

# Sokratis Trifinopoulos

MIT Center of Theoretical Physics  
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Interactions (IAIFI)  
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## 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**, 46<sup>th</sup> 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

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## 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

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## 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)

### Undergraduate student research advisor

- 2025-present ○ Dylan Perez (Caltech)
- 2023-present ○ Victor Samuel Pérez Díaz (Universidad del Rosario, now: Ph.D. at NYU)
- 2023 ○ Sabina Tomasicchio (U. of Seville)
- 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)

### International Baccalaureate Diploma tutor

- 2016 ○ Dustin Fichmann (United World College Costa Rica, now: Scientist at World Data Lab)

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## Conference and Workshop Talks

2025 Jun	<b><u>Invited</u> workshop talk:</b> HES scattering workshop, Crete, Greece
2025 Apr	<b><u>Invited</u> conference plenary talk:</b> Quantum Observables for Collider Physics, Florence, Italy
2025 Mar	<b>Conference talk:</b> Empowering the New Vision in High Energy Physics, Aspen, USA
2025 Mar	<b><u>Invited</u> conference plenary talk:</b> Moriond Electroweak Interactions & Unified Theories, La Thuile, Italy
2025 Feb	<b><u>Invited</u> conference plenary talk:</b> KEK Theory Meeting, Tsukuba, Japan
2024 Nov	<b><u>Invited</u> conference talk:</b> Uncovering New Laws of Nature at EIC, BNL, USA
2024 Aug	<b>Conference talk:</b> XVIth Quark Confinement and the Hadron Spectrum, Cairns, Australia
2024 Aug	<b><u>Invited</u> conference speaker:</b> Light Dark World, Daejeon, Korea
2024 Jul	<b>Conference poster:</b> ICML2024, Vienna, Austria
2024 Jun	<b><u>Invited</u> workshop talk:</b> SynCRETism 2024, Rethymno, Greece
2024 Jun	<b><u>Invited</u> workshop talk:</b> Workshop on PBHs, MIT LIGO Lab, Cambridge, USA
2024 Mar	<b><u>Invited</u> conference plenary talk:</b> Black Holes & Cosmology, Nassau, Bahamas
2023 Dec	<b><u>Invited</u> workshop talk:</b> Xmas Theoretical Physics Workshop, Athens, Greece
2023 Aug	<b><u>Invited</u> workshop talk:</b> Invisibles Workshop, Göttingen, Germany
2023 Mar	<b>Conference poster:</b> AI for Science, Chicago
2023 Mar	<b><u>Invited</u> conference talk:</b> LISHEP2023, Rio de Janeiro, Brazil
2022 Nov	Workshop participant: ML4Jets2022, New Jersey, USA
2022 Aug	<b>Conference talk:</b> Vietnam Flavour Physics Conference, Quy Nhon, Vietnam
2021 Sep	<b>Workshop talk:</b> Workshop on the Standard Model and Beyond, Corfu, Greece
2021 Jun	<b>Workshop talk:</b> Workshop on Axions WIMPs and WISPs, Patras, Greece
2021 Aug	<b>Conference talk:</b> SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Beijing, China
2020 Mar	<b>Conference talk:</b> La Thuile, Aosta Valley, Italy; canceled
2019 Jun	<b>Conference talk:</b> PLANCK International Conference from the Planck Scale to the Electroweak Scale, Granada, Spain
2019 May	<b>Conference talk:</b> SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Corpus Christi, USA
2017 Dec	<b>Conference talk:</b> SUSY International Conference on Supersymmetry and the Unification of Fundamental Interactions, Mumbai, India
2017 Feb	<b>Workshop talk:</b> PRISMA Symposium "A Matter of Flavor", Mainz, Germany

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## Seminar Talks

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 Sep	University of Crete, Heraklion, Greece (online)
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

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

## Public Outreach

2022-present	<b>Committee member:</b> Organizer and representative of the public outreach events of IAIFI
2023 Oct	<b>Public lecture:</b> “Spot the Difference: AI vs Reality in Physics”, Cambridge Science Festival, Cambridge, USA
2023 Aug	<b>Public lecture:</b> “The Interplay between Physics and Artificial Intelligence”, Museum of Science of Boston, Boston, USA
2023 Jul	<b>Public lecture:</b> “Machine Learning Application to Physics”, Remote Experience for Young Researchers, Berkeley, USA
2023 Jun	<b>Invited industry talk:</b> “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

19. “Searching for exotic scalars at fusion reactors”. C. Baruch, P. J. Fitzpatrick, T. Menzo, Y. Soreq, **S. Trifinopoulos**, J. Zupan, submitted to JHEP • arXiv: 2502.12314 [hep-ph, hep-ex]
18. “New Physics at the Muon (Synchrotron) Ion Collider: MuSIC for several scales”. H. Davoudiasl, H. Liu, R. Marcarelli, Y. Soreq, **S. Trifinopoulos**, accepted in JHEP • arXiv: 2412.13289 [hep-ph]
17. “Flavor Patterns of Fundamental Particles from Quantum Entanglement?”. J. Thaler, **S. Trifinopoulos**, accepted in PRD • 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

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**) • 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-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]