

Garrett Goon

RESEARCHER · TRANSITIONING TO INDUSTRY (MACHINE LEARNING)

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Summary

Researcher with a background in theoretical physics, currently transitioning to machine learning. Over a decade of producing well-cited articles on a range of technical topics and publishing in top physics journals. Projects completed in conjunction with a diverse team of collaborators while holding positions in multiple world-class research groups. Recent work featured in the popular press.

Experience

Carnegie Mellon University, Department of Physics

Pittsburgh, PA, USA

RESEARCH ASSOCIATE

August 2019 - Present

- In collaboration with the groups of Riccardo Penco and Ira Rothstein, 2 articles published to date
- Effective field theory methods for black holes and condensed matter systems
- Research featured in popular article and podcast appearance

University of Cambridge, Department of Applied Math and Theoretical Physics

Cambridge, United Kingdom

RESEARCH ASSOCIATE

September 2018 - August 2019

- In collaboration with the group of Enrico Pajer, 2 articles published
- Constraining exotic species through early-universe physics

Universiteit Utrecht, Institute for Theoretical Physics

Utrecht, Netherlands

RESEARCHER

September 2017 - September 2018

- In collaboration with the group of Enrico Pajer, 3 articles published
- Consistency conditions and their violation during the primordial inflationary epoch
- Co-advisor to M.S. student Thomas Flöss (current Ph.D. at Rijksuniversiteit Groningen)

Universiteit van Amsterdam, Institute of Physics

Amsterdam, Netherlands

RESEARCH ASSOCIATE

September 2016 - August 2017

- In collaboration with the group of Daniel Baumann, 1 article published
- Quantum corrections to black hole physics

University of Cambridge, Department of Applied Math and Theoretical Physics

Cambridge, United Kingdom

RESEARCH ASSOCIATE

September 2014 - September 2016

- In collaboration with the group of Daniel Baumann, 3 articles published
- Effective field theory methods for models beyond General Relativity

Technical Skills

Programming Used Professionally: **Mathematica, LaTeX**. Proficient: **NumPy, Pandas, Python, PyTorch, React, Scikit-Learn**

Mathematics Calculus, Complex Analysis, Differential Equations, Differential Geometry, Fourier Methods, Linear Algebra, Statistics

Languages English (native speaker), Dutch (intermediate), French (basic), Spanish (basic)

Education

University of Pennsylvania

Philadelphia, PA, USA

PH.D., M.S. PHYSICS

2009-2014

- *Advisor:* Mark Trodden. *Thesis Title:* Aspects of Galileons. Published nine articles during Ph.D.

University of Maryland

College Park, MD, USA

B.S. PHYSICS, MINOR IN MATHEMATICS

2005-2008

- Honors college. REU experience in Materials Science at Drexel U. Academic honors in 6/7 semesters. Graduated early.

Press

Undisciplined Podcast

GRAVITY FALLS

July 2020

- Discussed black hole physics and *A Universal Relation Between Corrections to Entropy and Extremality*

Quanta Magazine

BLACK HOLE PARADOXES REVEAL A FUNDAMENTAL LINK BETWEEN ENERGY AND ORDER

May 2020

- Popular article on black hole thermodynamics prominently featuring *A Universal Relation Between Corrections to Entropy and Extremality*

Publications

Quantum Corrections to Generic Branes: DBI, NLSM, and More

GARRETT GOON, SCOTT MELVILLE, JOHANNES NOLLER

Journal of High Energy Physics 2021,159

arXiv preprint: 2010.05913

A Universal Relation Between Corrections to Entropy and Extremality

GARRETT GOON, RICCARDO PENCO

- Featured in *Quanta Magazine* and on the *Undisciplined Podcast* (see Press section)

Physical Review Letters 124, 101103

arXiv preprint: 1909.05254

Primordial Non-Gaussianity

P. DANIEL MEERBURG, GARRETT GOON, ET AL.

Astro2020: Science White Papers

arXiv preprint: 1903.04409

Shapes of gravity: Tensor non-Gaussianity and massive spin-2 fields

GARRETT GOON, KURT HINTERBICHLER, AUSTIN JOYCE, MARK TRODDEN

Journal of High Energy Physics 2019, 182

arXiv preprint: 1812.07571

The Effective Theory of Shift-Symmetric Cosmologies

BERNARDO FINELLI, GARRETT GOON, ENRICO PAJER, LUCA SANTONI

J. Cosmol. Astropart. Phys. 05 (2018) 060

arXiv preprint: 1802.01580

Partially Massless Fields During Inflation

DANIEL BAUMANN, GARRETT GOON, HAYDEN LEE, GUILHERME L. PIMENTEL

Journal of High Energy Physics 2018, 140

arXiv preprint: 1712.06624

Soft Theorems For Shift-Symmetric Cosmologies

BERNARDO FINELLI, GARRETT GOON, ENRICO PAJER, LUCA SANTONI

- Awarded *Editor's Suggestion* by *Physical Review D*

Physical Review D 97, 063531

arXiv preprint: 1711.03737

Heavy Fields and Gravity

GARRETT GOON

Journal of High Energy Physics 2017, 45

arXiv preprint: 1611.02705

Superluminality, Black Holes and Effective Field Theory

GARRETT GOON AND KURT HINTERBICHLER

Journal of High Energy Physics 2017, 134

arXiv preprint: 1609.00723

Aspects of Galileon Non-Renormalization

GARRETT GOON, KURT HINTERBICHLER, AUSTIN JOYCE AND MARK TRODDEN

Journal of High Energy Physics 2016, 100

arXiv preprint: 1606.02295

Einstein Gravity, Massive Gravity, Multi-Gravity and Nonlinear Realizations

GARRETT GOON, KURT HINTERBICHLER, AUSTIN JOYCE AND MARK TRODDEN

Journal of High Energy Physics 2015, 101

arXiv preprint: 1412.6098

Spontaneously Broken Gauge Theories and the Coset Construction

GARRETT GOON, AUSTIN JOYCE AND MARK TRODDEN

Physical Review D 90, 025022

arXiv preprint: 1405.5532

Galileons Coupled to Massive Gravity: General Analysis and Cosmological Solutions

GARRETT GOON, EMIR GUMRUKCUOGLU, KURT HINTERBICHLER, SHINJI MUKOHYAMA AND MARK TRODDEN

J. Cosmol. Astropart. Phys. 1408 (2014) 008

arXiv preprint: 1402.5424

Massive gravity coupled to DBI Galileons is ghost free

MELINDA ANDREWS, GARRETT GOON, KURT HINTERBICHLER, JAMES STOKES, MARK TRODDEN

Physical Review Letters 111, 061107

arXiv preprint: 1303.1177

Galileons as Wess-Zumino Terms

GARRETT GOON, KURT HINTERBICHLER, AUSTIN JOYCE, MARK TRODDEN

Journal of High Energy Physics 2012, 4

arXiv preprint: 1203.3191

Gauged Galileons From Branes

GARRETT GOON, KURT HINTERBICHLER, AUSTIN JOYCE, MARK TRODDEN

Physics Letters B 714 (2012) 115-119

arXiv preprint: 1201.0015

Galileons on Cosmological Backgrounds

GARRETT GOON, KURT HINTERBICHLER, MARK TRODDEN

J. Cosmol. Astropart. Phys. 12 (2011) 004

arXiv preprint: 1109.3450

New Class of Effective Field Theories from Embedded Branes

GARRETT GOON, KURT HINTERBICHLER, MARK TRODDEN

Physical Review Letters 106, 231102

arXiv preprint: 1103.6029

Symmetries for Galileons and DBI scalars on curved space

GARRETT GOON, KURT HINTERBICHLER, MARK TRODDEN

J. Cosmol. Astropart. Phys. 07 (2011) 017

arXiv preprint: 1103.5745

Stability and superluminality of spherical DBI galileon solutions

GARRETT GOON, KURT HINTERBICHLER, MARK TRODDEN

Physical Review D 83, 085015

arXiv preprint: 1008.4580

Selected Talks

Universal Corrections to Entropy and Extremality

EDINBURGH MATHEMATICAL PHYSICS GROUP SEMINAR

University of Edinburgh (UK)

May 2020

Linking Corrections to Entropy and Extremality

THEORETICAL PHYSICS SEMINAR

Columbia University

September 2019

Tensor non-Gaussianity and Partially Massless Fields

DAMTP GENERAL RELATIVITY SEMINAR

University of Cambridge (UK)

April 2019

Partially Massless Fields During Inflation

SOUTHAMPTON WORKSHOP ON GAUGE THEORY, HOLOGRAPHY, AND BLACK HOLES

University of Southampton (UK)

March 2018

Shift Symmetries and Inflation

15 MINUTE CONFERENCE TALK

Cosmology on the Beach

December 2018

Giving Gravity a Mass

NICO VAN KAMPEN COLLOQUIUM IN THEORETICAL PHYSICS

Universiteit Utrecht (NL)

June 2017

Superluminality, Black Holes, and EFT

COSMOLOGY SEMINAR

Oxford University (UK)

November 2015

Spontaneous Symmetry Breaking and Massive Gravity

PARTICLE THEORY GROUP TALK

University of Nottingham (UK)

March 2015

Coset Constructions and Modified Gravity

DAMTP GENERAL RELATIVITY SEMINAR

University of Cambridge (UK)

February 2015

Spacetime Symmetry Breaking and Galileons

COSMOLOGY LUNCH SEMINAR

Princeton University

November 2013

Symmetry Breaking and Galileons

PARTICLE/ASTROPHYSICS AND CERCA SEMINAR

Case Western Reserve University

October 2013

Galileons and Massive Gravity

NEIGHBORHOOD WORKSHOP ON ASTROPHYSICS AND COSMOLOGY

Pennsylvania State University

April 2013

Galileons as Wess-Zumino Terms

CASE-COLUMBIA-NYU-UPENN SEMESTERLY MEETING

New York University

April 2012

Galileons on Curved Spaces: The Probe Brane Construction

COMMON VISION WORKSHOP: BROKEN TRANSLATIONAL INVARIANCE FROM FUNDAMENTAL FIELDS TO SOFT MATTER

University of Pennsylvania

November 2011

Professional Activities

Referee *Physics Letters B, Physical Review D, Physical Review Letters, Journal of High Energy Physics, and Classical and Quantum Gravity*
Organizer *UK Cosmo meeting at DAMTP, University of Cambridge, May 2019. Various journal club, seminar, and colloquia series.*

Honors & Awards

- **Seal of Excellence**, *Marie Skłodowska-Curie Actions*, EU Research Fellowship Competition 2018
- **Travel Award**, *Universe Journal* 2017
- **Dissertation Completion Fellowship**, University of Pennsylvania 2013