

PAVEL PUTROV
CURRICULUM VITAE

CONTACT INFORMATION

International Centre for Theoretical Physics
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PERSONAL DETAILS

Date of birth: June, 1985
Citizenship: Russian Federation
Google Scholar profile: <https://scholar.google.com/citations?user=P2110PUAAAAJ>
INSPIRE profile: <https://inspirehep.net/authors/1034320>

EDUCATION

- 2002, High school diploma from Physical and Mathematical Lyceum 239, St. Petersburg, Russia.
- 2006, BSc summa cum laude, Department of High Energy Physics and Elementary Particles, Physics Faculty, St. Petersburg State University, Russia.
- 2009, MSc summa cum laude, Department of High Energy Physics and Elementary Particles, Physics Faculty, St. Petersburg State University, Russia.
- 2012, PhD, Section de mathématiques, University of Geneva, Switzerland. Advisor: Prof. Marcos Mariño.

EMPLOYMENT

- Feb 2009 – Aug 2012, Teaching Assistant, Section de mathématiques, University of Geneva, Switzerland.
- Sep 2012 – Aug 2015, Sherman Fairchild Prize Postdoctoral Fellow, California Institute of Technology, USA.
- Sep 2015 – Aug 2018, Member, Institute for Advanced Study, Princeton, USA.
- Aug 2018 – Mar 2022, Associate Research Officer (equivalent of tenure-track Assistant Professor in a university), The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.
- Apr 2022 – . . . , Research Scientist (equivalent of tenured Associate Professor in a university), The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

RESEARCH INTERESTS

Mathematical physics at the interface of quantum field theory, low-dimensional topology and number theory: topological quantum field theories (TQFTs), quantum invariants of knots and 3-manifolds and their categorification, generalized (higher-form, non-invertible, categorical) symmetries and anomalies, resurgence and quantum modularity, supersymmetric gauge theories and string theory. Recent and current interests include applications of machine learning to low-dimensional topology, TQFTs and their lattice realizations.

PUBLICATIONS & PREPRINTS

Author order is alphabetical in all papers except 21,25, where the order is by contribution.

1. P. Putrov, “Path integral in energy representation in quantum mechanics,” *Theor. Math. Phys.* **156**, 1041-1057 (2008), [arXiv:hep-th/0605169].
2. A. S. Alexandrov, A. Mironov, A. Morozov, P. Putrov, “Partition Functions of Matrix Models as the First Special Functions of String Theory. II. Kontsevich Model,” *Int. J. Mod. Phys. A* **24**, 4939-4998 (2009). [arXiv:0811.2825 [hep-th]].
3. M. Mariño, P. Putrov, “Multi-instantons in large N Matrix Quantum Mechanics,” [arXiv:0911.3076 [hep-th]].
4. M. Mariño, S. Pasquetti, P. Putrov, “Large N duality beyond the genus expansion,” *JHEP* **1007**, 074 (2010). [arXiv:0911.4692 [hep-th]].
5. M. Mariño, P. Putrov, “Exact Results in ABJM Theory from Topological Strings,” *JHEP* **1006**, 011 (2010). [arXiv:0912.3074 [hep-th]].
6. N. Drukker, M. Mariño, P. Putrov, “From weak to strong coupling in ABJM theory,” *Commun. Math. Phys.* **306**, 511-563 (2011). [arXiv:1007.3837 [hep-th]].

7. R. Couso Santamaría, M. Mariño, P. Putrov, “Unquenched flavor and tropical geometry in strongly coupled Chern-Simons-matter theories,” *JHEP* **1110**, 139 (2011). [arXiv:1011.6281 [hep-th]].
8. N. Drukker, M. Mariño, P. Putrov, “Nonperturbative aspects of ABJM theory,” *JHEP* **1111**, 141 (2011) [arXiv:1103.4844 [hep-th]].
9. M. Mariño, P. Putrov, “ABJM theory as a Fermi gas,” *J. Stat. Mech.* **1203**, P03001 (2012) [arXiv:1110.4066 [hep-th]].
10. M. Mariño and P. Putrov, “Interacting fermions and N=2 Chern-Simons-matter theories,” *JHEP* **1311**, 199 (2013) [arXiv:1206.6346 [hep-th]].
11. P. Putrov and M. Yamazaki, “Exact ABJM Partition Function from TBA,” *Mod. Phys. Lett. A* **27**, 1250200 (2012) [arXiv:1207.5066 [hep-th]].
12. A. Gadde, S. Gukov and P. Putrov, “Walls, Lines, and Spectral Dualities in 3d Gauge Theories,” *JHEP* **1405**, 047 (2014) [arXiv:1302.0015 [hep-th]].
13. A. Gadde, S. Gukov and P. Putrov, “Fivebranes and 4-manifolds,” *Arbeitstagung Bonn 2013: In Memory of Friedrich Hirzebruch* (Editors: Ballmann, W., Blohmann, C., Faltings, G., Teichner, P., Zagier, D.), Birkhäuser Basel, 2016, [arXiv:1306.4320 [hep-th]].
14. A. Gadde, S. Gukov and P. Putrov, “(0, 2) trialities,” *JHEP* **1403**, 076 (2014) [arXiv:1310.0818 [hep-th]].
15. A. Gadde, S. Gukov and P. Putrov, “Duality Defects,” arXiv:1404.2929 [hep-th].
16. A. Gadde, S. Gukov and P. Putrov, “Exact Solutions of 2d Supersymmetric Gauge Theories,” *JHEP* **11** (2019), 174 [arXiv:1404.5314 [hep-th]].
17. P. Putrov, J. Song and W. Yan, “(0, 4) dualities,” *JHEP* **1603**, 185 (2016) [arXiv:1505.07110 [hep-th]].
18. S. Gukov, P. Putrov and C. Vafa, “Fivebranes and 3-manifold homology,” *JHEP* **1707**, 071 (2017) [arXiv:1602.05302 [hep-th]].
19. S. Gukov, M. Mariño and P. Putrov, “Resurgence in complex Chern-Simons theory,” arXiv:1605.07615 [hep-th].
20. A. Gadde and P. Putrov, “Exact solutions of (0,2) Landau-Ginzburg models,” *JHEP* **02** (2020), 061 [arXiv:1608.07753 [hep-th]].
21. P. Putrov, J. Wang and S. T. Yau, “Braiding Statistics and Link Invariants of Bosonic/Fermionic Topological Quantum Matter in 2+1 and 3+1 dimensions,” *Annals Phys.* **384**, 254 (2017) [arXiv:1612.09298 [cond-mat.str-el]].
22. S. Gukov, D. Pei, P. Putrov and C. Vafa, “BPS spectra and 3-manifold invariants”, *J. Knot Theor. Ramifications* **29** (2020) no.02, 2040003 [arXiv:1701.06567 [hep-th]].
23. M. Dedushenko, S. Gukov and P. Putrov, “Vertex algebras and 4-manifold invariants,” *Geometry and Physics: Volume I: A Festschrift in honour of Nigel Hitchin*, Oxford University Press 2018 [arXiv:1705.01645 [hep-th]].
24. M. Guo, P. Putrov and J. Wang, “Time Reversal, SU(N) Yang-Mills and Cobordisms: Interacting Topological Superconductors/Insulators and Quantum Spin Liquids in 3+1D,” *Annals Phys.* **394** (2018) 244-293 [arXiv:1711.11587 [cond-mat.str-el]].
25. J. Wang, K. Ohmori, P. Putrov, Y. Zheng, H. Lin, P. Gao, S.-T. Yau, “Tunneling Topological Vacua via Extended Operators: TQFT Spectra and Boundary Deconfinement in Various Dimensions,” *PTEP* **2018** (2018) no.5, 053A01 [arXiv:1801.05416 [cond-mat.str-el]].
26. S. Gukov, D. Pei, P. Putrov and C. Vafa, “4-manifolds and topological modular forms,” *JHEP* **05** (2021), 084 [arXiv:1811.07884 [hep-th]].
27. M. Guo, K. Ohmori, P. Putrov, Z. Wan and J. Wang, “Fermionic Finite-Group Gauge Theories and Interacting Symmetric/Crystalline Orders via Cobordisms,” *Commun. Math. Phys.* **376** (2020) no.2, 1073-1154 [arXiv:1812.11959 [hep-th]].
- 28.† N. Drukker, D. Trancanelli, L. Bianchi, M. S. Bianchi, D. H. Correa, V. Forini, L. Griguolo, M. Leoni, F. Levkovich-Maslyuk, G. Nagaoka, S. Penati, M. Preti, M. Probst, P. Putrov, D. Seminara, G. A. Silva, M. Tenser, M. Trépanier, E. Vescovi, I. Yaakov and J. Zhang, “Roadmap on Wilson loops in 3d Chern-Simons-matter theories,” *J. Phys. A* **53** (2020) no.17, 173001 [arXiv:1910.00588 [hep-th]].
29. S. Gukov, D. Pei and P. Putrov, “Trialities of minimally supersymmetric 2d gauge theories,” *JHEP* **04** (2020), 079 [arXiv:1910.13455 [hep-th]].
30. A. Dabholkar, P. Putrov and E. Witten, “Duality and Mock Modularity,” *SciPost Phys.* **9** (2020) no.5, 072 [arXiv:2004.14387 [hep-th]].
31. S. Gukov, S. Park and P. Putrov, “Cobordism Invariants from BPS q-Series,” *Annales Henri Poincaré* **22** (2021) 12, 4173-4203 [arXiv:2009.11874 [hep-th]].
32. F. Ferrari and P. Putrov, “Supergroups, q-series and 3-manifolds,” *Annales Henri Poincaré* **25** (2024) 5, 2781-2837 [arXiv:2009.14196 [hep-th]].
33. A. Grigoletto and P. Putrov, “Spin-cobordisms, surgeries and fermionic modular bootstrap,” *Commun. Math. Phys.* **401** (2023) 3169-3245 [arXiv:2106.16247 [hep-th]].

34. F. Costantino, S. Gukov and P. Putrov, “Non-semisimple TQFT’s and BPS q -series,” *SIGMA* **19** (2023) 010 [arXiv:2107.14238 [math.GT]].
- 35.[†] A. Dabholkar and P. Putrov, “Three Avatars of Mock Modularity,” *Int. J. Mod. Phys. A* **36** (2021) 2130020 [arXiv:2110.09790 [hep-th]].
36. P. Putrov, “ $\mathbb{Q}/\mathbb{Z}$ symmetry,” [arXiv:2208.12071 [hep-th]].
37. P. Putrov and J. Wang, “Categorical Symmetry of the Standard Model from Gravitational Anomaly,” *Phys.Rev.D* **110** (2024) 12, 125028 [arXiv:2302.14862 [hep-th]].
38. P. Putrov and S. J. Ri, “Graph Neural Networks and 3-Dimensional Topology,” *Mach.Learn.Sci.Tech.* **4** (2023) 3, 035026 [arXiv:2305.05966 [math.GT]].
39. M. Furlan and P. Putrov, “On finite group global and gauged q -form symmetries in TQFT,” [arXiv:2403.04677 [math-ph]].
40. S. Gukov and P. Putrov, “On categorification of Stokes coefficients in Chern-Simons theory,” [arXiv:2403.12128 [hep-th]].
41. P. Putrov and R. Radhakrishnan, “Non-anomalous non-invertible symmetries in 1+1D from gapped boundaries of SymTFTs,” *JHEP* **03** (2026) 077 [arXiv:2405.04619 [hep-th]].
42. P. Putrov and R. Radhakrishnan, “Braidings on topological operators, anomaly of higher-form symmetries and the SymTFT,” [arXiv:2503.13633 [hep-th]].
43. T. Nicosanti and P. Putrov, “Summing over homology groups of 3-manifolds,” [arXiv:2508.02457 [hep-th]].
44. P. Putrov and A. Singh, “On Quantum Modularity for Geometric 3-Manifolds,” [arXiv:2512.10768 [math.GT]].
45. T. Nicosanti, P. Putrov and J. Quenta-Raygada, “Approximating $SU(2)$ Chern-Simons theory by finite group gauge theories,” [arXiv:2512.11704 [hep-th]].
46. M. Del Zotto, A. Gadde and P. Putrov, “From Multipartite Entanglement to TQFT,” [arXiv:2602.16770 [hep-th]].
47. P. Putrov and R. Radhakrishnan, “On the action of non-invertible symmetries on local operators in 3+1d,” *JHEP* **08** (2026) 076 [arXiv:2603.03438 [hep-th]].
48. X. Gu, B. Haghighat and P. Putrov, “On the monodromy of KZ-connections with irregular singularities,” [arXiv:2603.24098 [hep-th]].

[†] Review articles

INVITED CONFERENCE/WORKSHOP TALKS (FROM 2015)

*: virtual events. Invited talks that were canceled due to COVID-19 emergency are *not* listed.

- “Fivebranes on Coassociative Submanifolds”, March 6, 2015, ‘String/M-theory Compactifications and Moduli Stabilization’, University of Michigan.
- Series of talks on correspondence between 4-manifolds and 2d CFTs, ‘The Workshop on 6D Gauged Theory and Invariants of 4-manifolds’, November 9-13, 2015, Beijing International Center for Mathematical Research.
- “BPS spectra of 3-manifolds”, June 2, 2016, Chengdu International Conference on Gromov-Witten theory, China.
- “BPS spectra of 3-manifolds”, October 26, 2016, ‘Strings and Geometry’ workshop, Seoul, Korea.
- “Exact solutions of $\mathcal{N} = (0, 2)$ 2d Landau-Ginzburg models”, November 13, 2016, ‘Mathematical string theory’ special session at the fall southeastern sectional meeting of the AMS, Raleigh, NC.
- “Resurgence in Chern-Simons theory”, ‘Resurgence at Kavli IPMU’, 12-16 December, 2016, Tokyo, Japan.
- “Integrality in analytically continued Chern-Simons theory”, ‘Physics and knot homologies’ workshop, 10-13 April, 2017, Isaac Newton Institute for mathematical sciences, Cambridge, UK.
- “BPS spectra and 3-manifold invariant”, June 12, 2017, ‘Gauge theories, supergravity and superstrings’ workshop, Benasque, Spain.
- “Finite group gauge theories and link invariants”, July 13, 2017, ‘VII Workshop on Geometric Correspondences of Gauge Theories’, SISSA, Trieste, Italy.
- “Integrality in analytically continued Chern-Simons theory”, August 16, 2017, ‘Workshop on Arithmetic Geometry and Quantum Field Theory’, KIAS, South Korea.
- “BPS spectra of 3-manifolds”, August 30, 2017, ‘ICTP Mini Workshop on String Theory’, ICTP, Italy.
- “Vertex algebras and 4-manifold invariants”, January 18, 2018, Tsinghua Workshop on SCFTs in 6 and lower dimensions, Sanya, China.
- “BPS spectra and 3-manifold invariants”, March 5, 2018, ‘Quantum Knot Homology and Supersymmetric Gauge Theories’, Aspen, USA.
- “Towards a categorification of WRT invariant of 3-manifolds”, April 10, 2018, ‘Categorification in Mathematical Physics’, Simons Center for Geometry and Physics, Stony Brook, USA [video].

- “Topological terms in Yang-Mills theory with time-reversal symmetry”, June 15, 2018, ‘VIII Workshop on Geometric Correspondences of Gauge Theories’, SISSA, Trieste, Italy.
- “Resurgence in Chern-Simons theory”, July 12, 2018, 7th International Conference on New Frontiers in Physics, Workshop on Resurgent Asymptotics in Physics and Mathematics, Crete, Greece.
- “Fermionic finite group gauge theories, Sato-Levine invariants and categorification”, December 5, 2018, KITP Program: Quantum Knot Invariants and Supersymmetric Gauge Theories, Santa Barbara, USA [\[video\]](#).
- “4-manifolds and topological modular forms”, December 17, 2018, ‘Vertex Algebras and Gauge Theory’, Simons Center for Geometry and Physics, Stony Brook, USA [\[video\]](#).
- “4-manifolds and (topological) modular forms”, May 13, 2019, HMI Workshop ‘Gauge theory and virtual invariants’, Dublin, Ireland.
- “Cayley cycles and modular forms”, June 4, 2019, ‘Special Holonomy and Calibrated Geometry’, Imperial College, London, UK [\[video\]](#).
- “Fermionic finite group gauge theories”, June 7, 2019, ‘New Developments in Quantum Topology’, UC Berkeley, USA.
- “Dualities of minimally supersymmetric 2d gauge theories”, September 5, 2019, ‘Non-Perturbative Methods in Quantum Field Theory’, ICTP, Italy.
- “Trialities of minimally supersymmetric 2d gauge theories”, November 21, 2019, APCTP Workshop on Quantum Field Theory and String Theory, Pohang, South Korea.
- “Trialities of minimally supersymmetric 2d gauge theories”, December 12, 2019, ‘Tsinghua Seminar on Strings and Fields 2019’, Yau Mathematical Sciences Center, Tsinghua University, Beijing, China.
- “Supergroup Chern-Simons theory, q -series, and resurgence”, July 27, 2020, Conference ‘String-Math 2020’* [\[video\]](#).
- “3-manifolds and q -series”, December 11, 2020, Conference ‘Mathematical Physics Days 2020’* [\[video\]](#).
- “Holomorphic anomaly in Vafa-Witten theory”, December 28, 2020, 5th Iranian Mathematical Physics Workshop*.
- “Spin-cobordisms, surgery, and fermionic modular bootstrap”, July 2, 2021, Conference ‘Strings 2021’* [\[video\]](#).
- “Spin-cobordisms, surgery, and fermionic modular bootstrap”, September 6, 2021, Workshop ‘Topological properties of gauge theories and their applications to high-energy and condensed-matter physics’, GGI, Florence, Italy [\[video\]](#).
- “Unification of WRT and CGP invariants of 3-manifolds via BPS q -series”, March 25, 2022, Workshop ‘Recent Developments in Representation Theory and Mathematical Physics’, Mathematisches Forschungsinstitut Oberwolfach, Germany.
- “Non-semisimple TQFTs and BPS q -series”, June 28, 2022, workshop ‘New Trends in Non-Perturbative Gauge/String Theory and Integrability’, Institut de Mathématiques de Bourgogne, France.
- “CGP invariants of 3-manifolds and BPS q -series”, July 28, 2022, conference ‘Enumerative Invariants, Quantum Fields and String Theory Correspondences’, Institut Mittag-Leffler, Djursholm, Sweden
- “ $\mathbb{Q}/\mathbb{Z}$ symmetry”, September 14, 2022, workshop ‘Higher Symmetry and Quantum Field Theory’, Aspen Center for Physics, USA.
- “Non-semisimple TQFTs and BPS q -series”, October 3, 2022, conference ‘Field Theories and Vertex Algebras’, Lake Arrowhead, CA, USA.
- “Counting Solutions of Kapustin-Witten Equations on a Three-Manifold Times a Line from Physics Dualities”, October 27, 2022, workshop ‘New Four-Dimensional Gauge Theories’, MSRI, Berkeley, CA, USA [\[video\]](#).
- “Analytically continued Chern-Simons theory on plumbed 3-manifolds”, June 4, 2023, ‘Richmond Geometry Meeting’, VCU, Richmond, VA, USA.
- “Analytically continued Chern-Simons theory on plumbed 3-manifolds”, July 4, 2023, special session on ‘Quantum Chern-Simons Theory’ at 29th Nordic Congress of Mathematicians, Aalborg, Denmark.
- “ $\mathbb{Q}/\mathbb{Z}$ symmetry and non-invertible topological defects from mixed anomalies”, August 14, 2023, Workshop on Categorical aspects of symmetries, NORDITA, Stockholm, Sweden [\[video\]](#).
- “Stokes phenomenon in Chern-Simons theory”, February 7, 2024, Fields & Strings 2024, Moscow, Russia [\[video\]](#).
- “On p -form symmetries in functorial quantum field theory”, April 2, 2024, Workshop on Symmetries, Anomalies and Dynamics of Quantum Field Theory, Brussels, Belgium.
- “On p -form symmetries in functorial quantum field theory”, July 18, 2024, International Congress of Basic Science, BIMSA, China [\[video\]](#).
- “A categorification of Stokes coefficients in Chern-Simons theory on plumbed 3-manifolds”, January 16, 2025, Resurgence, wall-crossing and geometry, SwissMAP Research Station, Switzerland

- “Some relations between gauge theories with finite and continuous gauge groups”, June 12, 2025, Mini Workshop on QFTs and symmetries, Uppsala University, Sweden
- “An analogue of the volume conjecture for closed non-hyperbolic 3-manifolds”, July 14, 2025, International Congress of Basic Science, BIMS, China [\[video\]](#).
- “On quantum modularity of 3-manifold invariants”, July 24, 2025, workshop ‘Recent Developments in Logarithmic Conformal Field Theory’, BIRS, Canada*.
- “TQFT from the ground state”, March 11, 2026, workshop ‘Lattice Methods, TQFTs, and Symmetries’, Uppsala University, Sweden.
- “A relationship between topological gauge theories with finite and continuous gauge groups”, April 23, 2026, workshop ‘Low-dimensional Topology and Number Theory’, Mathematisches Forschungsinstitut Oberwolfach, Germany.
- “TQFT from the ground state”, May 21, 2026, workshop ‘Defects and Extended Excitations in Quantum Field Theory, Quantum Matter and Statistical Models’, Galileo Galilei Institute for Theoretical Physics, Florence, Italy [\[video\]](#).
- “From Multipartite Entanglement to TQFT”, June 11, 2026, ‘Huddle on Quantum Entanglement and Spacetime’, ICTP, Trieste, Italy.
- “Multipartite Entanglement in Fusion-Categorical Lattice Models”, August 24, 2026, conference ‘Physics and Mathematics of Generalized Symmetry in QFT’, Kavli IPMU, Kashiwa, Japan [\[video\]](#).

INVITED SEMINAR TALKS (FROM 2015)

- 2015: University of Geneva; Stanford; Aarhus University.
- 2016: Caltech; UT Austin; CCNY; Perimeter Institute [\[video\]](#); University of Amsterdam; UC Berkeley; Fudan University.
- 2017: University of Michigan; HSE Moscow; IST Austria; Aarhus University; ICTP.
- 2018: University of Alberta; Harvard University; Caltech; Weizmann Institute; Neve Shalom seminar; UC Santa Barbara.
- 2019: Uppsala University; Augsburger Mathematisches Kolloquium; ICTP Basic Notions Seminar.
- 2020: Oxford University*; Beijing Mathematical Physics seminar*; CMSA Harvard University* [\[video\]](#); ICTS (Bengaluru, India)* [\[video\]](#); Institut Mittag-Leffler; IST Lisbon*.
- 2021: Joint Heidelberg/Vienna/Munich seminar*.
- 2022: University of Amsterdam.
- 2023: UC Berkeley [\[video I\]](#) [\[video II\]](#); UK Symmetry Seminar* [\[video\]](#); Center for Quantum Mathematics (Denmark); University of Toulouse; LMU Munich.
- 2024: Institut Mittag-Leffler; SIMIS.
- 2025: Skoltech*; Quantum Theories of Fields, Matter, and Strings seminar* [\[video\]](#); TQFT Club (Lisbon)* [\[video\]](#); London Institute for Mathematical Sciences [\[video\]](#).
- 2026: Yau Mathematical Sciences Center, Tsinghua University (Beijing).

TEACHING EXPERIENCE

Regular courses:

- 2019, winter term, Algebraic Topology (Diploma Programme course). ICTP, Trieste.
- 2020, winter term, Algebraic Topology (Diploma Programme course). ICTP, Trieste.
- 2021, winter term, Algebraic Topology (Diploma Programme course). ICTP, Trieste [\[video\]](#).
- 2022, winter term, Algebraic Topology (Diploma Programme course). ICTP, Trieste.
- 2022, fall term, Quantum Field Theory I (Diploma Programme course). ICTP, Trieste.
- 2024, winter term, Algebraic Topology (Diploma Programme course). ICTP, Trieste.
- 2026, spring term, Algebraic Topology (Diploma Programme course). ICTP, Trieste.

Teaching assistance:

- 2009, spring term, teaching assistant, General Mathematics, Laboratory of mathematical programming, University of Geneva.
- 2009, fall term, Statistical Mechanics, University of Geneva.

- 2010, spring term, Laboratory of mathematical programming, University of Geneva.
- 2010, fall term, Complex Analysis, University of Geneva.
- 2011, spring term, Laboratory of mathematical programming, University of Geneva.
- 2011, fall term, Analysis, University of Geneva.
- 2012, spring term, Topology and Geometry of Manifolds, University of Geneva.

Invited mini-courses:

- 2006, June, “Path Integral” (for undergraduate students), ITP, Kiev.
- 2008, May, “Path Integral” (for undergraduate students), 7th International School ITP-ITEP on Theoretical and Mathematical Physics, May 2-9, 2008, Kiev.
- 2018, January, “Topological strings and Chern-Simons theory”, 3rd school on string theory, integrable models and representation theory, Moscow [\[video\]](#).
- 2018, July, “BPS spectra and 3-manifold invariants”, CQ3MI Summer School and Workshop, USC, Los Angeles, USA.
- 2019, April, “Vertex operator algebras and 4-manifolds”, Graduate school ‘Chiral Algebras for the 21st Century’, UC Davis, USA.
- 2019, July, “TQFTs, knots and BPS states”, PCMI Graduate Summer School, Park City, USA [\[video\]](#).
- 2019, September, “Invariants of manifolds from 6 dimensions”, ‘School and Workshop on Gauge Theories and Differential Invariants’, ICTP, Italy [\[video\]](#)
- 2020, August, “Three avatars of Mock Modularity (Part II)”, ‘Summer School on Superstring Theory and Related Topics’, ICTP, Italy*.
- 2020, November, “Knots, 3-manifolds and their invariants”, ISMC, Saint Petersburg State University* [\[video\]](#).
- 2024, May, “Algebraic Topology in Physics”, Physics Latam [\[video\]](#)
- 2025, July, “Chern-Simons theory and relation to 3D quantum gravity”, PhD School on ‘Modern Methods in Quantum Gravity and Cosmology’, Bucharest – Magurele, Romania.

Master-level student supervision:

- 2019: Monica Lucia Cabria Zambrano (ICTP MATH Diploma); Ri Song Jin (ICTP MATH Diploma).
- 2020: Jaiver José Murgas Ibarra (ICTP MATH Diploma); Maria Azam (ICTP MATH Diploma); Osama Khlaif (ICTP HECAP Diploma).
- 2021: Muhammad Shoaib Khan (International Mathematics Master, Pakistan); Danial Hussain (International Mathematics Master, Pakistan); Junaid Razzaq (ICTP MATH Diploma); Younes Benyahia (ICTP MATH Diploma).
- 2022: Bertan Keleş (ICTP HECAP Diploma); Johann Sebastian Quenta Raygada (ICTP HECAP Diploma).
- 2023: Nicola Aladrah (ICTP HECAP Diploma); Nada Eissa (ICTP HECAP Diploma); Mohamed Salaheldeen (ICTP HECAP Diploma); Manuel Furlan (University of Trieste, Master in Physics); Niccolò Porciani (Scuola Normale Superiore, Pisa, Master in Physics).
- 2024: Huzaifa Arshad (ICTP HECAP Diploma); Muhammad Awais (ICTP MATH Diploma); Anis Bousclet (ICTP MATH Diploma); Julian Alberto Alzate Cardenas (ICTP MATH Diploma).
- 2025: Jimmy Rosales Ventocilla (ICTP HECAP Diploma); Qusai Yousef (ICTP HECAP Diploma); Qasim Mahmood Raja (ICTP MATH Diploma).
- 2026: Rashid Talha (ICTP MATH Diploma); Munawar Khan (ICTP MATH Diploma); Mohamed Khas (ICTP HECAP Diploma).

PhD student supervision:

- 2019 – 2022, Andrea Grigoletto (SISSA, Trieste), PhD Thesis “Spin-cobordisms and fermionic $d = 2$ anomalies”.
- 2020 – 2023, Ri Song Jin (ICTP/SISSA, Trieste), PhD Thesis “Topological Invariants of Plumbed 3-Manifolds”.
- 2023 – 2026, Ayush Singh (SISSA, Trieste), PhD Thesis “Modularity and Quantum Invariants of 3-Manifolds”.
- 2023 – 2026, Thomas Nicosanti (SISSA, Trieste), PhD Thesis “Topological Quantum Field Theories: gravity and finite group gauge theories”.
- 2024 – ..., Johann Sebastian Quenta Raygada (ICTP/SISSA, Trieste).

SERVICE

- Organizer of Caltech theory group informal seminar, 2013–2014.
- Journal referee: Journal of High Energy Physics, Communications in Mathematical Physics, Communications in Number Theory and Physics, Letters in Mathematical Physics, Nuclear Physics B, Annals of Physics, Annales Henri Poincaré, Computer Physics Communications, Journal of Mathematical Physics, Physics Letters B, Journal of Physics A: Mathematical and Theoretical, SciPost, Quantum Topology, Advances in Theoretical and Mathematical Physics, SIGMA, Journal of Knot Theory and Its Ramifications, Physical Review Research.
- Governing board, ICTP/SISSA Institute for Geometry and Physics, 2018–2022.
- Organizer of the workshop “New Pathways in Explorations of Quantum Field Theory and Quantum Gravity Beyond Supersymmetry”, June 2019, ICTP, Trieste, Italy.
- Organizer of the “Summer School on Superstring Theory and Related Topics”, August 2020, ICTP, Trieste, Italy*.
- Organizer of “School on Superstring Theory and Related Topics”, October 2021, ICTP, Trieste, Italy*.
- Organizer of workshop “Generalized Cohomology and Physics”, November 2021, ICTP, Trieste, Italy**.
- Organizer of “Learning Workshop on BPS states and 3-manifolds”, February 2022, ICTP, Trieste, Italy.
- Organizer of “Spring School on Superstring Theory and Related Topics”, May 2022, ICTP, Trieste, Italy**.
- Organizer of “Spring School on Superstring Theory and Related Topics”, April 2023, ICTP, Trieste, Italy.
- Organizer of “Spring School on Superstring Theory and Related Topics”, April 2024, ICTP, Trieste, Italy.
- Organizer of “String-Math 2024”, June 2024, ICTP, Trieste, Italy.
- Organizer of “School & Workshop on Number Theory and Physics”, June 2024, ICTP, Trieste, Italy.
- Organizer of “Conference on Recent Developments in Topological Quantum Field Theory”, September 2024, BIMSA, Beijing, China.
- Organizer of “Spring School on Superstring Theory and Related Topics”, March 2025, ICTP, Trieste, Italy.
- Organizer of “Summer School on Modern Tools in Low-Dimensional Topology” & “Conference on Modern Developments in Low-Dimensional Topology”, June 2025, ICTP, Trieste, Italy.
- Organizer of “Spring School on Superstring Theory and Related Topics”, March 2026, ICTP, Trieste, Italy.
- Coordinator of ICTP Mathematics Diploma Programme, 2026 – ...
- Member of ICTP Faculty Board, 2026 – ...

* Online events. ** Hybrid online/in-person events.

LANGUAGES

- Natural: Russian (native), English (fluent), French (intermediate), Italian (intermediate).
- Programming: Mathematica, C/C++, Python, R, Maple, Matlab.