

Sokratis Trifinopoulos

MIT Center of Theoretical Physics
Institute for Artificial Intelligence and Fundamental
Interactions (IAIFI)
77 Massachusetts Avenue
Cambridge, MA 02139, USA
✉ trifinos@mit.edu | 🌐 strifinopoulos.github.io
ID orcid.org/0000-0002-0492-1144

Academic Positions

- 2022-present **Massachusetts Institute of Technology**, Center of Theoretical Physics & Institute of Artificial Intelligence and Fundamental Interactions, Cambridge, USA
- **Postdoctoral Fellow**, Advisor: Prof. Dr. Jesse Thaler
- 2020-2022 **Scuola Internazionale Superiore di Studi Avanzati**, Department of Physics, Trieste, Italy
- **Postdoctoral Fellow**, Advisor: Dr. David Marzocca

Education

- 2016-2020 **Universität Zürich**, Zürich, Switzerland
- **Ph.D. in Physics**, Advisor: Prof. Dr. Gino Isidori
- 2015-2016 **Eidgenössische Technische Universität Zürich**, Zürich, Switzerland
- **M.Sc. in Physics**, Advisor: Prof. Dr. Gino Isidori
- 2011-2014 **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

- 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, USA
- 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

Tutorial Leader, IAIFI Summer School

- 2024 August ○ Representation/Manifold Learning (Prof. M. Weber)

Teaching assistant, Universität Zürich

- 2019 Fall ○ Quantum Field Theory III (Prof. G. Isidori)
2019 Spring ○ Advanced Field Theory (Dr. Lazopoulos)
2018 Fall ○ Quantum Field Theory I (Prof. A. Gehrmann-De Ridder),
2018 Spring ○ Quantum Mechanics II (Prof. A. Signer)
2017 Fall ○ General Relativity (Prof. G. M. Graf)
2017 Spring ○ Quantum Field Theory II (Prof. N. Beisert)

Replacement lecturer, Universität Zürich

- 2019 Fall ○ Quantum Field Theory III (Prof. G. Isidori)
2018 Spring ○ Quantum Mechanics II (Prof. A. Signer)

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

- 2015-2016 **Teaching assistant**, ETH, undergraduate courses

Mentoring

Ph.D. student research advisor

- 2024-present ○ Noah Wolfe (MIT)
2024-present ○ Kate Richardson (MIT)
2024-present ○ Chaja Baruch (Technion)
2023-present ○ Ta'el Coren (Technion)
2023-present ○ Sean Benevedes (MIT)
2023-present ○ Pamela Pajarillo (MIT)
2022 ○ Miguel Vanvlasselaer (SISSA)

M.Sc. student research advisor

- 2023-present ○ Victor Samuel Pérez Díaz (Universidad del Rosario, now: Ph.D. at NY University)
2023 ○ Sabina Tomasicchio (University of Seville)
2023 Jun-Oct ○ Alicia Mand (University of Wisconsin-Madison)
2023-2024 ○ Dhruv Kumar (IIT Guwahati)
2023 Jun-Oct ○ Acchhyut Jolly (BITS Pilani)
2023 Jun-Oct ○ Soham Sanyashiv (IISER Kolkata)
2023 Jun-Oct ○ Gokhula Prasad (The American College, Madurai)
2023 Jun-Oct ○ Abhay Singh Rawat (HNBGU)

International Baccalaureate Diploma tutor

- 2016 ○ Dustin Fichmann (United World College Costa Rica)

Conference and Workshop Talks

2024 Nov	Invited conference speaker: Uncovering New Laws of Nature at EIC, BNL, USA
2024 Aug	Conference speaker: XVIth Quark Confinement and the Hadron Spectrum, Cairns, Australia
2024 Aug	Invited conference speaker: Light Dark World, Daejeon, Korea
2024 Jul	Conference participant: ICML2024, Vienna, Austria
2024 Jun	Invited workshop speaker: SynCRETism 2024, Rethymno, Greece
2024 Jun	Invited workshop speaker: Workshop on PBHs, MIT LIGO Lab, Cambridge, USA
2024 Jun	Invited conference speaker: Large Hadron Collider Physics, Boston, USA; declined
2024 Mar	Invited conference planary speaker: Black Holes & Cosmology, Nassau, Bahamas
2023 Dec	Invited workshop speaker: Xmas Theoretical Physics Workshop, Athens, Greece
2023 Aug	Invited workshop speaker: Invisibles Workshop, Göttingen, Germany
2023 May	Invited conference speaker: LHCP2023, Belgrade, Serbia; declined
2023 Mar	Conference poster presenter: AI for Science, Chicago
2023 Mar	Invited conference speaker: LISHEP2023, Rio de Janeiro, Brazil
2022 Nov	Workshop participant: ML4Jets2022, New Jersey, USA
2022 Aug	Invited conference speaker: Vietnam Flavour Physics Conference, Quy Nhon, Vietnam
2021 Sep	Invited workshop speaker: Workshop on the Standard Model and Beyond, Corfu, Greece
2021 Jun	Workshop speaker: Workshop on Axions WIMPs and WISPs, Patras, Greece
2021 Aug	Conference speaker: SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Beijing, China
2020 Mar	Invited conference speaker: La Thuile, Aosta Valley, Italy; canceled
2019 Jun	Conference speaker: PLANCK International Conference from the Planck Scale to the Electroweak Scale, Granada, Spain
2019 May	Conference speaker: SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Corpus Christi, USA
2018 Jan	Workshop participant: Zurich Phenomenology Workshop
2017 Dec	Conference speaker: SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Mumbai, India
2017 Feb	Workshop speaker: PRISMA Symposium "A Matter of Flavor", Mainz, Germany

Invited Seminar Talks

2024 Nov	University of Crete, Heraklion, Greece (online)
2024 Sep	University of Melbourne, Melbourne, Australia
2024 Mar	Argonne National Laboratory, Lermont, USA
2024 Feb	Brookhaven National Laboratory, Upton, USA
2024 Jan	UC Berkeley, Berkeley, USA
2023 Dec	Vrije Universiteit Brussel, Brussels, Belgium
2023 Oct	Chinese Academy of Sciences (online)
2023 Mar	Majorana-Raychaudhuri Seminars Series (online)

2023 Mar	Technion, Haifa, Israel
2023 Mar	University of Chicago, Chicago, USA
2023 Jan	Technion, Haifa, Israel
2022 Sep	MIT, Cambridge, USA
2019 Sep	FermiLab, Batavia, USA
2019 Sep	Cornell, Ithaca, USA
2019 Sep	Lawrence Berkeley National Laboratory, Berkeley, USA
2019 Aug	UC Santa Cruz, Santa Cruz, USA

Academic Service

2023-2024	School Organizer: IAIFI Summer School & Workshop 2024
2019-present	Journal referee: Physical Review Letters, Physical Review D, European Physical Journal C, Physical Letters B
2023-present	Workshop referee: NeurIPS, ICML
2018 Jan	Workshop organizer: Zurich Phenomenology Workshop
2018-2019	Organizer: Theoretical Physics Journal Club of Zürich

Public Outreach

2022-present	Committee member: Organizer and representative of the public outreach events of IAIFI
2023 Oct	Public lecturer: “Spot the Difference: AI vs Reality in Physics”, Cambridge Science Festival, Cambridge, USA
2023 Aug	Public lecturer: “The Interplay between Physics and Artificial Intelligence”, Museum of Science of Boston, Boston, USA
2023 Jul	Invited speaker: “Machine Learning Application to Physics”, Remote Experience for Young Researchers, Berkeley, USA
2023 Jun	Invited speaker: “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, CosmoLattice, OriginPro, Python libraries (Pytorch, Numpy, SciPy, scikit-learn, Pandas, PySR etc.), wandb.ai, Slurm.

Publications in Peer-Review Journals

17. “Flavor Patterns of Fundamental Particles from Quantum Entanglement?”. J. Thaler, **S. Trifinopoulos**, submitted to PRX • 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 [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 $b \rightarrow s\mu\mu$: 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

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