

UNIVERSITY OF MILAN

Public selection for recruiting No. 1_ tenure track researcher(s) (RTT) for competition sector 02/A2 - FISICA TEORICA DELLE INTERAZIONI FONDAMENTALI , (scientific-disciplinary sector PHYS-02/A - Fisica teorica delle interazioni fondamentali, modelli, metodi matematici e applicazioni)

at the Department of Dipartimento di Fisica Aldo Pontremoli , (announcement published in Official Gazette No. G.U. 49 del 18/06/2024) - Competition code 5577

Giuseppe Bruno De Luca

CURRICULUM VITAE

PERSONAL DATA (DO NOT INCLUDE YOUR PERSONAL ADDRESS AND LANDLINE OR MOBILE PHONE NUMBER)

SURNAME	DE LUCA
NAME	GIUSEPPE BRUNO
DATE OF BIRTH	19 05 1992

QUALIFICATIONS

DEGREE

(Specify full degree name and related score, University, date, thesis title, etc.)

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|---------------------------|---|
| - Oct. 2014 - Oct. 2016 : | Master's Degree in Theoretical Physics.
Università degli Studi di Milano – Bicocca
Final Mark: 110/110 cum laude.
Advisor: Prof. Alessandro Tomasiello.
Thesis: Geometry of supersymmetry in ten and eleven dimensions. |
| - Sep. 2011 - Oct. 2014: | Bachelor's Degree in Physics.
Università degli Studi di Milano – Bicocca.
Final Mark: 107/110.
Advisor: Prof. Alessandro Tomasiello.
Thesis: Instantons and divergence of the perturbative series in physics. |

DOCTORAL DEGREE OR EQUIVALENT QUALIFICATION EARNED IN ITALY OR ABROAD / MEDICAL SPECIALISATION DIPLOMA OR EQUIVALENT QUALIFICATION, FOR THE RELEVANT SECTORS, EARNED IN ITALY OR ABROAD

(Specify qualification full name and related score, institution, date, thesis title, etc.)

Nov. 2016 - Jan. 2020 :	Ph.D. in Theoretical Physics, with honours.
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Università degli Studi di Milano – Bicocca.
Advisor: Prof. Alessandro Tomasiello.
Thesis: Non-Supersymmetric Space-Times and Renormalization Group
Flows in String Theory.

RESEARCH CONTRACTS, RESEARCH FELLOWSHIP CONTRACTS, POSTDOCTORAL SCHOLARSHIPS OR SIMILAR CONTRACTS

(Specify, for each contract, university/institution, starting and termination date, duration in years, etc.)

Jan. 2020 – current : Postdoctoral Scholar, Stanford University (5 years contract)

TEACHING ACTIVITIES AT ITALIAN OR FOREIGN UNIVERSITIES

(Specify academic year, university, degree course, number of hours/CFU, indicate type of activity, start and end date - day, month, year, etc.)

- Nov. 2023: Guest Lecturer.
Stanford University.
I gave two lectures for the graduate course PHYSICS 450: "Advanced Theoretical Physics I: Fundamentals of Cosmic Acceleration".
- 2022 – current Supervising work of 3 Graduate Students
Gauri Batra, Sungyeon Yang, and Henry Zheng,
in Eva Silverstein's group at Stanford University.
- Mar. 2023 Co-advisor of Master's thesis
of Marta Bucca at Università degli Studi di Milano – Bicocca.
- May 2022 Supervisor of Master's student
Stanislao Salvatore Bruno at ETH, Zurich (visiting at Stanford University).
- Nov. 2021 Supervisor of rotation Graduate Student
Anthony Morales at Stanford University.
- 2017 – 2018 Teaching assistant.
Università degli Studi di Milano – Bicocca.
Course "General Physics II" (Electromagnetism) for students of the third year of the Bachelor's Degree in Mathematics
- 2014 – 2016 Peer tutor.
Università degli Studi di Milano – Bicocca.
Tutor for undergraduate physics students for two consecutive academic years.

ATTESTED TRAINING OR RESEARCH ACTIVITIES AT QUALIFIED ITALIAN OR FOREIGN INSTITUTIONS

(Specify academic year, institution, course, period, commitment in terms of hours, indicate type of activity, etc.)

I have been a full time postdoctoral scholar at the Stanford Institute for Theoretical physics since January 2020, under the supervision of prof. Eva Silverstein. My training consists in performing

research in cosmological aspects of quantum gravity and on physics method for machine learning algorithms.

IMPLEMENTATION OF PROJECTS

(Specify date, project name, indicate type of activity, any organization in favor of which the activity was carried out etc.)

- 2023-2024: Organizer of Department seminars at Stanford (SITP)
- Reviewer for Journal of High Energy Physics (JHEP), Review Editor for Frontiers in Physics.

Outreach:

- Participation to the podcast channel "Theoretically Podcasting" on Youtube, with the presentation Optimal Transport derivation of Einstein's equations, www.youtube.com/watch?v=IFK KfdA2c4.

ORGANISATION, SUPERVISION AND COORDINATION OF NATIONAL AND INTERNATIONAL RESEARCH GROUPS, OR PARTICIPATION IN THEM

(For each entry, specify year, role, research group, any financing institutions and amount of financing, indicate type of project, etc.)

- From January 2020 to April 2022 I have been part of the Simons Collaboration on Modern Inflationary Cosmology. As part of the team, I attended the regular virtual meetings, in which I also presented my ongoing works. In addition, I developed my published work "Hyperbolic compactification of M-theory and dS Quantum Gravity" as part of the collaboration, and I presented it at the Simons Symposium Origins of the Universe (April 2022, Edinburgh) [url: <https://www.simonsfoundation.org/event/origins-of-the-universe-2022/>]

- I am part of various informal international research collaborations that resulted in my published papers mentioned below, which involve various international collaborators

SPEAKING AT NATIONAL AND INTERNATIONAL CONFERENCES AND CONVENTIONS

(Specify conference/convention title, date, duration in days/hours, organizing institution, etc.)

International Conference Talks:

- Swamplandia 2024 - in Bavaria (Seeon Abbey, May 27-29/2024), Can you hear the Planck mass?.
- Fields, Strings, and Deep Learning (Aspen Center for Physics, Jan. 14-19/2024), Machine Learning negatively- curved manifolds and de Sitter vacua.
- Deconstructing the String Landscape (Saclay, Nov. 29-Dec. 1/2023), A dS from higher dimensions.
- Swamplandia Workshop (Madrid, Sep. 13-15/2023), A dS from higher dimensions.

- Cosmology, Quantum Gravity, and Holography: the Interplay of Fundamental Concepts (CERN, Sep. 4-13/2023), The matter with $T\bar{T}$ + Λ_2 .
- Supergravity 2022 (Genova, Sep. 19-20/2022), Gravity from Thermodynamics and Optimal Transport.
- ICML 2022, Oral Presentation (Baltimore, Jul. 17-23/2022), Born-Infeld (BI) for AI: Energy-Conserving Descent (ECD) for Optimization.
- Simons Symposium on Origins of the Universe (Edinburgh, Apr. 24-30/2022), Hyperbolic compactification of M-theory and dS quantum gravity.
- Southwest Strings meeting 2020, (USU, Feb 14-15/2020), New non-supersymmetric compactifications with sources.

Invited Department Seminars:

- Dipartimento di Fisica, University of Milano-Bicocca (May 2024) Learning A dS compactification.
- Mitchell Institute, Texas A&M University (Apr. 2024) Universal properties of spin 2 Kaluza-Klein modes.
- Kadanoff Center for Theoretical Physics, University of Chicago (Feb. 2022), Bounds on spin-two Kaluza-Klein fields, part 2.
- Stanford Institute For Theoretical Physics, It from Qubit Meeting (Dec. 2021), Bounds on spin-two Kaluza-Klein fields.
- Harvard Swampland Seminar Series (May 2021, virtual), Bounds on spin-two Kaluza-Klein fields.
- String Theory Journal Club at Oxford (May 2021, virtual), Leaps and bounds towards scale separation.

Poster presentations:

- Theoretical Physics for Machine Learning, Aspen Center For Physics (Feb. 2023), Optimization and Sampling algorithms from Physics: MCHMC and BBI.
- ICML 2022 (Jul. 2022), Born-Infeld (BI) for AI: Energy-Conserving Descent (ECD) for Optimization.

SCIENTIFIC PRODUCTION

SCIENTIFIC PUBLICATIONS

(For each publication, specify the following: authors' names, full title, publisher, date and place of publication, ISBN/ISSN/DOI or equivalent code)

I have published 16 papers in peer-reviewed journals, and I have written 3 pre-prints. My works, listed below, have attracted in total 390 citations, with an H-index of 12, as detailed in my author page on INSPIRE-HEP, the citation platform of the high-energy physics community.

Published Papers:

- [1] G. Bruno De Luca, Nicolò De Ponti, Andrea Mondino, and Alessandro Tomasiello
"Harmonic functions and gravity localization"
JHEP 09 (2023). 2023. DOI: 10.1007/JHEP09(2023)127. arXiv: 2306.05456 [hep-th].
- [2] Jakob Robnik, G. Bruno De Luca, Eva Silverstein, and Uroš Seljak
"Microcanonical Hamiltonian Monte Carlo"
Journal of Machine Learning Research 24.311 (2023). 2023. URL: <http://jmlr.org/papers/v24/22-1450.html>.
- [3] G. Bruno De Luca, Nicolò De Ponti, Andrea Mondino, and Alessandro Tomasiello
"Gravity from thermodynamics: optimal transport and negative effective dimensions"
SciPost Phys. 15 (2023). 2023. DOI: 10.21468/SciPostPhys.15.1.039. arXiv: 2212.02511 [hep-th].
- [4] G. Bruno De Luca and Eva Silverstein
"Born-Infeld (BI) for AI: Energy-Conserving Descent (ECD) for Optimization"
. Proceedings of Machine Learning Research 162 (2022). PMLR. 2022. URL: <https://proceedings.mlr.press/v162/de-luca22a.html>.
- [5] Fabio Apruzzi, G. Bruno De Luca, Gabriele Lo Monaco, and Christoph F. Uhlemann
"Non-supersymmetric AdS₆ and the swampland"
JHEP 12 (2021). 2021. DOI: 10.1007/JHEP12(2021)187. arXiv: 2110.03003 [hep-th].
- [6] G. Bruno De Luca, Nicolò De Ponti, Andrea Mondino, and Alessandro Tomasiello
"Cheeger bounds on spin-two fields"
JHEP 12 (2021). 2021. DOI: 10.1007/JHEP12(2021)217. arXiv: 2109.11560 [hep-th].
- [7] G. Bruno De Luca, Eva Silverstein, and Gonzalo Torroba
"Hyperbolic compactification of M-theory and de Sitter quantum gravity"
SciPost Phys. 12.3 (2022). 2022. DOI: 10.21468/SciPostPhys.12.3.083. arXiv: 2104.13380 [hep-th].
- [8] G. Bruno De Luca and Alessandro Tomasiello
"Leaps and bounds towards scale separation"
JHEP 12 (2021). 2021. DOI: 10.1007/JHEP12(2021)086. arXiv: 2104.12773 [hep-th].
- [9] Roberto Auzzi, Stefano Baiguera, G. Bruno De Luca, Andrea Legramandi, Giuseppe Nardelli, and Nicolò Zenoni
"Geometry of quantum complexity"
Phys. Rev. D 103.10 (2021). 2021. DOI: 10.1103/PhysRevD.103.106021. arXiv: 2011.07601 [hep-th].
- [10] Iosif Bena, G. Bruno De Luca, Mariana Graña, and Gabriele Lo Monaco
"Oh, wait, O₈ de Sitter may be unstable!"
JHEP 03 (2021). 2021. DOI: 10.1007/JHEP03(2021)168. arXiv: 2010.05936 [hep-th].

[11] Fabio Apruzzi, G. Bruno De Luca, Alessandra Gnecci, Gabriele Lo Monaco, and Alessandro Tomasiello
"On AdS7 stability"
JHEP 07 (2020). 2020. DOI: 10.1007/JHEP07(2020)033. arXiv: 1912.13491 [hep-th].

[12] Clay Córdova, G. Bruno De Luca, and Alessandro Tomasiello
"New de Sitter Solutions in Ten Dimensions and Orientifold Singularities"
JHEP 08 (2020). 2020. DOI: 10.1007/JHEP08(2020)093. arXiv: 1911.04498 [hep-th].

[13] Clay Córdova, G. Bruno De Luca, and Alessandro Tomasiello
"Classical de Sitter Solutions of 10-Dimensional Supergravity"
Phys. Rev. Lett. 122.9 (2019). 2019. DOI: 10.1103/PhysRevLett.122.091601. arXiv: 1812.04147 [hep-th].

[14] Clay Córdova, G. Bruno De Luca, and Alessandro Tomasiello
"AdS8 solutions in type II supergravity"
JHEP 07 (2019). 2019. DOI: 10.1007/JHEP07(2019)127. arXiv: 1811.06987 [hep-th].

[15] G. Bruno De Luca, Alessandra Gnecci, Gabriele Lo Monaco, and Alessandro Tomasiello
"Holographic duals of 6d RG flows"
JHEP 03 (2019). 2019. DOI: 10.1007/JHEP03(2019)035. arXiv: 1810.10013 [hep-th].

[16] G. Bruno De Luca, Gabriele Lo Monaco, Niall T. Macpherson, Alessandro Tomasiello, and Oscar Varela
"The geometry of $N = 3$ AdS4 in massive IIA"
JHEP 08 (2018). 2018. DOI: 10.1007/JHEP08(2018)133. arXiv: 1805.04823 [hep-th].

Preprints (submitted):

[17] G. Bruno De Luca, Nicolò De Ponti, Andrea Mondino, and Alessandro Tomasiello
"Can you hear the Planck mass?"
(May 2024). May 2024. arXiv: 2406.00095 [hep-th].

[18] Gauri Batra, G. Bruno De Luca, Eva Silverstein, Gonzalo Torroba, and Sungyeon Yang
"Bulk-local dS3 holography: the Matter with $T\bar{T} + \Lambda^2$ "
(Mar. 2024). Mar. 2024. arXiv: 2403.01040 [hep-th].

[19] G. Bruno De Luca, Alice Gatti, and Eva Silverstein
"Improving Energy Conserving Descent for Machine Learning: Theory and Practice"
(June 2023). June 2023. arXiv: 2306.00352 [cs.LG].

Date

18/07/2024

Place

Stanford