

Gavin S. Hartnett

MACHINE LEARNING RESEARCHER/THEORETICAL PHYSICIST

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| 🔗 LinkedIn

Education

University of California, Santa Barbara

Santa Barbara, CA

PHD AND MA IN PHYSICS

Aug. 2009 - May 2015

- Adviser: Prof. Gary Horowitz
- Dissertation: Aspects of Black Holes in Higher Dimensions

Syracuse University

Syracuse, NY

BSC IN PHYSICS AND MATHEMATICS

Sept. 2005 - May 2009

- Summa Cum Laude
- Honors Thesis: Spiral Patterns in Liquid Crystals

Research Experience

The RAND Corporation (Current Position)

Santa Monica, CA

INFORMATION SCIENTIST

Aug. 2017 - present

- Organizer of company-wide AI seminar series and study group
- RAND Data Science Lead for a NSF-funded project to build an ML-powered landslide warning system in Alaska [\[link\]](#)
- Co-PI for project on generative modeling for networks
- Investigated the vulnerability of autonomous agents to adversarial examples
- Investigated domain adaptation for object detection using synthetic data sets

University of Southampton

Southampton, United Kingdom

POSTDOCTORAL RESEARCH FELLOW

Sept. 2015 - Aug. 2017

- Studied theoretical properties of black holes and quantum field theories
- Worked on multiple projects as part of an international collaboration
- Co-organized 3 seminar series
- Traveled extensively to present research and facilitate collaborations

University of California, Santa Barbara

Santa Barbara, CA

GRADUATE STUDENT RESEARCHER

May 2010 - Aug 2015

- Researched black holes, string theory, and quantum field theory
- Played active role in department, serving as head TA and as the organizer of a weekly journal club

Syracuse University

Syracuse, NY

UNDERGRADUATE RESEARCH ASSISTANT

June 2006 - May 2009

- Senior Thesis Project in Condensed Matter, with Prof.'s Mark Bowick and Cristina Marchetti
- Laser Interferometer Gravitational-Wave Observatory (LIGO) research, with Prof. Peter Saulson
- Cosmology research, with Prof.'s Mark Trodden and Christian Armendariz-Picon

Cornell University

Ithaca, NY

REU SUMMER RESEARCH ASSISTANT

Summer 2008

- Investigated Modified Source Gravity Models, with Prof. Rachel Bean
- Studied cosmic string dynamics in expanding universe, with Prof. David Chernoff

Teaching

Pardee RAND Graduate School

CORE FACULTY MEMBER

- Introduction to Blockchain Technology

Santa Monica, CA

2018-2019 Academic Year

University of Southampton

LECTURER

- MATH1052 Differential Equations
- MATH1008 Mathematical Methods
- MATH3071 Light and Waves

Southampton, UK

Sept. 2015 - May 2015

University of California, Santa Barbara

HEAD TEACHING ASSISTANT

- Managed team of 40+ TA's for the entire Physics Department
- Worked with faculty and staff to assign TA's to courses

Santa Barbara, CA

Aug. 2010 - Aug. 2012

TEACHING ASSISTANT

- PHYS6L Introductory Physics (3 quarters)
- PHYS21 General Physics
- PHYS105 Classical Mechanics
- PHYS115 Quantum Mechanics (2 quarters)
- PHYS219 Statistical Mechanics (graduate level)

Sept. 2009 - May 2015

Professional Activities

REFeree FOR

- *NeurIPS 2019 Workshop: Machine Learning and the Physical Sciences*
- *Journal of High Energy Physics (JHEP)*
- *Physical Letters B*
- *Classical and Quantum Gravity*
- *General Relativity and Gravitation*

ORGANIZER OF THE COMPANY-WIDE AI SEMINAR SERIES AND STUDY GROUP AT THE RAND CORPORATION

2018 - present

ORGANIZER OF GRADUATE STUDENT HIGH-ENERGY JOURNAL CLUB

2012 - 2014

Awards

2020	RAND Bronze Medal Award , company-wide annual award, awarded for “vision, integrity, and leadership” in the course of a project on adversarial machine learning for cyber defense systems.	<i>Santa Monica, CA</i>
2019	RAND Spotlight Award , awarded for “developing a new game theoretic approach with Machine Learning techniques to assess cyber defense capabilities.”	<i>Santa Monica, CA</i>
2019	RAND Project Air Force Team Innovation Award , awarded for our team’s “high-risk/high-reward approach to solving a complex technical problem – understanding how machine learning-based algorithms might be vulnerable to cyber attack”	<i>Santa Monica, CA</i>
2014	Dean’s Fellowship , Competitive University-wide fellowship	<i>Santa Barbara, CA</i>
2013	James Hartle Award , Best graduate student talk	<i>Warsaw, Poland</i>
2011	Chairs Certificate of Appreciation , Outstanding service as Head TA	<i>Santa Barbara, CA</i>
2009	Syracuse University Scholar , Highest undergraduate academic honor	<i>Syracuse, NY</i>
2008	Barry Goldwater Scholarship , Most prestigious undergraduate national science award	<i>Syracuse, NY</i>

Publications

1. **Self-Supervised Learning of Generative Spin-Glasses with Normalizing Flows**
G. S. Hartnett, M. Mohseni.
arXiv:2001.00585 [cs.LG]
2. **A Probability Density Theory for Spin-Glass Systems**
G. S. Hartnett, M. Mohseni.
arXiv:2001.00927 [cond-mat.dis-nn]
3. **Covariant Noether charges for type IIB and 11-dimensional supergravities**
O. J. C. Dias, G. S. Hartnett, J. E. Santos.
arXiv:1912.01030 [hep-th]
4. **Adversarial Examples for Cost-Sensitive Classifiers**
G. S. Hartnett, A. J. Lohn, A. P. Sedlack.
arXiv:1910.02095 [stat-ML]
Accepted to the Workshop on Safety and Robustness in Decision Making, NeurIPS 2019
5. **Holographic dual of hot Polchinski-Strassler quark-gluon plasma**
I. Bena, O. J. C. Dias, G. S. Hartnett, Benjamin. E. Niehoff, J. E. Santos.
arXiv:1805.06463 [hep-th]
JHEP 9, 33 2019
6. **Replica Symmetry Breaking in Bipartite Spin Glasses and Neural Networks**
G. S. Hartnett, E. Parker, E. Geist.
arXiv:1803.06442 [cond-mat.dis-nn; cs.LG]
Phys. Rev. E 98, issue 2, 022116 (2018)
7. **Constraining the mass of dark photons and axion-like particles through black-hole superradiance**
V. Cardoso, O. J. C. Dias, G. S. Hartnett, M. Middleton, P. Pani, J. E. Santos.
arXiv:1801.01420 [gr-qc]
JCAP 1803, no.03, 043 (2018)
8. **Mass-deformed M2 branes in Stenzel space**
O. J. C. Dias, G. S. Hartnett, B. E. Niehoff, J. E. Santos
arXiv:1704.02323 [hep-th]
JHEP 1711, 105 (2017)
9. **Localised Anti-Branes in Flux Backgrounds**
G. S. Hartnett.
arXiv:1501.06568 [hep-th]
JHEP 1506, 007 (2015)
10. **A No Black Hole Theorem**
G. S. Hartnett, G. T. Horowitz and K. Maeda.
arXiv:1410.1875 [hep-th]
Class. Quant. Grav. 32, no. 5, 055011 (2015)
11. **Quasinormal modes of asymptotically flat rotating black holes**
O. J. C. Dias, G. S. Hartnett and J. E. Santos.
arXiv:1402.7047 [hep-th]
Class. Quant. Grav. 31, no. 24, 245011 (2014)
12. **Holographic thermalization, quasinormal modes and superradiance in Kerr-AdS**
V. Cardoso, O. J. C. Dias, G. S. Hartnett, L. Lehner and J. E. Santos.
arXiv:1312.5323 [hep-th]
JHEP 1404, 183 (2014)
13. **Non-Axisymmetric Instability of Rotating Black Holes in Higher Dimensions**
G. S. Hartnett and J. E. Santos.
arXiv:1306.4318 [gr-qc]
Phys. Rev. D 88, 041505 (2013)
14. **Geons and Spin-2 Condensates in the AdS Soliton**
G. S. Hartnett and G. T. Horowitz.
arXiv:1210.1606 [hep-th]
JHEP 1301, 010 (2013)

Invited Talks

REPLICA SYMMETRY BREAKING IN BIPARTITE SPIN GLASSES AND NEURAL NETWORKS

- Theoretical Physics for Machine Learning, Aspen Winter Conference
Aspen Center of Physics
Aspen, Colorado
January 2019

MACHINE LEARNING FOR CYBERSECURITY

- Project Air Force, Force Modernization and Employment Seminar
RAND Corporation
Santa Monica, California
November 2017
(joint talk with A. Shah, O. Osoba, M. Lee, and C. Steiner)

DEEP LEARNING AS RENORMALIZATION: USING TOOLS FROM PHYSICS TO BETTER UNDERSTAND NEURAL NETWORKS

- RAND Corporation
Santa Monica, California
April 2017

THINKING OUTSIDE THE TRUNCATION: NEW HAIR FOR HOLOGRAPHIC SUPERCONDUCTORS

- 21st International Conference on General Relativity and Gravitation
Columbia University, New York City
July 2016

LOCALISED ANTI-BRANES IN FLUX BACKGROUNDS

- Weekly High Energy Seminar
Institute for Theoretical Physics, Katholieke Universiteit Leuven, Belgium
March 2016
- Friday Gravity Seminar
Department of Applied Mathematics and Theoretical Physics, Cambridge University, United Kingdom
February 2016
- Rencontres Théoriciennes Seminar: “Supergravité, théorie des cordes et théorie M”
Institut Henri Poincaré, Paris, France
December 2015

A NO BLACK HOLE THEOREM

- High Energy Physics Seminar
CEA Saclay, Paris, France
December 2015
- High Energy Physics Seminar
University of California at Santa Barbara
November 2014

SPINNING OUT OF CONTROL: BLACK HOLE INSTABILITIES IN HIGHER DIMENSIONS

- Gravity Seminar
University of Southampton, United Kingdom
October 2015

SYMMETRY IN STRING THEORY

- Invited Guest Lecture: Undergraduate Course CS 10: Symmetry and Aesthetics in Contemporary Physics
University of California, Santa Barbara
March 2016

HOW HORIZONS SAVED THE LANDSCAPE

- High Energy Physics Seminar
University of Southern California
February 2015

INSTABILITIES OF ROTATING BLACK HOLES AND QUASINORMAL MODES IN THE LARGE D LIMIT

- 30th Annual Pacific Coast Gravity Meeting
University of California, San Diego
March 2014

GEONS AND SPIN-2 CONDENSATES IN THE AdS SOLITON

- 20th International Conference on General Relativity and Gravitation/10th Edoardo Amaldi Conference on Gravitational Waves
University of Warsaw, Warsaw, Poland
July 2013 April
- APS Meeting
Denver
April 2013