for a project titled: “Approaching QCD with Quantum Simulators and Quantum Computers”, PI’s share of grant: **\$110,000**, award period: 2020-2023.

National Science Foundation, Quantum Leap Challenge Institute: “Robust Quantum Simulation”, PI’s share of award: **\$450,000**, award period: 2021-2026.

OUTREACH  
HIGHLIGHTS

*Is universe a simulation?*, **invited** panelist of the “2016 Isaac Asimov Memorial Debate”, hosted by Neil deGrasse Tyson at the American Museum of Natural History, NYC, NY, April 2016. (The debate has reached nearly **5.6M viewers** on the museum’s youtube channel so far and can be viewed [here](#).)

**Invited** scientist and lesson writer of a TED-Ed project featuring the topic of simulating laws of nature, released in 2019. (The lesson has reached more than **1.3M** viewers on TED-Ed’s website so far and can be viewed [here](#).)

PUBLICATIONS  
AND PREPRINTS

- [1] N. Craig, C. Csaki, A. X. El-Khadra et al (Z. Davoudi), Snowmass Theory Frontier Report (2022), arXiv:2211.05772 [hep-ph].
- [2] A. Lovato et al (Z. Davoudi), Long Range Plan: Dense matter theory for heavy-ion collisions and neutron stars (2022), arXiv:2211.02224 [nucl-th].
- [3] N. Mueller, J. Carolan, A. Connelly, Z. Davoudi, E. Dumitrescu, K. Yeter-Aydeniz, Quantum computation of dynamical quantum phase transitions and entanglement tomography in a lattice gauge theory (2022), arXiv:2210.03089 [quant-ph].
- [4] S. Catterall, R. Harnik, V. E. Hubeny, C. W. Bauer, A. Berlin, Z. Davoudi, T. Faulkner, T. Hartman, M. Headrick, Y. F. Kahn, H. Lamm, Y. Meurice, S. Rajendran, M. Rangamani, B. Swingle, Report of the Snowmass 2021 Theory Frontier Topical Group on Quantum Information Science (2022), arXiv:2209.14839 [quant-ph].
- [5] Z. Davoudi, E. Neil et al, Report of the Snowmass 2021 Topical Group on Lattice Gauge Theory (2022), arXiv:2209.10758 [hep-lat].
- [6] Z. Davoudi, N. Mueller, C. Powers, Toward Quantum Computing Phase Diagrams of Gauge Theories with Thermal Pure Quantum States (2022), arXiv:2208.13112 [hep-lat].
- [7] J. Bringewatt, Z. Davoudi, Parallelization techniques for quantum simulation of fermionic systems (2022), arXiv:2207.12470 [quant-ph].
- [8] V. Cirigliano et al (Z. Davoudi), Towards Precise and Accurate Calculations of Neutrinoless Double-Beta Decay, an NSF Project Scoping Workshop Report (2022), arXiv:2207.01085 [nucl-th].
- [9] A. Kronfeld et al (Z. Davoudi), Lattice QCD and Particle Physics (2022), a whitepaper submitted to the U.S. Particle Physics Planning Process (Snowmass2021), arXiv:2207.07641 [hep-lat].
- [10] C. Bauer, Z. Davoudi et al, *Quantum Simulation for High Energy Physics*, arXiv:2204.03381 [quant-ph].

- [11] V. Cirigliano, Z. Davoudi, W. Dekens, J. de Vries, J. Engel, X. Feng, J. Gehrlein, M. L. Graesser, L. Graf, H. Hergert, L. Jin, E. Mereghetti, A. Nicholson, S. Pastore, M. J. Ramsey-Musolf, R. Ruiz, M. Spinrath, U. van Kolck, A. Walker-Loud, *Neutrinoless Double-Beta Decay: A Roadmap for Matching Theory to Experiment*, arXiv:2203.12169 [hep-ph].
- [12] I. Tews, Z. Davoudi, A. Ekstrom, J. D. Holt, et al, *Nuclear Forces for Precision Nuclear Physics—a collection of perspectives*, accepted for publication in *Few-Body Systems*, arXiv:2202.01105 [nucl-th].
- [13] N. H. Nguyen, M. C. Tran, Y. Zhu, A. M. Green, C. H. Alderete, Z. Davoudi, N. M. Linke, *Digital Quantum Simulation of the Schwinger Model and Symmetry Protection with Trapped Ions*, *Phys. Rev. X Quantum* 3 (2022) 2, 020324, arXiv:2112.14262 [quant-ph].
- [14] Z. Davoudi, S. Kadam, *On the Extraction of Low-energy Constants of Single- and Double- $\beta$  Decays from Lattice QCD: A Sensitivity Analysis*, *Phys. Rev. D* 105, no.9, 094502 (2022), arXiv:2111.11599 [hep-lat].
- [15] S. Amarasinghe, R. Baghdadi, Z. Davoudi, W. Detmold, M. Illa, A. Parreno, A. Pochinsky, P. E. Shanahan, M. Wagman, *A variational study of two-nucleon systems with lattice QCD*, arXiv:2108.10835 [hep-lat].
- [16] B. Andrade, Z. Davoudi, T. Grass, M. Hafezi, G. Pagano, A. Seif, *Engineering an Effective Three-spin Hamiltonian in Trapped-ion Systems for Applications in Quantum Simulation*, *Quantum Science and Technology* 7 (2022) 3, 034001, arXiv:2108.01022 [quant-ph].
- [17] Z. Davoudi, N. Linke, and G. Pagano, *Toward simulating quantum field theories with controlled phonon-ion dynamics: A hybrid analog-digital approach*, *Phys. Rev. Research* 3, 043072 (2021), arXiv:2104.09346 [quant-ph].
- [18] Z. Davoudi, S. Kadam, *The path from lattice QCD to the short-distance contribution to  $0\nu\beta\beta$  decay with a light Majorana neutrino*, *Phys. Rev. Lett.* 126, 152003 (2021), arXiv:2012.02083 [hep-lat].
- [19] M. Illa, S. R. Beane, E. Chang, Z. Davoudi, W. Detmold, D. J. Murphy, K. Orginos, A. Parreño, M. J. Savage, P. E. Shanahan, M. L. Wagman, F. Winter, *Low-energy Scattering and Effective Interactions of Two Baryons at  $m_\pi \approx 450$  MeV from Lattice Quantum Chromodynamics*, *Phys. Rev. D* 103, 054508 (2021), arXiv:2009.12357 [hep-lat].
- [20] Z. Davoudi, I. Raychowdhury, A. Shaw, *Search for Efficient Formulations for Hamiltonian Simulation of non-Abelian Lattice Gauge Theories*, *Phys. Rev. D* 104, 074505 (2021), arXiv:2009.11802 [hep-lat].
- [21] Z. Davoudi, W. Detmold, K. Orginos, A. Parreño, M. J. Savage, P. E. Shanahan, M. L. Wagman, *Nuclear matrix elements from lattice QCD for electroweak and beyond-Standard-Model processes*, *Physics Reports*, Volume 900, 1-74 (2021), arXiv:2008.11160 [hep-lat].
- [22] Z. Davoudi, S. Kadam, *Two-neutrino double-beta decay in pionless effective field theory from a Euclidean finite-volume correlation function*, *Phys. Rev. D* 102, 114521 (2020), arXiv:2007.15542 [hep-lat].

- [23] I. Tews, Z. Davoudi, A. Ekström, J.D. Holt, J.E. Lynn, *New ideas in constraining nuclear forces*, J. Phys. G: Nucl. Part. Phys. **47**, 103001 (2020), arXiv:2001.03334 [nucl-th].
- [24] R. Briceno, Z. Davoudi, M. T. Hansen, M. Schindler, A. Baroni, *Long-range electroweak amplitudes of single hadrons from Euclidean finite-volume correlation functions*, Phys. Rev. D **101**, 014509 (2020) [Editor's Suggestion], arXiv:1911.04036 [hep-lat].
- [25] Z. Davoudi, M. Hafezi, C. Monroe, G. Pagano, A. Seif, A. Shaw, *Towards analog quantum simulations of lattice gauge theories with trapped ions*, Phys. Rev. Research, **2**, 023015 (2020), arXiv: 1908.03210 [quant-ph]. Also see a story piece about this work at JQI's website [here](#).
- [26] V. Cirigliano, Z. Davoudi, T. Bhattacharya, T. Izubuchi, P. Shanahan, S. Syritsyn, M. Wagman, *The Role of Lattice QCD in Searches for Violations of Fundamental Symmetries and Signals for New Physics*, Eur. Phys. J. A (2019) **55**: 197(2019), arXiv:1904.09704 [hep-lat].
- [27] Z. Davoudi, J. Harrison, A. Jüttner, A. Portelli and M. J. Savage, *Theoretical aspects of quantum electrodynamics in a finite volume with periodic boundary conditions*, Phys. Rev. D **99**, 034510 (2019), arXiv:1810.05923 [hep-lat].
- [28] E. Chang, Z. Davoudi, W. Detmold, A. S. Gambhir, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan, M. L. Wagman, F. Winter, *Scalar, axial and tensor interactions of light nuclei from lattice QCD*, Phys. Rev. Lett. **120**, 152002 (2018), arXiv:1712.03221 [hep-lat].
- [29] M. L. Wagman, F. Winter, S. R. Beane, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan and B. C. Tiburzi, *Baryon-Baryon Interactions and Spin-Flavor Symmetry from Lattice Quantum Chromodynamics*, Phys. Rev. D **96**, no. 11, 114510 (2017), arXiv:1706.06550 [hep-lat].
- [30] S. R. Beane, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, A. Parreno, M. J. Savage and P. E. Shanahan, B. C. Tiburzi, M. L. Wagman and F. Winter, *Comment on "Are two nucleons bound in lattice QCD for heavy quark masses? - Sanity check with Lüscher's finite volume formula -"*, arXiv:1705.09239 [hep-lat] (2017).
- [31] B. C. Tiburzi, M. L. Wagman, F. Winter, E. Chang, Z. Davoudi, W. Detmold, K. Orginos, M. J. Savage and P. E. Shanahan, *Double- $\beta$  Decay Matrix Elements from Lattice Quantum Chromodynamics*, Phys. Rev. D **96**, no. 5, 054505 (2017), arXiv:1702.02929 [hep-lat].
- [32] P. E. Shanahan, B. C. Tiburzi, M. L. Wagman, F. Winter, E. Chang, Z. Davoudi, W. Detmold, K. Orginos and M. J. Savage, *The isotensor axial polarisability and lattice QCD input for nuclear double- $\beta$  decay phenomenology*, Phys. Rev. Lett. **119**, no. 6, 062003 (2017), arXiv:1701.03456 [hep-lat].
- [33] M. J. Savage, P. E. Shanahan, B. C. Tiburzi, M. L. Wagman, F. Winter, S. R. Beane, E. Chang, Z. Davoudi, W. Detmold and K. Orginos, *Proton-proton fusion and tritium  $\beta$ -decay from lattice quantum chromodynamics*, Phys. Rev. Lett. **119**, no. 6, 062002 (2017) [Physics Synopsis at [physics.aps.org](http://physics.aps.org)], arXiv:1610.04545 [hep-lat]. The work was also highlighted by the Department of Energy's Office of Science [here](#).

- [34] Z. Davoudi and W. Detmold, *Composite Vector Particles in External Electromagnetic Fields*, Phys. Rev. D **93**, 014509 (2016), arXiv:1510.02444 [hep-lat].
- [35] Z. Davoudi and W. Detmold, *On the Implementation of General Background Electromagnetic Fields on a Periodic Hypercubic Lattice*, Phys. Rev. D **92**, 074506 (2015), arXiv:1507.01908 [hep-lat].
- [36] R. A. Briceno, Z. Davoudi and T. C. Luu, *Nuclear Reactions from Lattice QCD*, review article on the workshop hosted by the Institute for Nuclear Theory on March 2013, Journal of Physics G: Nuclear and Particle Physics **42**, 023101, arXiv:1406.5673 [hep-lat] (2015).
- [37] Z. Davoudi and M. J. Savage, *Finite-volume Electromagnetic Corrections to the Masses of Mesons, Baryons, and Nuclei*, Phys. Rev. D **90**, 054503 (2014), arXiv:1402.6741 [hep-lat].
- [38] R. A. Briceno, Z. Davoudi, T. Luu and M. J. Savage, *Two-Baryons Systems with Twisted Boundary Conditions*, Phys. Rev. D **89**, 074509 (2013), arXiv:1311.7686 [hep-lat].
- [39] R. A. Briceno, Z. Davoudi, T. Luu and M. J. Savage, *Two-nucleon systems in a finite volume: (II)  $3S1$ - $3D1$  coupled channels and the deuteron*, Phys. Rev. D **88**, 114507 (2013), arXiv:1309.3556 [hep-lat].
- [40] R. A. Briceno, Z. Davoudi and T. C. Luu, *Two-nucleon systems in a finite volume: (I) Quantization conditions*, Phys. Rev. D **88**, 034502 (2013), arXiv:1305.4903 [hep-lat].
- [41] R. A. Briceno and Z. Davoudi, *Three-particle scattering amplitudes from a finite volume formalism*, Phys. Rev. D **87**, 094507 (2013), arXiv:1212.3398 [hep-lat].
- [42] S. R. Beane, Z. Davoudi and M. J. Savage, *Constraints on the Universe as a Numerical Simulation*, Eur. Phys. J. A **50** 148 (2014), arXiv:1210.1847 [hep-ph]. Read a story about the work in Seattle Times [here](#), in New York Times [here](#), and in Medium.com [here](#).
- [43] Z. Davoudi and M. J. Savage, *Restoration of Rotational Symmetry in the Continuum Limit of Lattice Field Theories*, Phys. Rev. D **86**, 054505 (2012), arXiv:1204.4146 [hep-lat].
- [44] R. A. Briceno and Z. Davoudi, *Moving multi-channel systems in a finite volume with application to  $pp$  fusion*, Phys. Rev. D **86**, 094507 (2012), arXiv:1204.1110 [hep-lat].
- [45] Z. Davoudi and A. Karch, *Surface plasmons on a thin film topological insulator*, arXiv:1109.5723 [cond-mat.mes-hall] (2011).
- [46] Z. Davoudi and M. J. Savage, *Improving the volume dependence of two-body binding energies calculated with lattice QCD*, Phys. Rev. D **84**, 114502 (2011), arXiv:1108.5371 [hep-lat].
- [47] Z. Davoudi, *Formal Developments for Lattice QCD with Applications to Hadronic Systems*, Ph.D. thesis, University of Washington, arXiv:1409.1966 [hep-lat] (2014).

PROCEEDINGS AND  
NEWS ARTICLES

- [48] Z. Davoudi, I. Raychowdhury, A. Shaw, Exploring different Formulations of non-Abelian Lattice Gauge Theories for Hamiltonian simulation (2022), PoS LATTICE2021 (2022) 277.
- [49] Z. Davoudi, *Light Nuclei from Lattice QCD: Spectrum, Structure and Reactions*, **invited** contribution to the proceedings of the “XXII International Conference on Few-Body Problems in Physics”, July 9-13, 2018, Caen, France, arXiv:1902.0495 [hep-lat].
- [50] Z. Davoudi, *The path from finite to infinite volume: Hadronic observables from lattice QCD*, **invited** contribution to the proceedings of the “36th International Symposium on Lattice Field Theory” (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA. arXiv:1812.11899 [hep-lat].
- [51] Y. Cai and Z. Davoudi, *QED-corrected Lellouch-Lüscher formula for  $K \rightarrow \pi\pi$  decay*, contribution to the proceedings of the “36th International Symposium on Lattice Field Theory” (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA. arXiv:1812.11015 [hep-lat].
- [52] Z. Davoudi, *Lattice QCD input for nuclear structure and reactions*, **invited** contribution to the proceedings of the “35th International Symposium on Lattice Field Theory”, Granada, Spain, June 2017, arXiv:1711.02020 [hep-lat].
- [53] Z. Davoudi, *Nuclear Physics in the Spotlight: From exploring nature’s most extreme environments to testing its most fundamental symmetries*, **invited** contribution to the Kavli Institute for Theoretical Physics Newsletter, Spring 2017.
- [54] Z. Davoudi, *Two-Baryon Systems with Twisted Boundary Conditions*, PoS LATTICE **2014**, 108 (2014), arXiv: 1411.2010 [hep-lat].

PROFESSIONAL  
SERVICE

Topical Co-convener of the U.S. Particle Physics Planning in Lattice Gauge Theory (Snowmass 2021).

Co-editor of the Snowmass Topical Group Report on Lattice Gauge Theory (2022).

Co-editor of the Snowmass Whitepaper on Quantum Simulation for High-Energy Physics (2020-2022).

Co-chair of the USQCD collaboration’s working group to recognize future opportunities and formulate possible goals for lattice field theory calculations related to the topic of Fundamental Symmetries and Signals for New Physics (2018-2019).

Reviewer of the U.S. Department of Energy’s Office of Science, National Science Foundation, Swiss National Supercomputing Centre, and UK Royal Society.

Referee of journals *Physical Review X*, *Physical Review Letters*, *Physical Review D*, *Quantum*, *NPJ Quantum Information*, *Journal of High Energy Physics*, *European Physical Journal A* [distinguished referee], *Europhysics Letters*, and *Philosophical Transactions of the Royal Society A* (2014-).

International advisory board of the 2020 EuroPLEx School, Edinburgh, Scotland.

Organizer of the IQuS workshop on “Next-Generation Computing for Low-Energy Nuclear Physics: from Machine Learning to Quantum Computing”, InQubator for Quantum Simulation, Seattle, WA, Aug 2022.

Session organizer on “Lattice Gauge Theory for High Energy Physics” at the Snowmass Community Study Conference, University of Washington, Seattle, WA, July 2022.

Organizer of the (virtual) INT program on “Nuclear Forces for Precision Nuclear Physics”, Institute for Nuclear Theory, Seattle, WA, April-May 2021.

Organizer of the (virtual) IQuS workshop on “Quantum Simulation of Strong Interactions (QuaSI) Workshop 1 : Theoretical Strategies for Gauge Theories”, InQubator for Quantum Simulation, Seattle, WA, April 2021.

Organizer of the (virtual) IQuS workshop on “Quantum Simulation of Strong Interactions (QuaSI) Workshop 2: Implementation Strategies for Gauge Theories”, InQubator for Quantum Simulation, Seattle, WA, June 2021.

Session organizer of the (virtual) Snowmass Community Planning Conference on the topics of “Lattice Gauge Theory for High Energy Physics“ and “Exotic Hadron Spectroscopy and Interpretation”, October 2020.

Organizer of the (virtual) Quantum Systems for Fundamental Science (QSFS) workshop on “Trapped Ions and Quantum Simulation”, August 2020.

Organizer of the INT workshop on “Lattice QCD input for neutrinoless double-beta decay”, Institute for Nuclear Theory, Seattle, WA, July 2017, total budget granted: \$8,400.

Lead organizer of the INT program on “Nuclear physics from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, March-May 2016, total budget granted: \$156,800.

Organizer of the INT workshop on “Nuclear reactions from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, March, 2013, total budget granted: \$6,750.

Invited reviewer of the Biruni Award, aimed to recognize the most promising Iranian graduate students in Physics in the U.S. (2016-2019).

#### EXPERT PANELS

[2] *Lattice QCD (+EFT) for neutrinoless double-beta decay?*, **invited** panelist at the virtual workshop on “Neutrinoless double-beta decay beyond tonne-scale”, Center for Fundamental Interactions, University of Massachusetts, Amherst, MA, December 2020.

[1] *Quantum Directions in Nuclear and High-Energy Physics*, **invited** panelist at the virtual program on “Scientific Quantum Computing and Simulation on Near-Term Devices”, Institute of Nuclear Theory’s (INT), Seattle, WA, November 2020.

#### SUMMER- AND WINTER-SCHOOL LECTURES

[10] *Quantum Simulation of Lattice Gauge Theories*, **three** invited lectures presented at the 2022 EuroPLEX physics school, Benasque, Spain, June 2022.

[9] *Nuclear physics with applications to neutrino physics (lattice)*, **two** invited lectures presented at the 2021 Bad Honnef [virtual] physics school on “Methods of effective field theory and lattice field theory”, Bad Honnef, Germany, August 2021.

[8] *Quantum Simulation*, **two** invited lectures and **two** problem-solving sessions at the [virtual] summer school on the “Problem Solving Based Lattice QCD Summer School”, Institute for Nuclear Theory, Seattle, WA, June-July, 2021.

[7] *Nuclear physics and effective (field) theories*, **five** invited lectures presented at the [virtual] Doctoral Training Program on “High-Energy and Nuclear Physics within Quantum Technologies”, European Center for Theoretical Studies in Nuclear Physics (ECT\*),

Trento, Italy, July 2021.

[6] *Lattice QCD and nucleon(us) structure*, **three** invited lectures presented at the 2021 National Nuclear Physics [virtual] Summer School, National Autonomous University (Mexico) and Indiana University (USA), June 2021.

[5] *Lattice QCD and nucleon(us) structure*, **three** invited lectures presented at the first CFNS summer school on the “Physics of the electron-ion collider”, Stony Brook University, Long Island, NY, August 2019.

[4] *Multi-hadron physics and lattice QCD*, **six** invited lectures presented at the TALENT course on “From Quarks and Gluons to Nuclear Forces and Structure”, ECT\*, Trento, Italy, July-August 2019.

[3] *Topics in lattice QCD for nuclear physics*, **three** invited lectures presented at the school/workshop on “Scattering from the Lattice, Applications and Phenomenology”, Hamilton Mathematics Institute, Trinity College, Dublin, Ireland, May 2018.

[2] *From QCD to nuclear physics*, **two** invited lectures delivered at the 10th Odense Winter School on Theoretical Physics, CP3-Origins Institute, Odense, Denmark, December 2017.

[1] *Nuclear forces from lattice QCD*, **one** invited lecture delivered at the TALENT course on “Nuclear forces”, Institute for Nuclear Theory, Seattle, WA, July 2013.

SEMINARS, TALKS, AND COLLOQUIA [107] *Hybrid digital-analog quantum simulations (of gauge field theories)*, invited talk at the InQubator for Quantum Simulation (IQUS) workshop: “At the Interface of Quantum Sensors and Quantum Simulations”, Seattle, WA, November 2022 .

[106] *Toward building a quantum-simulation program for QCD*, invited talk at the Fall 2022 Meeting of the APS Division of Nuclear Physics, Topical Workshop on QCD and the EIC, New Orleans, LA, October 2022.

[105] *A Quantum Simulation Program for QCD?*, invited (virtual) seminar at Nuclear Data and Theory and Nuclear and Particle Physics groups at the Lawrence Livermore National Laboratory, Livermore, CA, October 2022.

[104] *Quantum Field Theories with Quantum Tools*, invited (virtual) talk at the Triangle Quantum Seminar Series, North Carolina State University, Raleigh, NC, October 2022.

[103] *Quantum Information Science for QCD Research*, 2022 DNP’s Town Hall meeting on hot and cold QCD, Massachusetts Institute of Technology, Cambridge, MA, September 2022.

[102] *A quantum simulation program for QCD?*, invited keynote talk at the International Conference on Recent Progress in Many-Body Theories XXI, University of North Carolina, Chapel Hill, NC, September 2022.

[101] *The quantum world of quarks and gluons on a quantum simulator?*, Physics Colloquium, University of Maryland, College Park, MD, September 2022.

[100] *Quantum simulation for QCD: Where we are now and what is in reach*, invited (virtual) plenary talk at the XVth Quark Confinement and the Hadron Spectrum Conference, University of Stavanger, Norway, August 2022.



- [99] *Uncovering new physics signals in nucleons and nuclei with lattice QCD*, invited colloquium at the Snowmass Community Study Conference, University of Washington, Seattle, WA, July 2022.
- [98] *Quantum simulation: Applications in High Energy Physics*, invited talk co-presented at the Snowmass Community Study Conference, University of Washington, Seattle, WA, July 2022.
- [97] *Gauge theories, trapped ions, and NISQ-era simulation strategies*, invited talk at the Munich Center for Quantum Science and Technology’s annual conference, Sonthofen, Germany, July 2022.
- [96] *Enhancing trapped-ion simulator toolkit for simulating quantum field theories*, **invited** talk at the workshop on “New trends in complex quantum systems dynamics 2022 San Sebastian”, Basque Country, Spain, June 2022.
- [97] *Simulating QCD with quantum tools?*, **invited** talk at the 7th Annual GPMFC Workshop on Exploring Physics With Quantum-Enabled Precision Measurement, APS DAMOP Meeting, Orlando, FL, May 2022.
- [95] *Trapped ions, gauge theories, and NISQ-era simulation strategies*, **invited** talk at the workshop on “Simulating Quantum Many-Body Systems on NISQ Computers”, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, Apr 2022.
- [94] *The quantum world of quarks and gluons on a quantum simulator?*, **invited** colloquium at the Physics Department, University of Illinois, Urbana Champaign, Mar 2022.
- [93] *The quantum world of quarks and gluons on a quantum simulator?*, **invited** seminar at the Physics Department, University of California, Berkeley, Mar 2022.
- [92] *The quantum world of quarks and gluons on a quantum simulator?*, **invited** colloquium at the Physics Department, Duke University, Feb 2022.
- [91] *Strong-interaction physics and lattice field theory in the era of quantum simulation*, **invited** virtual colloquium at the Physics Department of Iowa State University, IA, Feb 2022.
- [90] *Lattice QCD, fundamental symmetries, and neutrinoless double beta decay*, **invited** virtual talk at the 2021 school and workshop on “Aspects of Symmetry” organized by the University of Bonn, Germany, Nov 2021.
- [89] *Lattice QCD and nucleon(us) structure*, **invited** virtual talk at the Frontiers and Careers workshop within the European Research Conference on on Electromagnetic Interactions with Nucleons and Nuclei, Nov 2021.
- [88] *Quantum simulation with trapped ions with applications to nuclear physics*, **invited** virtual talk at the EP/NP theory seminar series at Washington University, St. Louis, MO, Oct 2021.
- [87] *Lattice field theory in the era of quantum simulation*, **invited** virtual HEP/GR colloquium at the Clare Hall, Cambridge University, UK, Oct 2021.
- [86] *Lattice field theory and strong-interaction physics in the era of quantum simulation*, **invited** virtual colloquium at the Physics Department of Tufts University, MA, Oct 2021.

- [85] *Hybrid analog-digital quantum simulations for quantum field theories*, virtual talk presented at the 38th International Symposium on Lattice Field Theory, Massachusetts's Institute of Technology, Cambridge, MA, July 2021.
- [84] *Quantum Simulation for Nuclear Physics*, **invited** virtual talk presented at the workshop on "Perspectives on Quantum Sensing and Computation for Particle Physics", CERN, Switzerland, July 2021.
- [83] *Quantum field theories with trapped-ion quantum simulators?*, **invited** virtual talk presented at the workshop "Nuclear Physics Meets Condensed Matter", at European Center for Theoretical Studies in Nuclear Physics (ECT\*), Trento, Italy, July 2021.
- [82] *Extending the Trapped-Ion Simulator Toolkit for Lattice Gauge Theory Simulations*, virtual talk presented at the workshop "QuaSI workshop II: Implementation strategies for gauge theories", InQubator for Quantum Simulation, Seattle, WA, June 2021.
- [81] *Simulations of gauge field theories with quantum tools*, **invited** virtual seminar at the Center for Quantum Technologies, National University of Singapore, May 2021.
- [80] *Toward simulating nature from its fundamental laws*, **invited** virtual talk at the Physics Department, University of Texas, El Paso, TX, May 2021.
- [79] *Simulations of gauge field theories with quantum tools*, **invited** virtual QI Cambridge seminar, Cambridge University, UK, May 2021.
- [78] *Quantum computing and lattice field theory program*, **invited** virtual talk at the USQCD's all-hands meeting hosted by Massachusetts's Institute of Technology, May 2021.
- [77] *Quantum simulation with trapped ions (for nuclear and high-energy physics)*, **invited** virtual talk at the APS April Meeting, April 2021.
- [76] *Toward quantum simulations of quantum field theories*, **invited** virtual seminar at the ARQC Quantum Seminar Series hosted by Applied Physics Laboratory, John Hopkins University, MD, April 2021.
- [75] *Lattice field theory and strong-interaction physics in the era of quantum simulation*, **invited** virtual Frontiers in Nuclear Physics Colloquium, Institute for Nuclear Theory, Seattle, WA, April 2021.
- [74] *Toward Simulating Laws of Nature*, **invited** virtual seminar at the Horn Point Laboratory, University of Maryland, MD, February 2021.
- [73] *Atoms and ions as quantum simulators of quarks, gluons, and nuclei?*, **invited** virtual colloquium, Arizona State University, AZ, January 2021.
- [72] *Hamiltonian simulation of non-Abelian lattice gauge theories: Search for an efficient formulation*, **invited** virtual talk presented at the workshop on Quantum Computing for Quantum Field Theories, Yukawa Institute for Theoretical Physics, Japan, January 2021.
- [71] *Toward quantum simulation of systems of relevance to nuclear and particle physics*, **invited** virtual talk presented at the XXVI edition of the annual Christmas workshop at the instituto de física teórica (IFT), Madrid, Spain, December 2020.
- [70] *Quantum simulators for nuclear and particle physics: progress, challenges, and future*, **invited** virtual colloquium presented at the Institute for Quantum Computing

(IQC), University of Waterloo, Waterloo, Canada, November 2020.

[69] *Quantum simulators for nuclear physics: progress, challenges, and future*, **invited** virtual Physics Division Seminar, Argonne National Laboratory, IL, November 2020.

[68] *Nuclear physics entering a quantum-simulation era: lessons from the past, vision for the future*, **invited** virtual talk presented at the workshop on “Advances in Many-body Theories: From First-principles Methods to Quantum Computing and Machine Learning”, European Center for Theoretical Studies in Nuclear Physics (ECT\*), Trento, Italy, November 2020.

[67] *Advances in quantum simulation for nuclear physics*, **invited** virtual talk presented at the Fall Meeting of APS Division of Nuclear Physics, Michigan State University, East Lansing, MA, October 2020.

[66] *Towards analog quantum simulations of quantum field theories*, virtual talk presented at the QSFS workshop on “Trapped Ions and Quantum Simulation”, August 2020.

[65] *Toward matching double-beta decay amplitudes in effective field theory to lattice QCD*, **invited** virtual talk presented at the program on “Beyond-the-Standard-Model Physics with Nucleons and Nuclei”, INT, Seattle, WA, July 2020.

[64] *Toward analog quantum simulation of lattice gauge theories with trapped ions*, **invited** virtual seminar presented at Fermi National Laboratory, Department of Theoretical Physics, IL, April 2020.

[63] *Restorations of infinite-volume and continuum symmetries of spacetime in lattice field theory simulations of nature*, **invited** talk presented at the workshop on “Structure-preserving geometric discretization of physical systems”, Princeton Center for Theoretical Science, Princeton, February 2020.

[62] *The road to nuclear physics from Standard Model using lattice QCD*, **invited** colloquium presented at the physics department, Ohio University, Athens, October 2019.

[61] *(Towards) quantum simulation of field theories for applications in nuclear and particle physics*, **invited** talk presented at the QuICS Seminars, Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland, September 2019.

[60] *Towards analog quantum simulations of lattice gauge theories with trapped ions*, talk presented at the 2019 fall meeting of the APS division of nuclear physics, Arlington, Virginia, October 2019.

[59] *Computational nuclear physics with the lattice QCD method*, **invited** talk presented at the workshop on “Bayesian inference in subatomic physics”, Gothenburg University, Gothenburg, Sweden, September 2019.

[58] *Progress in multi-nucleon physics from lattice QCD*, **invited** talk presented at the Bethe forum in “Multihadron dynamics in a box”, Bethe Center for Theoretical Physics (BCTP), University of Bonn, Germany, September 2019.

[57] *Towards neutrinoless double-beta decay from lattice QCD*, **invited** talk presented at the program on “Advances in lattice gauge theories”, CERN, Switzerland, July 2019.

- [56] *Lattice QCD for neutrinoless double-beta decay*, **invited** talk presented at the workshop on “Progress and challenges in neutrinoless double beta decay”, ECT\*, Trento, Italy, July 2019.
- [55] *Fundamental symmetries*, talk presented at the “Department of Energy’s review of the USQCD project”, Rockville, MD, July 2019.
- [54] *Bound nuclear and hypernuclear systems from lattice QCD*, **invited** talk presented at the “Bound states in QCD and beyond III” workshop, St. Goar, Germany, April 2019.
- [53] *Towards analog and digital quantum simulations of strongly-interacting dynamics*, **invited** talk presented at the “Nuclear and Particle Seminars”, University of Connecticut, March 2019.
- [52] *The road to nuclear physics from the Standard Model*, **invited** colloquium presented at the Physics department, Duke University, February 2019.
- [51] *Towards analog and digital simulations of interactions relevant to nuclear and particle physics*, **invited** talk presented at the kick-off meeting on pre-pilot program in QC and QIS for nuclear theory, January 2019.
- [50] *Nuclear physics from underlying interactions of nature using lattice QCD*, talk presented at the University of Tsukuba, department of Physics, January 2019.
- [49] *Nuclear physics from underlying interactions of nature using advanced computing*, **invited** talk presented at the “International workshop on massively parallel programming for quantum chemistry and physics”, January 2019.
- [48] *Nuclear physics and lattice QCD*, **invited** talk presented at the program on “Interface of effective field theories and lattice gauge theory”, Munich Institute for Astro- and Particle Physics (MIAPP), November 2018.
- [47] *The road to nuclear physics from the Standard Model*, **invited** colloquium presented at the Physics department, University of Iowa, October 2018.
- [46] *Spectrum, reaction and structure of light nuclei from lattice QCD*, **invited** plenary talk presented at the “9th international workshop on chiral dynamics”, Durham, NC, September 2018.
- [45] *Prospect of analog simulations of interactions relevant to nuclear and particle physics with trapped ions*, **invited** talk presented at the INT workshop on “Advances in Monte Carlo techniques for many-body quantum systems”, Institute for Nuclear Theory, Seattle, WA, August 2018.
- [44] *The path from finite to infinite volume: Hadronic observables from lattice QCD*, award presentation at “The 36th international symposium on lattice field theory”, Michigan State University, July 2018.
- [43] *Higher moments of parton distribution functions from lattice QCD*, talk presented at “The 36th international symposium on lattice field theory”, Michigan State University, July 2018.
- [42] *Light nuclei from lattice QCD: spectrum, structure and reactions*, **invited** plenary talk presented at “The 22nd international conference in few-body physics”, Caen, France, July 2018.

- [41] *From quantum chromodynamics to hypernuclear interactions*, **invited** plenary talk presented at “The 13th International Conference on Hypernuclear and Strange Particle Physics”, Portsmouth, VA, June 2018.
- [40] *Axial properties of nuclei from lattice QCD and EFT*, **invited** talk presented at the INT workshop on “Fundamental physics with electroweak probes of light nuclei”, Institute for Nuclear Theory, Seattle, WA, June 2018.
- [39] *Nuclear and hypernuclear forces from lattice QCD*, **invited** talk presented at the ECT\* workshop on “New ideas in constraining nuclear forces”, European Center for Theoretical Studies in Nuclear Physics and Related Areas, Trento, Italy, June 2018.
- [38] *Standard Model input for nuclear physics*, **invited** talk presented at “The Joint Science Meeting”, Institute for Advanced Computational Sciences, Stony Brook University, Stony Brook, NY, May 2018.
- [37] *Fundamental symmetries and signals for new physics*, **invited** talk presenting progress report on a planned whitepaper at the “USQCD collaboration’s all-hands meeting”, Fermilab, Batavia, IL, April 2018.
- [36] *The road to nuclear physics from Standard Model*, **invited** colloquium at the Department of Physics, University of Maryland, College Park, April 2018.
- [35] *The road from QCD to nuclear double- $\beta$  decays*, **invited** talk presented at the Theory Seminar Series, Fermilab, Batavia, IL, April 2018.
- [34] *Higher moments of parton distribution functions from lattice QCD*, **invited** talk at the “Lattice PDF” workshop, University of Maryland, College Park, April 2018.
- [33] *Baryon-baryon scattering and nuclear forces from lattice QCD*, **invited** talk at the workshop on “Multi-hadron physics from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, February 2018.
- [32] *Towards unraveling nuclear and hypernuclear forces from QCD*, **invited** seminar at the FRIB/NSCL seminar series, Michigan State University, East Lansing, January 2018.
- [31] *Double-beta decay processes from lattice quantum chromodynamics*, **invited** presentation at the mini-Symposium on Nuclear Matrix Element Calculations for Neutrinoless Double-Beta, Fall Meeting of the APS Division of Nuclear Physics, Pittsburgh, Pennsylvania, October 2017.
- [30] *Beyond nucleon properties from lattice QCD*, **invited** presentation at the 11th International Workshop on the Physics of Excited Nucleons, University of South Carolina, Columbia, SC, August 2017.
- [29] *Status of LQCD calculations for nuclear and multi-nucleon systems*, **invited** talk delivered at the “Lattice QCD input for neutrinoless double-beta decay” workshop, Institute for Nuclear Theory, Seattle, WA, July 2017.
- [28] *The road to nuclear physics from standard model*, **invited** seminar delivered at Universitat de Barcelona, Spain, June 2017.
- [27] *Lattice QCD input for nuclear structure and reactions*, **invited** plenary talk at the International Symposium for Lattice Gauge Theory, Granada, Spain, June 24, 2017.
- [26] *Nuclear and hypernuclear interactions from QCD*, seminar delivered at MIT’s lattice

club, Center for Theoretical Physics, MIT, Cambridge, MA, April 2017.

[25] *The road to nuclear physics from Standard Model*, **invited** seminar delivered at the Brookhaven National Laboratory, Department of Physics, Long Island, NY, April 2017.

[24] *The road to nuclear physics from Standard Model*, **invited** colloquium delivered at the Old Dominion University, Department of Physics, Norfolk, VA, March 2017.

[23] *Lattice QCD and few-body observables*, **invited** talk presented at the Jefferson Laboratory, Theory Group, Newport News, VA, March 2017.

[22] *The road to nuclear physics from Standard Model*, **invited** talk presented at the University of Connecticut, Department of Physics, Mansfield, CT, March 2017.

[21] *QCD input for nuclear double-beta decays*, **invited** talk presented at the University of Massachusetts, Department of Physics, Amherst, MA, February 2017.

[20] *The road to nuclear physics from Standard Model*, **invited** talk presented at the University of Maryland, Department of Physics, College Park, MD, February 2017.

[19] *Can we reliably predict nuclear forces and/or nuclei from QCD?*, **invited** talk presented at the workshop on “The tower of the effective field theories and the emergence of the nuclear phenomena”, the Commissariat à l’énergie atomique (CEA), Saclay, France, January 2017.

[18] *Neutrinoless double-beta decay: The role of effective field theory and lattice QCD*, **invited** talk presented at the symposium on “Advances in Effective Field Theories”, Forschungszentrum, Jülich, Germany, November 2016.

[17] *Bottom-Up approach to nuclear physics*, **invited** talk presented at the “Rising Stars in Physics” workshop, MIT, Cambridge, MA, October 2016.

[16] *Effective field theory and lattice QCD input for neutrinoless double-beta decay*, **invited** talk presented at the MIT’s Center for Theoretical Physics, “Nuclear and Particle Theory Seminar”, Cambridge, MA, October 2016

[15] *Neutrinoless double-beta decay: The role of effective field theory and lattice QCD*, **invited** talk presented at the University of Maryland, Department of Physics, “Nuclear Theory group Seminar”, College Park, MD, September 2016.

[14] *Towards lattice QCD studies of high moments of parton distribution functions*, **invited** talk presented at the “Spin Conference”, University of Illinois, Urbana Champaign, IL, September 2016.

[13] *LQCD for few-body observables*, **invited** talk presented at “Frontiers in Nuclear Physics” program, Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2016.

[12] *Charge radii and higher electromagnetic moments with lattice QCD in nonuniform background fields*, talk presented at the “34nd International Symposium on Lattice Field Theory”, University of Southampton, Southampton, UK, July 2016.

[11] *Hadronic observables with QED interactions in a finite volume: classical and quantum views*, **invited** talk presented at Columbia University, department of Physics, “Theory Group Seminar”, NYC, NY, November 2015.

[10] *Lattice QCD with Background Electromagnetic Fields: Implementation and Appli-*

*cations*, **invited** talk presented at the “Brookhaven Forum 2015: Great Expectations, a New Chapter”, Brookhaven National Laboratory, Uptown, NY, October 2015.

[9] *Hadronic few-body systems in a finite volume*, **invited** talk presented at the “Lattice gauge theory for the LHC and beyond” program, Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2015.

[8] *Single-hadron states in a finite volume in the presence of QED interactions*, **invited** talk presented at the “Multi-hadron and nonlocal matrix elements in lattice QCD”, a RIKEN-BNL research-center workshop, Brookhaven National Laboratory, Uptown, NY, February 2015.

[7] *Two-baryons systems with twisted boundary conditions*, talk presented at the “32nd International Symposium on Lattice Field Theory”, Columbia University, New York, NY, June 2014.

[6] *Three-body finite-volume formalism for lattice QCD*, **invited** talk presented at the Institute for Nuclear Theory’s (INT) program “Universality in few-body systems: Theoretical challenges and new directions”, Institute for Nuclear Theory, Seattle, WA, May 2014.

[5] *Finite-volume formalism for lattice QCD: Two-nucleon systems and the deuteron*, **invited** talk presented at the College of William and Mary, “Nuclear Physics Group Seminar”, Williamsburg, VA, October 2013.

[4] *On the extraction of tensor force from lattice QCD*, the fall meeting of the APS division of nuclear physics, Newport News, VA, October 2013.

[3] *Three-particle scattering amplitudes from a finite volume formalism*, INT workshop on “Nuclear reactions from lattice QCD”, Institute for Nuclear Theory, Seattle, WA, March 2013.

[2] *Restoration of rotational symmetry from the continuum limit of lattice field theories*, **invited** talk presented at the INT program on “Lattice QCD studies of excited resonances and multi-hadron systems”, Institute for Nuclear Theory, Seattle, WA, July 2012.

[1] *Coupled-channel systems in a finite volume*, the fall meeting of the APS division of nuclear physics, Newport Beach, CA, October 2012.

PUBLIC TALKS  
AND PANELS,  
INTERVIEWS, AND  
OUTREACH

[18] *Toward Simulating Laws of Nature...and Implications for a Simulated Universe*, invited seminar at the Professional Physics Seminar for Undergraduate Students at the University of Maryland, College Park, October 2022.

[17] Invited panelist of the “Dark Matter and Dark Energy Panel” organized by the National Science Foundation at the annual comic convention AwesomeCon, Washington DC, June 2022.

[16] *To share a few excitements of my research*, invited talk presented to the Society of Physics Students (SPS) @UMD, September 2021.

[15] Invited panelist of the “Dark Matter and Dark Energy Panel” organized by the National Science Foundation at the annual comic convention AwesomeCon, Washington DC, August 2021.

[14] *Toward Simulating Laws of Nature...and Implications for a Simulated Universe*,

invited virtual talk at the Raytheon Technologies, September 2021.

[13] Interviewed by Emmy-award winning Irish TV and radio presenter, Baz Ashmawy, about the topic of scientific angles to simulation hypothesis, May 2021. Listen [here](#).

[12] *Toward Simulating Laws of Nature...and Implications for a Simulated Universe*, invited virtual public talk at the Reyes Lecture Series, Old Dominion University, VA, March 2021, watch [here](#).

[11] *Toward simulating nature from fundamental particles and interactions*, invited seminar at the Professional Physics Seminar for Undergraduate Students at the University of Maryland, College Park, November 2020.

[10] Interviewed by Paris-based science and technology writer Loïc Hecht for a book on the simulation hypothesis.

[9] Invited speaker at the summer camp for (female) high-school students presenting a talk entitled “*Simulating fundamental particles and forces of nature*”, University of Maryland, College Park, July 2019.

[8] Interviewed by Boston-based science and technology journalist Brian Bergstein for a piece on “Is the Universe Real?” which was published in Medium.com, February 2019, read [here](#).

[7] Invited speaker of TEDxUMD presenting a talk entitled “*Towards simulating nature From fundamental particles and interactions*”, University of Maryland, College Park, April 2019.

[6] Invited scientist and lesson writer of a TED-Ed project featuring the topic of simulating laws of nature, released in 2019, watch [here](#).

[5] Invited faculty panelist at the graduate students advising session at the “36th International Symposium on Lattice Field Theory” (LATTICE2018), 22-28 July, 2018, Michigan State University, East Lansing, MI, USA.

[4] *From QCD to nuclear physics*, invited seminar at the “Foundations and Frontiers of Physics Seminar for Physics Graduate Students” at the University of Maryland, College Park, February 2018.

[3] *Simulating fundamental particles and forces of nature...and why I like it!*, invited seminar at the Professional Physics Seminar for Undergraduate Students at the University of Maryland, College Park, October 2017.

[2] *Is universe a simulation?*, invited panelist of the “2016 Isaac Asimov Memorial Debate”, hosted by Neil deGrasse Tyson at the American Museum of Natural History, NYC, NY, April 2016, watch [here](#).

[1] *Universe as a numerical simulation?*, invited public talk presented at the Art Institute of Seattle, Seattle, WA, January 2013.

#### LANGUAGES

Persian (Native)

English (Fluent)