

EVAN COLEMAN

Postdoctoral Fellow in Climate Change Mitigation Science

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eacoleman

I am a string theorist with a background in AI, who has transitioned to a career in climate-critical infrastructure and disaster mitigation technology. I care deeply about preparing our world for a changing climate.

EXPERTISE

- **Theoretical Physics:** Over 110 citations, six publications in quantum gravity and particle physics, utilizing a spectrum of mathematical frameworks: quantum field theory, string theory and supergravity, statistical mechanics, symplectic geometry, differential topology, and general relativity.
- **Machine Learning and Data Analysis:** One research publication utilizing decision trees to evaluate experimental performance as function of detector design. Deep learning coursework at Stanford. Independent projects utilizing RL, RNNs, generative models, ImageNets.
- **Earth System Science:** Extensive Stanford coursework on nutrient cycles, climate simulation, energy & entropy budgets, tropical cyclones, greenhouse gas sequestration, and geoengineering. Independent study on farming techniques.

EXPERIENCE

Climate & Sustainability Impact Fellow

MIT Climate & Sustainability Consortium

Aug 2022 – Sep 2024

Cambridge, MA

- Leading research program on nature-based solutions to climate change, targeting terrestrial sinks of carbon — soils and biomass. Managing three students: Ph.D., M.S., and B.S.
- With team at Lincoln Lab, combining hardware, software, and physics modeling to develop sensible procedures for validating soil carbon sequestration. Applying NMR, spectral unmixing techniques, hyperspectral Earth observation, and more to deploy physics-based, ML-accelerated scalable systems for tracking the carbon content of soil.
- Mission is to rigorously budget carbon distributed among natural systems, to enable carbon marketplaces to represent the true economic value extracted in climate change mitigation efforts.
- Consulting with Consortium members (Apple, Cargill, PepsiCo, and more) anticipate regulatory future in carbon and bioenergy markets, and maximize their first-mover advantage as they work to achieve their climate and sustainability targets.

NSF Graduate Research Fellow

Stanford Institute for Theoretical Physics

Aug 2018 – Present

Stanford, CA

- Worked under Prof. Eva Silverstein in cosmology and string theory. Thesis covered my work on adapting formulations of quantum gravity to inflationary universes. Tools included Mathematica and MATLAB for numerical simulation.
- Advised an undergraduate thesis project on supersymmetry.
- Taught 3 quarters: quantum mechanics, relativity, and advanced electricity & magnetism.

EDUCATION

Ph.D., Theoretical Physics

Stanford University

Aug 2018 – July 2022

Sc.B. (Honors), Mathematical Physics

Brown University

Sept 2014 – May 2018

4.00 GPA, Magna cum laude, Sigma Xi

PROJECTS & SERVICE

Little Earth Sandbox

Summer 2020

Built a toy climate simulator in OpenGL, with machine learning analysis framework.

Stanford Community Farm

May 2019 – Aug 2022

Volunteer farmhand.

ITPO for Undergraduates

thworldcup.com

Sept 2018 – Mar 2022

Coordinate, write problems for annual International Theoretical Physics Olympiad.

EXPERIENCE

Undergraduate Researcher

CERN: Compact Muon Solenoid Experiment

📅 Mar 2015 – July 2018

📍 Brown University

- Applied machine learning methods (BDTs, Bayesian NNs) to particle identification. Using MLE, measured the top quark lifetime to record precision.
- Contributed to codebase running the Large Hadron Collider.
- As college senior, taught statistics at CMS Data Analysis School, a preparatory program for young graduate students.
- Gained 3 years of coding experience in C++, Python, bash/zsh scripting, Linux systems. 1 year experience in TensorFlow.

PUBLICATIONS 📄

- Coleman, E., Soni, R. M., & Yang, S. (2022). On the Spread of Entanglement at Finite Cutoff. arXiv: 2208.12376 [hep-th]
- Coleman, E., Silverstein, E. et al. (2021). de Sitter Microstates from $T\bar{T} + \Lambda_2$ and the Hawking-Page Transition. arXiv: 2110.14670 [hep-th]
- Aguilera-Damia, J., Anderson, L. M., & Coleman, E. (2020). A substrate for brane shells from $T\bar{T}$. arXiv: 2012.09802 [hep-th]
- Coleman, E., & Shyam, V. (2020). Conformal Boundary Conditions from Cutoff AdS_3 . arXiv: 2010.08504 [hep-th]
- Coleman, E., Aguilera-Damia, J., Freedman, D. Z., & Soni, R. M. (2019). $T\bar{T}$ -deformed actions and (1,1) supersymmetry. *JHEP*, 10, 080. arXiv: 1906.05439 [hep-th]
- Coleman, E. et al. (2018). The importance of calorimetry for highly-boosted jet substructure. *JINST*, 13(01), T01003. arXiv: 1709.08705 [hep-ph]
- Bounding the top quark width using final states with two charged leptons and two jets at $\sqrt{s} = 13$ TeV. (2016), (CMS-PAS-TOP-16-019). Retrieved from <https://cds.cern.ch/record/2218019>

RECOGNITION

NSF Fellowship

\$138,000 grant to pursue Ph.D.

Dr. HaiPing and Jianmei Jin Fellowship

Supports leading theoretical physics graduate students at Stanford.

Paul H. Kirkpatrick Award

Top 5 Stanford Physics TA of 2021

R. Bruce Lindsay Prize for Physics

Top physics student, Brown University

Astronaut Scholarship

Merit-based scholarship

Goldwater Scholarship

Merit-based scholarship

Youth Philanthropist of the Year, California Central Coast

Cycled 600 mi. across Tibet, raising money to fight child trafficking.