

ATAKAN HILMI FIRAT

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Inspire HEP ◊ arXiv ◊ Google Scholar ◊ ORCID

RESEARCH INTERESTS

Theoretical high energy physics, string theory, and string field theory. I am currently interested in covariant phase space methods with a view towards applications to cosmological models in string theory.

ACADEMIC POSITIONS

QMAP, University of California Davis,
Postdoctoral Scholar

Sep 2024 - current

EDUCATION

Massachusetts Institute of Technology, Aug 2019 - May 2024
Ph.D. in Physics,
Thesis: “Hyperbolic String Field Theory”,
Advisor: Barton Zwiebach,
GPA: 5.00/5.00.

University of Colorado Boulder, Aug 2015 - May 2019
B.A. in Physics and Mathematics,
Summa Cum Laude with distinction,
Thesis: “Local Holographic Superconductors and Hovering Black Holes”,
Advisor: Oliver DeWolfe,
GPA: 4.00/4.00, graduated as valedictorian.

PUBLICATIONS

- [1] Vinícius Bernardes, Theodore Erler, and **Atakan Hilmi Firat**. “Symplectic structure in open string field theory I: Rolling tachyons” (2025). arXiv: 2511.03777 [hep-th].
- [2] Vinícius Bernardes, Theodore Erler, and **Atakan Hilmi Firat**. “Covariant phase space and L_∞ algebras”. *JHEP* 09 (2025), p. 057. DOI: 10.1007/JHEP09(2025)057. arXiv: 2506.20706 [hep-th].
- [3] **Atakan Hilmi Firat** and Raji Ashenafi Mamade. “Boundary terms in string field theory”. *JHEP* 02 (2025), p. 058. DOI: 10.1007/JHEP02(2025)058. arXiv: 2411.16673 [hep-th].
- [4] **Atakan Hilmi Firat** and Nico Valdes-Meller. “Topological recursion for hyperbolic string field theory”. *JHEP* 11 (2024), p. 005. DOI: 10.1007/JHEP11(2024)005. arXiv: 2409.02982 [hep-th].
- [5] **Atakan Hilmi Firat**. “ A_∞ perspective to Sen’s formalism”. *Nucl. Phys. B* 1008 (2024), p. 116691. DOI: 10.1016/j.nuclphysb.2024.116691. arXiv: 2405.05310 [hep-th].
- [6] Theodore Erler and **Atakan Hilmi Firat**. “Wilsonian effective potentials and closed string field theory”. *JHEP* 02 (2024), p. 018. DOI: 10.1007/JHEP02(2024)018. arXiv: 2311.17322 [hep-th].
- [7] **Atakan Hilmi Firat**. “String vertices for the large N limit”. *Nucl. Phys. B* 1000 (2024), p. 116485. DOI: 10.1016/j.nuclphysb.2024.116485. arXiv: 2311.00747 [hep-th].
- [8] Harold Erbin and **Atakan Hilmi Firat**. “Open string stub as an auxiliary string field”. *SciPost Phys.* 17 (2024), p. 044. DOI: 10.21468/SciPostPhys.17.2.044. arXiv: 2308.08587 [hep-th].

- [9] **Atakan Hilmi Firat**. “Hyperbolic string tadpole”. *SciPost Phys.* 15.6 (2023), p. 237. DOI: 10.21468/SciPostPhys.15.6.237. arXiv: 2306.08599 [hep-th].
- [10] **Atakan Hilmi Firat**. “Bootstrapping closed string field theory”. *JHEP* 05 (2023), p. 186. DOI: 10.1007/JHEP05(2023)186. arXiv: 2302.12843 [hep-th].
- [11] Harold Erbin and **Atakan Hilmi Firat**. “Characterizing 4-string contact interaction using machine learning”. *JHEP* 04 (2024), p. 016. DOI: 10.1007/JHEP04(2024)016. arXiv: 2211.09129 [hep-th].
- [12] Sergei Alexandrov, **Atakan Hilmi Firat**, Manki Kim, Ashoke Sen, and Bogdan Stefański. “D-instanton induced superpotential”. *JHEP* 07 (2022), p. 090. DOI: 10.1007/JHEP07(2022)090. arXiv: 2204.02981 [hep-th].
- [13] Harold Erbin, **Atakan Hilmi Firat**, and Barton Zwiebach. “Initial value problem in string-inspired nonlocal field theory”. *JHEP* 01 (2022), p. 167. DOI: 10.1007/JHEP01(2022)167. arXiv: 2111.03672 [hep-th].
- [14] **Atakan Hilmi Firat**. “Hyperbolic three-string vertex”. *JHEP* 08 (2021), p. 035. DOI: 10.1007/JHEP08(2021)035. arXiv: 2102.03936 [hep-th].

SCHOLARSHIPS, HONORS, AND CERTIFICATES

<i>Presidential Graduate Fellowship Award, MIT.</i>	<i>Oct 2019</i>
<i>Stephen Hillye White Undergraduate Research Award, University of Colorado Boulder.</i>	<i>May 2019</i>
<i>Chancellor’s Recognition Award, University of Colorado Boulder.</i>	<i>May 2019</i>
<i>GRE Physics 990/990.</i>	<i>Sep 2018</i>
<i>George and Clara Moreno Scholarship, University of Colorado Boulder.</i>	<i>Aug 2017</i>

INVITED TALKS AND POSTERS

<i>What is string theory?, ODTÜ Physics Seminar, Ankara, Turkey.</i>	<i>Nov 2025</i>
<i>What is string theory?, Özyegin University Colloquium, İstanbul, Turkey.</i>	<i>Nov 2025</i>
<i>Covariant Phase Space and L_∞ Algebras, ICTS String Seminars, Bengaluru, India.</i>	<i>Sep 2025</i>
<i>What is string theory?, İYTE Physics Seminar, İzmir, Turkey.</i>	<i>Sep 2025</i>
<i>Covariant Phase Space and L_∞ Algebras, MIT CTP Special Summer Seminar, Cambridge MA, USA.</i>	<i>Jul 2025</i>
<i>Covariant Phase Space and Homotopy Algebras, UC Davis Fields, Strings, Gravity Seminar, Davis CA, USA.</i>	<i>Mar 2025</i>
<i>Topological Recursion for Hyperbolic String Field Theory, The University of Tokyo String Seminar, Komaba, Japan.</i>	<i>Dec 2024</i>
<i>Topological Recursion for Hyperbolic String Field Theory, ICTS String Seminars, Bengaluru, India.</i>	<i>Oct 2024</i>
<i>String Field Theory: An Introduction, UC Davis Mathematical Physics Seminar, Davis CA, USA.</i>	<i>Sep 2024</i>

<i>Recent Developments in (Hyperbolic) String Vertices, At the Interface of Physics, Mathematics, and AI, Pollica, Italy.</i>	<i>June 2023</i>
<i>Recent Developments in (Hyperbolic) String Vertices, CEA-LIST, Paris, France.</i>	<i>May 2023</i>
<i>Hyperbolic String Vertices, Matrix Models and String Field Theory, Benasque, Spain.</i>	<i>May 2023</i>
<i>Bootstrapping Closed String Field Theory, ICTS String Seminars, Bengaluru, India.</i>	<i>Apr 2023</i>
<i>Characterizing 4-string Contact Interaction Using Machine Learning, SITP Colloquia, Stanford University, Palo Alto CA, USA.</i>	<i>Nov 2022</i>
<i>Characterizing 4-string Contact Interaction Using Machine Learning, SFT 2022, FZU, Prague, Czechia.</i>	<i>Sep 2022</i>
<i>Introduction to String Vertices, FZU, Prague, Czechia.</i>	<i>Sep 2022</i>
<i>D-instanton Induced Superpotential, Poster, Strings 2022, University of Vienna, Vienna, Austria.</i>	<i>July 2022</i>
<i>D-instanton Induced Superpotential, SFT Journal Club.</i>	<i>May 2022</i>
<i>D-instanton Superpotential in Type II String Theory on Calabi-Yau Orientifolds, Seminar Series on String Phenomenology.</i>	<i>Mar 2022</i>
<i>D-instanton Superpotential in Type II String Theory on Calabi-Yau Orientifolds, Particle Theory Seminar, Cornell University, Ithaca NY USA.</i>	<i>Mar 2022</i>
<i>Initial Value Problem and Causality in String-Inspired Non-local Field Theory, SFT@Cloud 2021.</i>	<i>Sep 2021</i>
<i>Hyperbolic Three-String Vertex, Poster, Strings 2021, ICTP-SAIFR, Sao Paulo, Brazil.</i>	<i>June 2021</i>

TEACHING AND MENTORING

<i>Quantum Field Theory II, Teaching Assistant, MIT.</i>	<i>Fall 21, 22, 23</i>
<i>Quantum Field Theory III, Teaching Assistant, MIT.</i>	<i>Spring 21, 23</i>
<i>Directed Reading Program in Physics, Mentor, MIT.</i>	<i>Winter 21, 22</i>
<i>Graduate Quantum Mechanics I, Teaching Assistant, MIT.</i>	<i>Fall 20</i>
<i>Classical Mech. and Math. Methods II, Learning Assistant, University of Colorado Boulder.</i>	<i>Spring 19</i>
<i>Foundations of Modern Physics, Learning Assistant, University of Colorado Boulder.</i>	<i>Fall 17</i>

SERVICE AND OUTREACH

<i>Referee: JHEP, Modern Mathematical Physics, Nuclear Physics B, Symmetry.</i>	<i>Current</i>
<i>Member of MSRP Physics Application Review Committee, MIT.</i>	<i>Winter 23</i>
<i>MIT Physics Graduate Students Friday Social, Chair, MIT.</i>	<i>Fall 22</i>
<i>CTP Graduate Student Faculty Search Committee, Committee Head, MIT.</i>	<i>Fall 21</i>