Justin L. Ripley

Department of Physics, University of Illinois, Urbana-Champaign · 1110 West Green Street, Urbana, IL 61801, USA

ripley[at]illinois[dot]edu · https://jlripley314.github.io/ · Citizenship: U.S.A.

Academic Employment

Research Associate, Department of Physics, University of Illinois, Urbana-Champaign **August 2022-present**

Research Associate, DAMTP, University of Cambridge **October 2020-June 2022**

Research and Teaching Assistant, Princeton University **September 2014-July 2020**

Education

PhD, Physics, Princeton University **September 2014-July 2020**
Advisor: Frans Pretorius

BA, Physics, Columbia University **September 2010-May 2014**
Minor in Mathematics
Departmental honors in Physics, *summa cum laude*, Phi Beta Kappa

Computational Experience

My Github account: JLRipley314, lists some of the individual computational projects I have worked on. I have also done some work for the GRChombo collaboration, which works on an open-source numerical relativity code.

Teaching and Mentorship

Mentorship of PhD students

Daniel Caballero (University of Illinois, Urbana-Champaign) **2023-present**
*Abhishek Hegade K. R. (University of Illinois, Urbana-Champaign) **2022-present**
*Hengrui Zhu (Princeton University) **2022-present**
*Maxence Corman (Perimenter Institute for Theoretical Physics) **2021-2022**
*Alex Pandya (Princeton University) **2021-2022**
*Tamara Evstafyeva (University of Cambridge) **2021-2022**

*Led to publication.

Mentorship of undergraduate students

Shikhar Kumar (University of Cambridge) **Summer 2021**
Adam Wills (University of Cambridge) **Summer 2021**

Assistant Instructor, Princeton University

EGR/PHY 191, An integrated introduction to engineering, math, physics **Fall 2019**
PHY 103/105, General Physics I Lab **Fall 2018**
PHY 304, Advanced Electromagnetism **Spring 2018**
AST 203, The Universe **Spring 2017,2018**
PHY 523, General Relativity (graduate course) **Fall 2017**
AST 204, Topics in Modern Astronomy **Spring 2016**
PHY 301, Thermal Physics **Fall 2015, Spring 2016**

Professional Activities

University of Illinois, Urbana-Champaign

University of Chicago - UIUC joint meetings co-organizer **September 2023-present**

University of Cambridge, DAMTP

Friday general relativity seminar co-organizer **October 2020-June 2022**

General relativity journal club co-organizer **October 2020-June 2022**

Princeton University Department of Physics
Member on the Climate and Inclusion Committee **September 2019-May 2020**

External PhD thesis reader
External thesis reader and committee member for Thanassis Giannakoupoulos (University of Lisbon) **September 2022**

Referee
Physical Review D, Physical Review Letters, Classical and Quantum Gravity

Awards/Grants

Hartle award **December 2019**
International Society on General Relativity and Gravitation (GR 22/Amaldi 13 conference)
Erwin H. Leiwant Scholarship **September 2013-May 2014**
Columbia University
John Jay Scholar **September 2010-May 2014**
Columbia University

Refereed Publications

Link to all papers, including preprints: InSpire Hep

23. Hengrui Zhu, **Justin L. Ripley**, Alejandro Cárdenas-Avendanño, Frans Pretorius, *Challenges in quasinormal mode extraction: Perspectives from numerical solutions to the Teukolsky equation.* Phys.Rev.D 109 (2024) 4, 044010 arXiv:2309.13204

22. **Justin L. Ripley**, Abhishek Hegade K.R., Nicolás Yunes, *Probing internal dissipative processes of neutron stars with gravitational waves during the inspiral of neutron star binaries.* Phys. Rev. D 108 (2023) 10, 103037 arXiv:2306.15633

21. Abhishek Hegade K.R., **Justin L. Ripley**, Nicolás Yunes, *Nonrelativistic limit of first-order relativistic viscous fluids.* Phys.Rev.D 107 (2023) 12, 124029 arXiv:2305.09725

20. Tamara Evstafyeva, Michalis Agathos, **Justin L. Ripley**, *Measuring the ringdown scalar polarization of gravitational waves in Einstein-scalar-Gauss-Bonnet gravity.* Phys. Rev. D 107 (2023), 124010 arXiv:2212.11359

19. Abhishek Hegade K.R., **Justin L. Ripley**. Nicolás Yunes, *Where and why does Einstein-scalar-Gauss-Bonnet theory break down?.* Phys.Rev.D 107 (2023) 4, 044044. arXiv:2211.08477

18. Maxence Corman, **Justin L. Ripley**, William E. East, *Nonlinear studies of binary black hole mergers in Einstein-scalar-Gauss-Bonnet gravity.* Phys.Rev.D 107 (2023) 2, 024014. arXiv:2210.09235

17. Alex Pandya, **Justin L. Ripley**. *Dynamics of a nonminimally coupled scalar field in asymptotically AdS_4 spacetime.* Class.Quant.Grav. 39 (2022) 21, 215018. arXiv:2206.08854

16. **Justin L. Ripley**. *Numerical relativity for Horndeski gravity.* IJMPD 31(13):2230017, 2022. arXiv:2207.13074

15. Maxence Corman, William E. East, **Justin L. Ripley**. *Evolution of black holes through a nonsingular cosmological bounce.* JCAP 09 (2022) 063 arXiv:2206.08466

14. **Justin L. Ripley**. *Computing the quasinormal modes and eigenfunctions for the Teukolsky equation using horizon penetrating, hyperboloidally compactified coordinates.* Class. Quantum Grav. 39 (14) 145009 (2022). arXiv:2202.03837

13. William E. East, **Justin L. Ripley**. *Dynamics of Spontaneous Black Hole Scalarization and Mergers in Einstein-Scalar-Gauss-Bonnet Gravity.* Phys. Rev. Lett. 127, 101102 (2021). arXiv:2105.08571

12. **Justin L. Ripley**. *A symmetric hyperbolic formulation of the vacuum Einstein equations in affine-null coordinates.* Journal of Mathematical Physics 62, 062501 (2021). arXiv:2104.09972

11. **Justin L. Ripley**, Nicholas Loutrel, Elena Giorgi, and Frans Pretorius. *Numerical computation of second-order vacuum perturbations of Kerr black holes.* Phys. Rev. D 103 (10), 104018 (2021). arXiv:2010.00162

10. Nicholas Loutrel, **Justin L. Ripley**, Elena Giorgi, and Frans Pretorius. *Second Order Perturbations of Kerr Black Holes: Reconstruction of the Metric.* Phys. Rev. D 103, 104017 (2021). arXiv:2008.11770

9. William E. East, **Justin L. Ripley**. *Evolution of Einstein-scalar-Gauss-Bonnet gravity using a modified harmonic formulation.* Phys.Rev.D 103 4, 044040 (2021). arXiv:2011.03547

8. **Justin L. Ripley**, Frans Pretorius. *Dynamics of a $\mathbb{Z}_2$ symmetric EdGB gravity in spherical symmetry.* Class. Quantum Grav. 37 (15), 155003 (2020). arXiv:2005.05417

7. **Justin L. Ripley**, Frans Pretorius. *Scalarized black hole dynamics in Einstein-dilaton-Gauss-Bonnet gravity.* Phys. Rev. D 101 (4), 044015 (2019). arXiv:1911.11027

6. **Justin L. Ripley**. *Excision and avoiding the use of boundary conditions in numerical relativity.* Class. Quantum Grav. 36 (23) 237001 (2019). arXiv:1908.04234

5. **Justin L. Ripley**, Frans Pretorius. *Gravitational collapse in Einstein dilaton Gauss-Bonnet gravity* Class. Quantum Grav. 36 (13) 134001 (2019). arXiv:1903.07543

4. **Justin L. Ripley**, Frans Pretorius. *Hyperbolicity in Spherical Collapse of a Horndeski Theory.* Phys. Rev. D 99 (8), 084014 (2019). arXiv:1902.01468

3. **Justin L. Ripley**, Kent Yagi. *Black hole perturbation under a 2+2 decomposition in the action.* Phys. Rev. D 97 (2), 024009 (2017). arXiv:1705.03068

2. Anna Ijjas, **Justin L. Ripley**, Paul J. Steinhardt. *NEC violation in mimetic cosmology revisited.* Phys.Lett. B760 132-138 (2016). arXiv:1604.08586

1. **Justin L. Ripley**, Brian D. Metzger, Almudena Arcones, and Gabriel Martinez-Pinedo. *X-ray Decay Lines from Heavy Nuclei in Supernova Remnants as a Probe of the r-Process Origin and the Birth Periods of Magnetars.* Mon. Not. Roy. Astron. Soc. 438 (4), 3243-3254 (2013). arXiv:1310.2950

GRChombo collaboration papers: For contributions to the GRChombo collaboration numerical relativity code.

2. Radia et al., *Lessons for adaptive mesh refinement in numerical relativity.* Class. Quant. Grav. 39 (13) 135006 (2022). arXiv:2112.10567

1. Andrade et al., *GRChombo: An adaptable numerical relativity code for fundamental physics.* J. Open Source Softw. 6 (2021) 3703. arXiv:2201.03458

Colloquia, Seminars, and Conferences

Colloquia

1. Oregon State University, Corvallis, OR **November 2023**
   Neutron stars: a window into dense nuclear matter

Invited conference talks/seminars

21. University of Illinois, Urbana-Champaign, Urbana, IL **February 2024**
    Probing the internal dynamics of neutron stars with gravitational waves

20. Infinity seminar (online) **December 2023**
    Measuring quasinormal modes in hyperboloidal slicings of Kerr

19. University of Oregon, Eugene, OR **November 2023**
    Probing the internal dynamics of neutron stars with gravitational waves

18. University of Mississippi, Oxford, MS (online) **October 2023**
    Probing internal dissipative processes of neutron stars with gravitational waves

17. California Institute of Technology, Pasadena, CA **August 2023**
    Probing internal dissipative processes of neutron stars with gravitational waves

16. University of Illinois, Urbana-Champaign, Urbana, IL **September 2022**
    Modeling black hole binaries in modified theories of gravity

15. Black Hole Initiative, Harvard University, Cambridge, MA (online) **March 2022**
    Numerical Relativity and testing General Relativity with gravitational waves: Parts I&II

14. University of Tübingen, Tübingen, DE (online) **February 2022**
    Evolution of binary black hole systems in scalar Gauss-Bonnet gravity

13. Albert Einstein Institute, Potsdam, DE (online) **November 2021**
Evolution of binary black hole systems in scalar Gauss-Bonnet gravity

12. Sapienza University of Rome, Rome, IT (online) **May 2021**
Computing the second order gravitational perturbation of Kerr black holes

11. University of Oxford, Oxford, UK (online) **February 2021**
The classical evolution of binary black hole systems in scalar-tensor theories

10. University of Virginia, Charlottesville, VA (online) **February 2021**
The classical evolution of binary black hole systems in scalar-tensor theories

9. Kyoto University, Kyoto, JP (online) **February 2021**
The classical evolution of binary black hole systems in scalar-tensor theories

8. University of Southampton, Southampton, UK (online) **January 2021**
The classical evolution of binary black hole systems in scalar-tensor theories

7. University of Cambridge, Cambridge, UK (online) **November 2020**
Computing the second order gravitational perturbation of Kerr black holes

6. Johns Hopkins University, Baltimore, MD (online) **November 2020**
Numerical computation of second order vacuum perturbations of Kerr black holes

5. Princeton University, Princeton, NJ (online) **October 2020**
Classical modifications to Einstein's General Relativity around black holes

4. Perimeter Institute, Waterloo, ON (online) **April 2020**
Exploring the nonlinear dynamics of Einstein dilaton Gauss-Bonnet gravity

3. University of Illinois, Urbana, IL **January 2020**
Testing General Relativity and the nonlinear dynamics of modified gravity theories

2. Massachusetts Institute of Technology, Cambridge, MA **December 2019**
Second order vacuum perturbation of a Kerr black hole

1. Black Hole Initiative, Harvard University, Cambridge, MA **December 2019**
Nonlinear dynamics of Horndeski theories in spherical collapse

Contributed conference talks/seminars

12. Midwest Relativity Meeting, Chicago, IL **Nov 2023**
Probing internal dissipative processes of neutron stars with gravitational waves during the inspiral

11. Amaldi 15 (Online) **July 2023**
Probing internal dissipative processes of neutron stars with gravitational waves

10. APS April Meeting, Minneapolis, MN **April 2023**
Impact of viscosity on the orbital dynamics of neutron star binaries

9. GR23 (online) **July 2022**
Evolution of binary scalar-hairy black holes

8. EPS-HEP2021 Conference (online) **July 2021**
Modeling black hole binaries in scalar-tensor theories of gravity

7. APS April Meeting, Sacramento, CA (online) **April 2021**
Application of the modified generalized harmonic formulation to scalar-tensor gravity theories

6. BritGrav21, UCD, Dublin, Ireland (online) **April 2021**
Computing the second order vacuum perturbation of Kerr black holes

5. XIII Black Holes Workshop, IST, Lisbon, PT (online) **December 2020**
Computing the second order vacuum perturbation of a Kerr black hole

4. APS April Meeting, Washington, DC (online) **April 2020**
Second order perturbation of a Kerr black hole

3. GR 22/Amaldi 13, Valencia, Spain **July 2019**
Nonlinear dynamics of Horndeski theories in spherical collapse

2. APS April Meeting, Denver, CO **April 2019**
Hyperbolicity in gravitational collapse in a modified gravity theory

1. Numerical Relativity beyond General Relativity, Benasque, Spain **June 2018**
Gravitational collapse in a modified gravity theory