Sokratis Trifinopoulos

CERN Department of Theoretical Physics
Office: 4/1-030
CH-1211 Geneva 23, Switzerland
sokratis.trifinopoulos@cern.ch, trifinos@mit.edu
strifinopoulos.github.io
orcid.org/0000-0002-0492-1144
inspirehep.net/authors/177884

Academic Positions

2025 Jun-present — **CERN**, Department of Theoretical Physics, Geneva, Switzerland
- **Scientific Associate**, Advisor: Prof. Dr. Gian Francesco Giudice

2022 Jun-2025 May — **Massachusetts Institute of Technology (MIT)**, Center of Theoretical Physics & Institute of Artificial Intelligence and Fundamental Interactions, Cambridge, USA
- **Postdoctoral Fellow**, Advisor: Prof. Dr. Jesse Thaler

2020 Oct - 2022 May — **Scuola Internazionale Superiore di Studi Avanzati (SISSA)**, Department of Physics, Trieste, Italy
- **Postdoctoral Fellow**, Advisor: Dr. David Marzocca

Education

2016 Dec - 2020 Sep — **Universität Zürich**, Zürich, Switzerland
- **Ph.D. in Physics**, Advisor: Prof. Dr. Gino Isidori

2015 Feb - 2016 Nov — **Eidgenössische Technische Universität Zürich (ETH)**, Zürich, Switzerland
- **M.Sc. in Physics**, Advisor: Prof. Dr. Gino Isidori

2011 Oct - 2014 Sep — **Technische Universität Dortmund**, Dortmund, Germany
- **B.Sc. in Physics**, Advisor: Prof. Dr. Emmanuel A. Paschos

Awards and Grants

2023 — **SNSF Return Grant** (PZ00P2_223581), Switzerland

2022 — **SNSF Postdoc.Mobility Grant** (P500PT_203156), Switzerland

2020 — **INFN Assegno di Ricerca Fellowship** (2017L5W2PT), Italy

2018 — **Invisibles Plus Exchange Scholarship**, Lawrence Berkeley Lab, USA

2016 — **ETH & TokyoTech Exchange Scholarship**, Tokyo, Japan

2016 — **Global Essay Competition Finalist**, 46th St. Gallen Symposium, Switzerland

Continuing Education

2024 Feb — **Brookhaven National Lab**, EIC Visitor program, Upton, USA

2023 Jun — **Jefferson Lab**, Quantum Computing Bootcamp, Newport News, USA

2022 Aug — **IAIFI**, Summer school & Workshop, Cambridge, USA

2020 Aug — **EPFL**, Machine Learning in High Energy Physics, Geneva, Switzerland (online)

2018 May — **Higgs Centre for Theoretical Physics**, Edinburgh, United Kingdom

2017 Jul **Institute for Advanced Study**, Prospects in High Energy Physics, Princeton, USA

Teaching Experience

2024 August **Tutorial Leader**, IAIFI Summer School
- Representation/Manifold Learning (Prof. M. Weber)

2019 Fall **Teaching assistant**, Universität Zürich

2019 Spring
- Quantum Field Theory III (Prof. G. Isidori)

2018 Fall
- Advanced Field Theory (Dr. Lazopoulos)

2018 Spring
- Quantum Field Theory I (Prof. A. Gehrmann-De Ridder),

2017 Fall
- Quantum Mechanics II (Prof. A. Signer)

2017 Spring
- General Relativity (Prof. G. M. Graf)
- Quantum Field Theory II (Prof. N. Beisert)

2019 Fall **Replacement lecturer**, Universität Zürich

2018 Spring
- Quantum Field Theory III (Prof. G. Isidori)

2015
- Quantum Mechanics II (Prof. A. Signer)

2015-2016 **Seminar for Didactics**, ETH Department of Education and Technology

Teaching assistant, ETH, undergraduate courses

Mentoring

Graduate student research advisor

2025-present
- Thomas Drischoll (U. of Oregon)

2024-present
- Kate Richardson (MIT)

2024-present
- Chaja Baruch (Technion)

2023-present
- Ta'el Coren (Technion)

2023-2025
- Sean Benevedes (MIT)

2023-present
- Pamela Pajarillo (MIT)

2022
- Miguel Vanvlasselaer (SISSA, now: PostDoc at Brussels U., IIHE)

Undegraduate student research advisor

2025-present
- Dylan Perez (Caltech)

2025-present
- Angelos Sirbou (University of Crete)

2023-present
- Victor Samuel Pérez Díaz (Universidad del Rosario, now: Ph.D. at NYU)

2023
- Sabina Tomasicchio (U. of Seville; now Ph.D. at University of Massachusetts Amherst)

2023 Jun-Oct
- Alicia Mand (U. of Wisconsin-Madison, Ph.D. at U. of Wisconsin Madison)

2023-2024
- Dhruv Kumar (IIT Guwahati, now: Intern at CADSL IIT Bombay)

2023 Jun-Oct
- Acchhyut Jolly (BITS Pilani)

2023 Jun-Oct
- Soham Sanyashiv (IISER Kolkata, now: Intern at TIFR, Mumbai)

2023 Jun-Oct
- Gokhula Prasad (The American College, Madurai, now: Ph.D. at NIT Tiruchirappalli)

2023 Jun-Oct
- Abhay Singh Rawat (HNBGU, now: Ph.D. at HNBGU)

2016 **International Baccalaureate Diploma tutor**

- Dustin Fichmann (United World College Costa Rica, now: Scientist at World Data Lab)

Conference and Workshop Talks

2025 Sep **Invited workshop plenary talk:** CERN TH Institute on Quantum Simulation & Computation in High-Energy Physics, Geneva, Switzerland

2025 Aug **Invited workshop plenary talk:** IAIFI Summer Workshop, Cambridge, USA

2025 Aug **Conference Talk:** Black Holes & Cosmology, Reykjavík, Iceland

2025 Apr **Invited conference plenary talk:** Quantum Observables for Collider Physics, Florence, Italy

2025 Mar **Conference talk:** Empowering the New Vision in High Energy Physics, Aspen, USA

2025 Mar **Invited conference plenary talk:** Moriond Electroweak Interactions & Unified Theories, La Thuile, Italy

2025 Feb **Invited conference plenary talk:** KEK Theory Meeting, Tsukuba, Japan

2024 Nov **Invited conference talk:** Uncovering New Laws of Nature at EIC, Upton, USA

2024 Aug **Conference talk:** XVIth Quark Confinement and the Hadron Spectrum, Cairns, Australia

2024 Aug **Invited conference speaker:** Light Dark World, Daejeon, Korea

2024 Jul **Machine Learning conference poster**: ICML2024, Vienna, Austria

2024 Jun **Invited workshop talk:** SynCRETism 2024, Rethymno, Greece

2024 Jun **Invited workshop talk:** Worskshop on PBHs, MIT LIGO Lab, Cambridge, USA

2024 Mar **Invited conference plenary talk:** Black Holes & Cosmology, Nassau, Bahamas

2023 Dec **Invited workshop talk:** Xmas Theoretical Physics Workshop, Athens, Greece

2023 Aug **Invited workshop talk:** Invisibles Workshop, Göttingen, Germany

2023 Mar **Machine Learning conference poster:** AI for Science, Chicago

2023 Mar **Invited conference talk**: LISHEP2023, Rio de Janeiro, Brazil

2022 Nov Workshop participant: ML4Jets2022, New Jersey, USA

2022 Aug **Conference talk:** Vietnam Flavour Physics Conference, Quy Nhon, Vietnam

2021 Sep **Workshop talk:** Workshop on the Standard Model and Beyond, Corfu, Greece

2021 Jun **Workshop talk:** Workshop on Axions WIMPs and WISPs, Patras, Greece

2021 Aug **Conference talk:** SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Beijing, China

2020 Mar **Conference talk:** La Thuile, Aosta Valley, Italy; canceled

2019 Jun **Conference talk:** PLANCK International Conference from the Planck Scale to the Electroweak Scale, Granada, Spain

2019 May **Conference talk:** SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Corpus Christi, USA

2017 Dec **Conference talk:** SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Mumbai, India

2017 Feb **Workshop talk:** PRISMA Symposium "A Matter of Flavor", Mainz, Germany

Invited Seminar Talks & Colloquia

2026 Sep	Queen Mary University of London, London, UK
2026 Sep	University of Oxford, Oxford, UK
2025 Jun	University of Crete, Heraklion, Greece (Colloquium)
2025 May	Kavli Institute for Cosmological Physics, Chicago, Illinois
2025 May	Northwestern University, Evanston, Illinois
2025 Apr	Indian Institute of Science, Bangalore, India (online)
2025 Feb	Chinese Academy of Sciences, Beijing, China
2025 Jan	Kavli IPMU, Kashiwa, Japan
2025 Jan	University of Tokyo, Tokyo, Japan
2025 Jan	Lawrence Berkeley National Laboratory, Berkeley, USA
2024 Dec	UC San Diego, San Diego, USA
2024 Mar	University of Melbourne, Melbourne, Australia
2024 Feb	Argonne National Laboratory, Lermont, USA
2024 Jan	Brookhaven National Laboratory, Upton, USA
2023 Dec	UC Berkeley, Berkeley, USA
2023 Oct	Vrije Universiteit Brussel, Brussels, Belgium
2023 Mar	Chinese Academy of Sciences, Beijing, China (online)
2023 Mar	Majorana-Raychaudhuri Seminars Series (online)
2023 Mar	Technion, Haifa, Israel
2023 Jan	University of Chicago, Chicago, USA
2022 Sep	Technion, Haifa, Israel
2019 Sep	MIT, Cambridge, USA
2019 Sep	FermiLab, Batavia, USA
2019 Sep	Cornell, Ithaca, USA
2019 Aug	Lawrence Berkeley National Laboratory, Berkeley, USA
2019 Aug	UC Santa Cruz, Santa Cruz, USA

Academic Service and Scientific Societies

2025-present	**Lead Conference Organizer:** Quantum Observables for Collider Physics 2026, CERN
2025-present	**Member:** European Astrophysical Society
2025-present	**Member:** Greek Astrophysical Society
2023-2024	**School & Workshop Organizer**: IAIFI Summer School & Workshop 2024
2019-present	**Journal referee:** Physical Review Letters, Physical Review A, Physical Review D, European Physical Journal C, Physical Letters B
2023-present	**ML Conference referee:** NeurIPS, ICML
2018 Jan	**Workshop organizer:** Zurich Phenomenology Workshop

2018-2019	**Organizer:** Theoretical Physics Journal Club of Zürich

Public Outreach

2025-present	**Outreach volunteer:** CERN guide in the Science Gateway (under training)
2022-2025	**Committee member**: Organizer and representative of the public outreach events of IAIFI
2023 Oct	**Public lecture**: "Spot the Difference: AI vs Reality in Physics", Cambridge Science Festival, Cambridge, USA
2023 Aug	**Public lecture:** "The Interplay between Physics and Artificial Intelligence", Museum of Science of Boston, Boston, USA
2023 Jul	**Public lecture:** "Machine Learning Application to Physics", Remote Experience for Young Researchers, Berkeley, USA
2023 Jun	**Invited industry talk:** "AI technologies: the new frontier", Industry Seminar FONTIS Beratung, Zürich, Switzerland

Languages

English (fluent), German (fluent), Greek (native).

Coding

Languages	C++, Python, Mathematica.
Packages	Madgraph5, Pythia8, Delphes3, FastJet3, MicroOMEGAs, MontePython, COLOSSUS, CLASS, PTArcade, CosmoLattice, OriginPro, Python libraries (Pytorch, Numpy, SciPy, scikit-learn, Pandas, PySR etc.), wandb.ai, Slurm.

Publications in Peer-Review Journals

23. "Implications for Pulsar Timing Arrays of Sub-solar Black Hole Detections: From LVK to Einstein Telescope and Cosmic Explorer". Y. Gouttenoire, **S. Trifinopoulos,** M. Vanvlasselaer, submitted in JCAP • arXiv: 2508.19328 [astro-ph]

22. "Spin versus Magic: Lessons from Gluon and Graviton Scattering". J. Gargalionis, N. Moynihan, **S. Trifinopoulos,** E. N. V. Wallace, C. D. White, and M. J. White, submitted in PRD • arXiv: 2508.14967 [hep-th, quant-ph]

21. "The DNA of nuclear models: How AI predicts nuclear masses". K. A. Richardson, **S. Trifinopoulos**, M. Williams, submitted in PRL • arXiv: 2508.04767 [nucl-th, cs.ai]

20. "Effective Field Theory Constraints on Primordial Black Holes from the High-Redshift Lyman-α Forest". M. M. Ivanov, **S. Trifinopoulos**, submitted in PRL • arXiv: 2508.04767 [astro-ph]

19. "Searching for exotic scalars at fusion reactors". C. Baruch, P. J. Fitzpatrick, T. Menzo, Y. Soreq, **S. Trifinopoulos**, J. Zupan, submitted in JHEP • arXiv: 2502.12314 [hep-ph]

18. "New Physics at the Muon (Synchrotron) Ion Collider: MuSIC for several scales". H. Davoudiasl, H. Liu, R. Marcarelli, Y. Soreq, **S. Trifinopoulos**, JHEP 03 (2025) 046 • arXiv: 2412.13289 [hep-ph]

17. "Flavor Patterns of Fundamental Particles from Quantum Entanglement?". J. Thaler, **S. Trifinopoulos**, Phys.Rev.D 111 (2025) 5, 056021 • arXiv: 2408.10297 [hep-ph, quant-ph]

16. "Spontaneous symmetry breaking, gauge hierarchy and electroweak vacuum metastability". S. Benevedes, T. Steingasser, **S. Trifinopoulos**, Phys.Rev.D 110 (2024) 7, 075019 • arXiv: 2408.10297 [hep-ph, astro-ph]

15. "From Neurons to Neutrons: A Case Study in Interpretability". O. Kitouni, N. Nolte, V. S. Pérez-Díaz, **S. Trifinopoulos**, M. Williams, ICML 2024 • arXiv:2405.17425 [cs.lg, nucl-th]

14. "Scrutinizing the Primordial Black Holes Interpretation of PTA Gravitational Waves and JWST Early Galaxies". Y. Gouttenoire, **S. Trifinopoulos**, G. Valogiannis, M. Vanvlasselaer, Phys.Rev.D 109 (2024) 12, 123002 • arXiv: 2307.01457 [astro-ph]

13. "LePDF: Standard Model PDFs for High-Energy Lepton Colliders". F. Garosi, D. Marzocca, **S. Trifinopoulos**, JHEP 09 (2023) 107 • arXiv: 2303.16964 [hep-ph]

12. "Cabibbo angle anomalies and oblique corrections: The remarkable role of the vectorlike quark doublet". B. Belfatto, **S. Trifinopoulos**, Phys.Rev.D 108 (2023) 3, 035022 • arXiv: 2302.14097 [hep-ph]

11. "Attracting the Electroweak Scale to a Tachyonic Trap". **S. Trifinopoulos**, M. Vanvlasselaer Phys.Rev.D 107 (2023) 7, L071701 • arXiv: 2210.13484 [hep-ph]

10. "New physics in b → sμμ: FCC-hh or a muon collider?" A. Azatov, F. Garosi, A. Greljo, D. Marzocca, J. Salko, **S. Trifinopoulos**, JHEP 08 (2022) 208 • arXiv: 2205.13552 [hep-ph, hep-ex]

9. "Radiative effects in the scalar sector of vector leptoquark models". R. Houtz, J. Pagès, **S. Trifinopoulos**, JHEP 08 (2022) 208 • arXiv: 2204.06440 [hep-ph]

8. "Displaced searches for light vector bosons at Belle II". T. Bandyopadhyay, S. Chakraborty, **S. Trifinopoulos**, JHEP 05 (2022) 141 • arXiv: 2203.03280 [hep-ph]

7. "Collider signatures of coannihilating dark matter in light of the B-physics anomalies". M.J. Baker, D. A. Faroughy, **S. Trifinopoulos**, Phys. Rev. D 100, 115022 (2021) • arXiv: 2109.08689 [hep-ph]

6. "From B-meson anomalies to Kaon physics with scalar leptoquarks". D. Marzocca, **S. Trifinopoulos**, E. Venturini, Phys. Rev. D 100, 115022 (2021) • arXiv: 2106.15630 [hep-ph]

5. "Minimal Explanation of Flavor Anomalies: B-Meson Decays, Muon Magnetic Moment, and the Cabibbo Angle". D. Marzocca, **S. Trifinopoulos**, Phys. Phys.Rev.Lett. 127 (2021) 6, 2021 • arXiv: 2104.05730 [hep-ph]

4. "Exploring the flavour structure of the high-scale MSSM". G. Isidori, **S. Trifinopoulos**, Eur.Phys.J.C 80 (2020) • arXiv: 1912.09940 [hep-ph]

3. "B-physics anomalies: The bridge between R-parity violating Supersymmetry and flavoured Dark Matter". **S. Trifinopoulos**, Phys. Rev. D 100, 115022 (2019) • arXiv: 1904.12940 [hep-ph]

2. "Revisiting R-parity violating interactions as an explanation of the B-physics anomalies". **S. Trifinopoulos**, Eur.Phys.J. C78 (2018) no.10, 803 • arXiv:1: 1807.01638 [hep-ph]

1. "Semileptonic *B*-physics anomalies: A general EFT analysis within $U(2)^n$ flavor symmetry". M. Bordone, G. Isidori, **S. Trifinopoulos**, Phys.Rev.D 96 (2017) 1, 015038 • arXiv:1: 1702.07238 [hep-ph]

Large-Collaboration Publications & White Papers

9. "The Muon Collider". C. Accettura et al (incl. **S. Trifinopoulos**) • arXiv: 2504.21417 [physics.acc-ph]

8. "Quantum Information meets High-Energy Physics: Input to the update of the European Strategy for Particle Physics" Y. Afik et al (incl. **S. Trifinopoulos**), Eur. Phys. J. Plus 140, 855 (2025); • arXiv: 2504.00086 [hep-ph]

7. "Interim report for the International Muon Collider Collaboration (IMCC)". C. Accettura et al (incl. **S. Trifinopoulos**) • arXiv: 2407.12450 [physics.acc-ph]

6. "Towards a Muon Collider". C. Accettura et al (incl. **S. Trifinopoulos**), Eur.Phys.J.C 83 (2023) 9, 864 • arXiv: 2303.08533 [physics.acc-ph]

5. "Simulated Detector Performance at the Muon Collider". Muon Collider Collaboration (incl. **S. Trifinopoulos**), Contribution to Snowmass 2021 • arXiv: 2203.07964 [hep-ex]

4. "A Muon Collider Facility for Physics Discovery". Muon Collider Collaboration (incl. **S. Trifinopoulos**), Contribution to Snowmass 2021 • arXiv: 2203.08033 [physics.acc-ph]

3. “Promising Technologies and R&D Directions for the Future Muon Collider Detectors”. Muon Collider Collaboration (incl. **S. Trifinopoulos**), Contribution to Snowmass 2021 • arXiv: 2203.07224 [physics.ins-det]

2. “Muon Collider Physics Summary”. C. Aime et al (incl. **S. Trifinopoulos**), Contribution to Snowmass 2021 • arXiv: 2203.07256 [hep-ph]

1. “The physics case of a 3 TeV muon collider stage”. Muon Collider Collaboration (incl. **S. Trifinopoulos**), Contribution to Snowmass 2021 • arXiv: 2203.07261 [hep-ph]

Workshop publications and proceedings

4. “r-process Nucleosynthesis: Identifying the significant nuclear properties”. S. G. Tomasicchio, **S. Trifinopoulos**, 2023 REYES Proceedings (https://digitalcommons.odu.edu/reyes-2023/)

3. “NuDyCLR: Nuclear Dynamic Co-Learned Representations”. V. S. Pérez-Diaz, **S. Trifinopoulos**, 2023 REYES Proceedings (https://digitalcommons.odu.edu/reyes-2023/)

2. “NuCLR: Nuclear Co-Learned Representations”. O. Kitouni, N. Nolte, **S. Trifinopoulos**, S. Kantamneni, M. Williams, accepted after peer review at ICML 2023 “1st workshop on Synergy of Scientific and Machine Learning Modeling” (SynS & ML) • arXiv: 2306.06099 [nucl-th, cs.lg]

1. “Explaining the Flavour Anomalies with Heavy Scalars”. **S. Trifinopoulos**, PoS CORFU2021 (2022) 052 • arXiv: 2203.09624 [hep-ph]