Ameek Malhotra

Curriculum Vitae

Physics Department, Swansea University
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Research Interests

The Early Universe, Gravitational Wave Backgrounds, Bayesian Inference

Employment

2023–2026 **Postdoctoral Researcher**, *Swansea University*, UK

Education

2020-2023 **PhD**, *University of New South Wales*, Sydney, Australia
Thesis: *Probing Inflationary Physics with Gravitational Waves*
Supervisor: Dr. Emanuela Dimastrogiovanni

2017–2019 **MSc**, *University of Geneva*, Geneva, Switzerland
Thesis: *Initial Spin Distribution of Primordial Black Holes,*
Supervisor: Prof. Antonio Riotto

2013–2017 **B.Tech**, *Engineering Physics, IIT Delhi*, New Delhi, India
Thesis: *Second Harmonic Generation in Resonant Cavities*
Supervisor: Dr. Bhaskar Kanseri

Presentations

Invited Talks

6 May 2025 Nottingham Particle Cosmology and Gravity Seminar: *Bayesian Optimisation for efficient cosmological model selection* (50 min)

11 November 2024 Sydney CPPC Seminar Series: *Aspects of early universe cosmology: gravitational waves and cosmological model selection* (50 min)

25 November 2022 Majorana–Raychaudhuri Seminar Series: *Probing the early universe with gravitational waves* (45 min)

25 October 2022 Cosmology Journal Club, Van Swinderen Institute for Particle Physics and Gravity, University of Groningen: *Probing the early universe with gravitational waves* (50 min)

9 March 2022 ICG Portsmouth Theoretical Cosmology Seminar: *Gravitational wave anisotropies as a probe of the early universe* (50 min)

Lectures

28–29 November 2024 Sydney CPPC meeting: Lectures on Gravitational Waves

23–24 July 2024 Swansea Cosmology Group: Lectures on MCMC methods for Cosmology

Contributed Talks

3 June 2025 LISA Cosmology Workshop 2025, Tallinn: *Bayesian free-form reconstruction of curvature perturbations from induced gravitational waves* (15 min)

22 May 2025 NEHOP 2025, Brussels: *Bayesian free-form reconstruction of curvature perturbations from scalar induced gravitational waves* (15 min)

7 April 2025 Tales of Gravity/UK Cosmo 2025, Nottingham: *Bayesian Optimisation for Bayesian Evidence* (10 min)

11 December 2024 The International Joint Workshop on the Standard Model, Sydney: *Astrometry, gravitational waves and synergies with Pulsar Timing Arrays* (15 min)

26 September 2024 DESY Theory Workshop 2024: *Measuring Kinematic anisotropies with Pulsar Timing Arrays* (15 min)

19 September 2024 Gravitational Wave Orchestra in the Alps 2024: *Measuring Kinematic anisotropies with Pulsar Timing Arrays* (15 min)

23 May 2024 Frontiers in Cosmology and Gravitational Physics 2024: *Measuring Kinematic anisotropies with Pulsar Timing Arrays* (15 min; Runner-up: Best contributed talk)

16 April 2024 BritGrav 24: *Measuring Kinematic anisotropies with Pulsar Timing Arrays* (12 min)

26 July 2023 Sixth Sydney CPPC meeting: *Probing the early universe with stochastic gravitational wave backgrounds* (25 min)

6 July 2023 Cosmology from Home 2023: *Cosmological gravitational wave anisotropies from adiabatic and isocurvature perturbations* (15 min)

2 June 2023 Third EuCAPT Annual Symposium 2023: *A new universal property of cosmological gravitational wave anisotropies* (5 min)

6 December 2022 Dark Side of the Universe 2022, Sydney: *Constraining primordial tensor features with the anisotropies of the Cosmic Microwave Background* (15 min)

23 September 2022 A Cosmic Window to Fundamental Physics: Primordial Non-Gaussianity and Beyond, IFT Madrid: *Gravitational wave anisotropies as a probe of primordial non-Gaussianity* (15 min)

20 July 2022 14th International LISA Symposium 2022, *Gravitational wave anisotropies as a probe of the inflationary particle content* (15 min)

7 July 2022 23rd International Conference on General Relativity and Gravitation, Beijing: *Gravitational wave anisotropies as probe of the inflationary particle content* (15 min)

5 July 2022 Cosmology from Home 2022, *Gravitational wave anisotropies as probe of the inflationary particle content* (15 min)

27 June 2022 4th Sydney CPPC meeting: *Searching for primordial tensor modes across small and large scales* (20 min)

24 June 2022 Gravity: Current challenges in black hole physics and cosmology, YITP Kyoto: *Gravitational wave anisotropies as probe of the inflationary particle content* (15 min)

24 June 2022 ACAMAR meeting on Astroparticle Physics 2022: *Gravitational wave anisotropies as probe of the inflationary particle content* (15 min)

Posters

10 June 2025	CosmoFONDUE 2025, Geneva: *Bayesian Optimisation for efficient cosmological model selection*
15 April 2024	Royal Society Meeting 2024, Challenging the Standard Cosmological Model: *Measuring the kinematic dipole with Pulsar Timing Arrays*
8 September 2022	Gravitational Wave Orchestra, UCLouvain, "*Constraining primordial tensor features with the anisotropies of the Cosmic Microwave Background*"

Students supervised

2024–Present	Secondary supervisor of PhD candidate Nathan Cohen (UNSW Sydney, primary supervisor: Jan Hamann)

Technical Skills

Programming	Python, Fortran, Mathematica, LaTeX.
Other	`CAMB`, `Cobaya`, enterprise, experience with HPC

Miscellaneous

Collaboration memberships	Member of LISA (2021–Present), ET (2022–Present), SKA (2024–Present)
Journals refereed	European Physical Journal C, Journal for Cosmology and Astroparticle Physics
Organising	Theory Seminar and Cosmology journal club, Swansea University (2024–Present) UNSW Sydney and Sydney University joint journal club (2022–2023)
Research Visits	Gordon Godfrey award (5500 AUD), UNSW Sydney (November–December 2024) Instituto de Física Teórica, UAM/CSIC, Madrid (September – October 2022)

References

Prof. Gianmassimo Tasinato	Physics Department, Swansea University SA2 8PP, Swansea, United Kingdom Email: g.tasinato@swansea.ac.uk Tel: +44 (0) 1792 295847
Dr. Ivonne Zavala	Physics Department, Swansea University SA2 8PP, Swansea, United Kingdom Email: e.i.zavalacarrasco@swansea.ac.uk Tel: +44 (0) 1792 602294
Dr. Emanuela Dimastrogiovanni	Van Swinderen Institute, University of Groningen, Nijenborgh 4, 9747 AG Groningen, The Netherlands Email: e.dimastrogiovanni@rug.nl Tel: +31 50 36 34950
Dr. Jan Hamann	School of Physics, The University of New South Wales, Sydney NSW 2052, Australia Email: jan.hamann@unsw.edu.au
Dr. Matteo Fasiello	Instituto de Física Teórica UAM/CSIC Calle Nicolás Cabrera 13–15, Cantoblanco, 28049 Madrid, Spain Email: matteo.fasiello@csic.es Tel: +34 91 299 9817

Publications

[1] A. Ghaleb, A. Malhotra, G. Tasinato, and I. Zavala, "Bayesian reconstruction of primordial perturbations from induced gravitational waves", (2025), arXiv:2505.22534 [astro-ph.CO].

[2] G. Borghetto, A. Malhotra, G. Tasinato, and I. Zavala, "Bounded Dark Energy", (2025), arXiv:2503.11628 [astro-ph.CO]. *(Under review at Phys. Rev. D)*

[3] S. Bhattacharya, G. Borghetto, A. Malhotra, S. Parameswaran, G. Tasinato, and I. Zavala, "Cosmological tests of quintessence in quantum gravity", JCAP **04**, 086 (2025), arXiv:2410.21243 [astro-ph.CO].

[4] B. Atkins, A. Malhotra, and G. Tasinato, "Novel probe of graviton dispersion relations at nanohertz frequencies", Phys. Rev. D **110**, 124018 (2024), arXiv:2408.10122 [gr-qc].

[5] N. M. J. Cruz, A. Malhotra, G. Tasinato, and I. Zavala, "Astrometry meets Pulsar Timing Arrays: Synergies for Gravitational Wave Detection", (2024), arXiv:2412.14010 [astro-ph.CO]. *(Under review at Phys. Rev. D)*

[6] N. M. J. Cruz, A. Malhotra, G. Tasinato, and I. Zavala, "Measuring the circular polarization of gravitational waves with pulsar timing arrays", Phys. Rev. D **110**, 103505 (2024), arXiv:2406.04957 [astro-ph.CO].

[7] S. Bhattacharya, G. Borghetto, A. Malhotra, S. Parameswaran, G. Tasinato, and I. Zavala, "Cosmological constraints on curved quintessence", JCAP **09**, 073 (2024), arXiv:2405.17396 [astro-ph.CO].

[8] N. M. J. Cruz, A. Malhotra, G. Tasinato, and I. Zavala, "Measuring kinematic anisotropies with pulsar timing arrays", Phys. Rev. D **110**, 063526 (2024), arXiv:2402.17312 [gr-qc].

[9] A. Malhotra, "Probing Inflationary Physics with Gravitational Waves", PhD thesis (New South Wales U., July 2023).

[10] P. Auclair et al., "Cosmology with the Laser Interferometer Space Antenna", Living Rev. Rel. **26**, 5 (2023), arXiv:2204.05434 [astro-ph.CO]. *(including **A. Malhotra**)*

[11] E. Dimastrogiovanni, M. Fasiello, A. Malhotra, and G. Tasinato, "Enhancing gravitational wave anisotropies with peaked scalar sources", JCAP **01**, 018 (2023), arXiv:2205.05644 [astro-ph.CO].

[12] A. Malhotra, E. Dimastrogiovanni, G. Domènech, M. Fasiello, and G. Tasinato, "New universal property of cosmological gravitational wave anisotropies", Phys. Rev. D **107**, 103502 (2023), arXiv:2212.10316 [gr-qc].

[13] J. Hamann and A. Malhotra, "Constraining primordial tensor features with the anisotropies of the Cosmic Microwave Background", JCAP **12**, 015 (2022), arXiv:2209.00827 [astro-ph.CO].

[14] E. Dimastrogiovanni, M. Fasiello, A. Malhotra, P. D. Meerburg, and G. Orlando, "Testing the early universe with anisotropies of the gravitational wave background", JCAP **02**, 040 (2022), arXiv:2109.03077 [astro-ph.CO].

[15] A. Malhotra, E. Dimastrogiovanni, M. Fasiello, and M. Shiraishi, "Cross-correlations as a Diagnostic Tool for Primordial Gravitational Waves", JCAP **03**, 088 (2021), arXiv:2012.03498 [astro-ph.CO].

[16] V. De Luca, V. Desjacques, G. Franciolini, A. Malhotra, and A. Riotto, "The initial spin probability distribution of primordial black holes", JCAP **05**, 018 (2019), arXiv:1903.01179 [astro-ph.CO].