# 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,** *Sep 2024 - current*
*Postdoctoral Scholar*

## 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,*
*Thesis: "Local Holographic Superconductors and Hovering Black Holes",*
*Advisor: Oliver DeWolfe,*
*GPA: 4.00/4.00, Summa Cum Laude with distinction, valedictorian.*

## PUBLICATIONS

[1] Vinícius Bernardes, Theodore Erler, and **Atakan Hilmi Fırat**. "Symplectic structure in open string field theory II: Sliding lump" (2025). arXiv: 2511.15781 [hep-th].

[2] Vinícius Bernardes, Theodore Erler, and **Atakan Hilmi Fırat**. "Symplectic structure in open string field theory I: Rolling tachyons" (2025). arXiv: 2511.03777 [hep-th].

[3] Vinícius Bernardes, Theodore Erler, and **Atakan Hilmi Fırat**. "Covariant phase space and $L_\infty$ algebras". *JHEP* 09 (2025), p. 057. DOI: 10.1007/JHEP09(2025)057. arXiv: 2506.20706 [hep-th].

[4] **Atakan Hilmi Fırat** 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].

[5] **Atakan Hilmi Fırat** 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].

[6] **Atakan Hilmi Fırat**. "$A_\infty$ perspective to Sen's formalism". *Nucl. Phys. B* 1008 (2024), p. 116691. DOI: 10.1016/j.nuclphysb.2024.116691. arXiv: 2405.05310 [hep-th].

[7] Theodore Erler and **Atakan Hilmi Fırat**. "Wilsonian effective potentials and closed string field theory". *JHEP* 02 (2024), p. 018. DOI: 10.1007/JHEP02(2024)018. arXiv: 2311.17322 [hep-th].

[8] **Atakan Hilmi Fırat**. "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].

[9] Harold Erbin and **Atakan Hilmi Fırat**. "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].

[10] **Atakan Hilmi Fırat**. "Hyperbolic string tadpole". *SciPost Phys.* 15.6 (2023), p. 237. DOI: 10.21468/SciPostPhys.15.6.237. arXiv: 2306.08599 [hep-th].

[11] **Atakan Hilmi Fırat**. "Bootstrapping closed string field theory". *JHEP* 05 (2023), p. 186. DOI: 10.1007/JHEP05(2023)186. arXiv: 2302.12843 [hep-th].

[12] Harold Erbin and **Atakan Hilmi Fırat**. "Characterizing 4-string contact interaction using machine learning". *JHEP* 04 (2024), p. 016. DOI: 10.1007/JHEP04(2024)016. arXiv: 2211.09129 [hep-th].

[13] Sergei Alexandrov, **Atakan Hilmi Fırat**, 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].

[14] Harold Erbin, **Atakan Hilmi Fırat**, 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].

[15] **Atakan Hilmi Fırat**. "Hyperbolic three-string vertex". *JHEP* 08 (2021), p. 035. DOI: 10.1007/JHEP08(2021)035. arXiv: 2102.03936 [hep-th].

## SCHOLARSHIPS, HONORS, AND CERTIFICATES

| | |
|---|---|
| *Presidential Graduate Fellowship Award, MIT.* | *Oct 2019* |
| *Stephen Hilley White Undergraduate Research Award, University of Colorado Boulder.* | *May 2019* |
| *Chancellor's Recognition Award, University of Colorado Boulder.* | *May 2019* |
| *GRE Physics 990/990.* | *Sep 2018* |
| *George and Clara Moreno Scholarship, University of Colorado Boulder.* | *Aug 2017* |

## INVITED TALKS AND POSTERS

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

*Recent Developments in (Hyperbolic) String Vertices,* *June 2023*
*At the Interface of Physics, Mathematics, and AI, Pollica, Italy.*

*Recent Developments in (Hyperbolic) String Vertices,* *May 2023*
*CEA-LIST, Paris, France.*

*Hyperbolic String Vertices,* *May 2023*
*Matrix Models and String Field Theory, Benasque, Spain.*

*Bootstrapping Closed String Field Theory,* *Apr 2023*
*ICTS String Seminars, Bengaluru, India.*

*Characterizing 4-string Contact Interaction Using Machine Learning,* *Nov 2022*
*SITP Colloquia, Stanford University, Palo Alto CA, USA.*

*Characterizing 4-string Contact Interaction Using Machine Learning,* *Sep 2022*
*SFT 2022, FZU, Prague, Czechia.*

*Introduction to String Vertices,* *Sep 2022*
*FZU, Prague, Czechia.*

*D-instanton Induced Superpotential,* *July 2022*
*Poster, Strings 2022, University of Vienna, Vienna, Austria.*

*D-instanton Induced Superpotential,* *May 2022*
*SFT Journal Club.*

*D-instanton Superpotential in Type II String Theory on Calabi-Yau Orientifolds,* *Mar 2022*
*Seminar Series on String Phenomenology.*

*D-instanton Superpotential in Type II String Theory on Calabi-Yau Orientifolds,* *Mar 2022*
*Particle Theory Seminar, Cornell University, Ithaca NY USA.*

*Initial Value Problem and Causality in String-Inspired Non-local Field Theory,* *Sep 2021*
*SFT@Cloud 2021.*

*Hyperbolic Three-String Vertex,* *June 2021*
*Poster, Strings 2021, ICTP-SAIFR, Sao Paulo, Brazil.*

## TEACHING AND MENTORING

*Quantum Field Theory II, Teaching Assistant, MIT.* *Fall 21, 22, 23*

*Quantum Field Theory III, Teaching Assistant, MIT.* *Spring 21, 23*

*Directed Reading Program in Physics, Mentor, MIT.* *Winter 21, 22*

*Graduate Quantum Mechanics I, Teaching Assistant, MIT.* *Fall 20*

*Classical Mech. and Math. Methods II, Learning Assistant, University of Colorado Boulder.* *Spring 19*

*Foundations of Modern Physics, Learning Assistant, University of Colorado Boulder.* *Fall 17*

## SERVICE AND OUTREACH

*Referee: JHEP, Modern Mathematical Physics, Nuclear Physics B, Symmetry.* *Current*

*Member of MSRP Physics Application Review Committee, MIT.* *Winter 23*

*MIT Physics Graduate Students Friday Social, Chair, MIT.* *Fall 22*

*CTP Graduate Student Faculty Search Committee, Committee Head, MIT.* *Fall 21*