

# Ryan Unger

email | website

Fine Hall 408  
Washington Rd  
Princeton, NJ 08544  
USA

## EDUCATION

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### Princeton University

Princeton NJ, USA

*Ph.D. candidate in Mathematics*

*2019 - ongoing*

Advisor: Mihalis Dafermos

Visiting student at **University of Cambridge** from Michaelmas 2022 - Easter 2023

### University of Tennessee

Knoxville TN, USA

*B.S. in Mathematics, summa cum laude*

*2015 - 2019*

Advisor: Alexandre Freire

Thesis: **Some problems in scalar curvature geometry**

## RESEARCH INTERESTS

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General relativity, nonlinear wave equations, and scalar curvature geometry.

## PAPERS

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### Event horizon gluing and black hole formation in vacuum: the very slowly rotating case

2023

*with Christoph Kehle*

arXiv:2304.08455.

### Gravitational collapse to extremal black holes and the third law of black hole thermodynamics

2022

*with Christoph Kehle*

arXiv:2211.15742. Submitted.

### Noncompact fill-ins of Bartnik data

2022

*with Dan A. Lee and Martin Lesourd*

arXiv:2211.06280. Submitted.

### Density and positive mass theorems for incomplete manifolds

2022

*with Dan A. Lee and Martin Lesourd*

arXiv:2201.01328. Submitted.

### Density and positive mass theorems for initial data sets with boundary

2021

*with Dan A. Lee and Martin Lesourd*

*Commun. Math. Phys.* **395**, 643–677 (2022).

### The positive mass theorem with arbitrary ends

2021

*with Martin Lesourd and Shing-Tung Yau*

arXiv:2103.02744. To appear in Journal of Differential Geometry.

### Positive scalar curvature on noncompact manifolds and the Liouville theorem

2020

*with Martin Lesourd and Shing-Tung Yau*

arXiv:2009.12618. To appear in Communications in Geometry and Analysis.

## INVITED TALKS

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|   |               |
|---|---------------|
| Edinburgh analysis seminar  | April 2023    |
| Oxbridge PDE conference   | March 2023    |
| Rutgers hyperbolic and dispersive PDE seminar                                 | February 2023 |
| Berkeley analysis seminar   | February 2023 |
| Vanderbilt analysis seminar   | February 2023 |
| Harvard BHI colloquium  | February 2023 |
| Cambridge Friday GR seminar   | January 2023  |
| Zürich mathematical physics & PDE seminar                                     | December 2022 |
| Imperial College London junior analysis seminar                               | November 2022 |
| YMNCGA Texas A&M  | August 2022   |
| Cambridge analysis student seminar  | June 2022     |
| Harvard CMSA workshop on scalar curvature and minimal surfaces                | May 2022      |
| Joint Mathematics Meeting special session on scalar curvature and convergence | April 2022    |
| Princeton graduate student seminar  | October 2021  |
| Johns Hopkins analysis seminar  | April 2021    |
| Harvard CMSA general relativity seminar                                       | April 2021    |
| Princeton junior general relativity seminar                                   | March 2021    |
| Princeton graduate student seminar  | October 2019  |

## TEACHING EXPERIENCE

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|   |                             |
|---|-----------------------------|
| Part II Differential Geometry supervisions                              | Lent 2023 (Cambridge)       |
| Part III Analysis of PDE examples class instructor                      | Michaelmas 2022 (Cambridge) |
| Part III General Relativity examples class instructor                   | Michaelmas 2022 (Cambridge) |
| Calculus I precept instructor   | Spring 2022 (Princeton)     |
| Teaching assistant for Calculus III, Linear Algebra, Real Analysis, PDE | (Princeton)                 |

## AWARDS AND HONORS

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|   |            |
|---|------------|
| Porter Ogden Jacobus Fellowship                     | 2023       |
| John H. Barrett Memorial Scholarship                | 2019       |
| James A. Cooley Memorial Scholarship                | 2018       |
| UTK Office of Undergraduate Research Grant          | 2017       |
| Pi Mu Epsilon Tennessee Delta Chapter               | 2017       |
| Cooper D. Schmitt Memorial Scholarship              | 2017, 2018 |
| Lucile and Herbert E. Lee Memorial Scholarship      | 2017       |
| UTK Nuclear Engineering Top Freshman Academic Award | 2016       |
| Tennessee Volunteer Scholarship                     | 2015-2019  |

## SERVICE

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| Referee for Annales Henri Poincaré             |                       |
| Princeton Graduate Student Seminar Organizer   | Fall 2020-Spring 2021 |
| Princeton First Year Student Seminar Organizer | Fall 2019-Spring 2020 |