EVAN COLEMAN

Postdoctoral Fellow in Climate Change Mitigation Science

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

EXPERTISE

- **Theoretical Physics:** 150+ 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, and general relativity.
- **Machine Learning and Data Analysis:** Active research program at MIT utilizing RL and transformer models for climate-relevant measurement tasks and sampling optimization. Prior research utilizing ML to evaluate experimental performance as function of particle physics detector design. Deep learning coursework at Stanford.
- **Earth System Science:** 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.
- Developed six-figure research collaboration at Lincoln Lab, combining hardware, software, and physics modeling to develop sensible procedures for validating soil carbon sequestration. With Jongyoon Han and Dimitris Manolakis, 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.
- Collaborating with Consortium members (Apple, Cargill, PepsiCo, and more) to scale data collection using modern machine learning approaches, for the purposes of optimizing farming practice sustainability.

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 – Aug 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

Coordinated, wrote problems for annual International Theoretical Physics Olympiad. Terminated due to Russo-Ukrainian War.

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 $\sqrt{s} = 13 \, \text{TeV}$. (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.

STUDENTS

Hans Gaensbauer
Ph.D. Candidate in MIT EECS

Jenny Moralejo
M.S. '24 in MIT EECS, Thesis student

Xinyi Zeng
M.S. '23 in MIT CEE, Thesis student

Alexandra Chua
MIT UROP, Summer '23

Donald J. Stralkus III
MIT UROP, Spring '23

Katherine Kempff
MIT UROP, IAP '23

Elijah Bell
MIT UROP, IAP '23

Paul Haidu Gerea
B.S./M.S. '21 in Stanford Physics, Thesis student