Matteo Biagetti

Curriculum Vitae

Current Position

Since 2023 **Researcher**, *Istituto di Ricerca e Innovazione Tecnologica, Area Science Park*, Trieste, Italy.

Previous Positions

2020 – 2023 **Postdoctoral fellow**, *Scuola Internazionale Superiore di Studi Avanzati (SISSA)*, Trieste, Italy.
Funding: NWO VENI grant (until end 2021)

2018 – 2020 **VENI postdoctoral fellow**, *University of Amsterdam*, Amsterdam, Netherlands.
Funding: NWO VENI grant

2016 – 2018 **Delta Institute for Theoretical Physics Postdoctoral Fellow**, *University of Amsterdam*, Amsterdam, Netherlands.
Supervisor: Daniel Baumann

2016 **Postdoctoral Researcher**, *University of Geneva*, Geneva, Switzerland.
Supervisor: Vincent Desjacques

Education

2012–2016 **Ph.D.**, *University of Geneva*, Geneva, Switzerland.
Supervisor: Vincent Desjacques

2010–2012 **Master's Degree**, *University of Padova*, Padova, Italy.
Supervisor: Sabino Matarrese

Research Activity

My research focuses on the physics of the Early Universe and its imprint on the Large-Scale Structures of the Universe. With this goal in mind, I have acquired combined expertise in studying high-energy processes relevant during inflation and modeling the physics of the late Universe.

STUDIES OF THE EARLY UNIVERSE

- Inflationary consistency relations
- Primordial non-Gaussianity
- Primordial Gravitational Waves
- Primordial Black Holes

STUDIES OF THE LATE UNIVERSE

- Large-scale clustering of dark matter halos and voids

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https://areasciencepark-rit.gitlab.io/lade/matteo.biagetti/

- Cosmological N-body simulations
- Large-Scale clustering including massive neutrinos, primordial non-Gaussianity or primordial features
- Topological data analysis applied to large-scale clustering

Output indicators. As of July 2023, I have published 32 papers with a citation count of 1006 and an h-index of 19 on INSPIRE-HEP and NASA-ADS. For a detailed citation record of my papers, see http://inspirehep.net/author/profile/M.Biagetti.1.

All my publications are in the journals with the highest impact factors in the field of Cosmology and Astroparticle Physics:

- 13 papers in *Journal of Cosmology and Astroparticle Physics* (JCAP) - 2020 IF: 5.839
- 7 papers in *Monthly Notices of the Royal Astronomical Society* (MNRAS) -2021 IF: 5.235
- 7 papers in *Physical Review D* (PRD) - 2021 IF: 5.407
- 2 papers in *The Astrophysical Journal* (ApJ) - 2021 IF: 5.521
- 1 paper in *Physical Letters B* (PLB) - 2020 IF: 4.771
- 1 paper in *Physical Review Research* (PRR) - 2021 IF: 3.900
- 1 paper in *Galaxies* (MDPI) - 2020 IF: 3.171

Computational Resources. I have acquired expertise in running and analyzing cosmological N-Body simulations and I currently own one of the largest sets of simulations with non-Gaussian initial conditions. A subset of this data has been already used in several publications. To produce these datasets, I have successfully applied for CPU time both at University of Geneva (Baobab supercluster) and at the National Dutch Computing Facilities (Cartesius and Snellius superclusters). Full info at https://mbiagetti.gitlab.io/cosmos/nbody/

Fellowships and awards

2020 – 2030 **Abilitazione Scientifica Nazionale**, *Italian Ministry of Education*, Italy.
Qualified as Associate Professor in Italy

2023 – 2025 **SMASH fellowship (declined)**, *Marie Curie COFUND*, University of Nova Gorica , Slovenia.
Amount: 10 Millions Eur
Role: SMASH Fellow

2018 – 2022 **VENI grant**, *Netherlands Organization for Scientific Research (NWO)*, Netherlands.
Amount: 250,000 EUR
Role: Principal Investigator

2018 – 2021 **Computing Time Grant (3 consecutive years)**, *Netherlands Organization for Scientific Research (NWO)*, Netherlands.
Amount: 2.5 Million CPU hours (total)
Role: Principal Investigator

Since 2021 **Storage Space at European Open Science Cloud**, *EUDAT*, "Cosmic Origins from Simulated Universes".
Amount: 100TB

2016 – 2018 **Delta Institute for Theoretical Physics Postdoctoral Fellowship**, *Netherlands Organization for Scientific Research (NWO)*, Netherlands.
Amount: 18.3 Million EUR
Role: Postdoctoral researcher

2014 – 2015 **Travel funding (2 consecutive years)**, *Ernst et Lucie Schmidheiny foundation*, Switzerland.
Amount: 1,600 EUR
Role: Principal Investigator

International Activities

Selected list of the most recent invited talks

February 2023 Astrophysics Seminar, Trieste Observatory (Italy)

January 2023 Theoretical Physics Seminar, LAPTh, Annecy (France)

May 2022 Physics Colloquium, University of Nova Gorica (Slovenia)

Feb 2022 Euclid Additional Probes GC telecon [remote]

Nov 2021 Cosmology seminar, ETH Zurich (Switzerland)[remote]

May 2021 Cosmology seminar, University of Geneva (Switzerland) [remote]

Nov 2020 Cosmology seminar. Lorentz Institute, Leiden (Netherlands) [remote]

Oct 2020 AstroCoffee, IAS Princeton (US) [remote]

Selected list of conference/workshop talks

May 2023 DataShape Seminar INRIA @Porquerolles (France)

Dec 2022 Extracting Reliable Constraints from Large-Scale Structure Surveys, Technion (Haifa)

Jul 2022 Smartno 2022, Vipolze (Slovenia)

Dec 2020 Latin American Workshop, Sao Paolo (Brazil) [remote]

Sep 2019 The non-Gaussian Universe, Cambridge (UK)

Jun 2019 String Theory and Cosmology, Castelldefels (Spain)

Network of collaborators. I have an international network of collaborators across 3 continents and 30 countries all over the world. I have visited top institutes in the world, such as the *Institute of Advanced Studies* in Princeton, *Berkeley National Laboratory*, *Fermilab*, *Caltech*, *CERN*, *ETH* and *University of Cambridge*, among others.

Mentoring and Supervision

2022 **Co-Supervision of Master Student**, *University of Trieste*, Trieste, Italy.
Master's Degree Candidate: Giosue Gambardella

2022 **Co-Supervision of PhD Student**, *Trieste Observatory (OATs)*, Trieste, Italy.
Ph.D. Candidate: Jacopo Salvalaggio

2022 **Mentoring of PhD Student**, *Scuola Internazionale Superiore di Studi Avanzati*, Trieste, Italy.
Ph.D. Candidate: Kevin Pardede

2019 **Supervision of visiting PhD student**, *University of Amsterdam*, Amsterdam, Netherlands.
Ph.D. Candidate: Giorgio Orlando (University of Padova)

2019 **Supervision of visiting PhD student**, *University of Amsterdam*, Amsterdam, Netherlands.
Ph.D. Candidate: Alex Cole (University of Wisconsin-Madison)

Teaching activities

2018 **Academic Teaching Assistance**, *Galileo Galilei Institute*, Florence, Italy.
Doctoral course on "Theory of fundamental interactions"

2012 – 2016 **Academic Teaching Assistance**, *University of Geneva*, Geneva, Switzerland.
Bachelor's degree course on "Mathematical Methods for Physics" (3 years in total)

2013 **Academic Teaching Assistance**, *University of Geneva*, Geneva, Switzerland.
Master's degree course on "Cosmology"

Organisation of Scientific Meetings

July 2023 **Main Organizer**, *Sexten Center for Astrophysics*, Sexten, Italy.
Workshop – 40 live participants
Title: "New Strategies for Extracting Cosmology from Galaxy Surveys"
`https://indico.sissa.it/event/93/`

June 2023 **Main Organizer**, *Institute for Fundamental Physics of the Universe*, Trieste, Italy.
IFPU Team Research week – 15 live participants, 5 remote participants
Title: "Applications of Topological Data Analysis to Cosmology and Beyond"
`https://indico.sissa.it/event/100/`

July 2022 **Main Organizer**, *Institute for Fundamental Physics of the Universe*, Trieste, Italy.
IFPU Focus week – 25 live participants, 30 remote participants
Title: "Interpretable and Higher-Order Summary Statistics for Late-Time Cosmology"
`https://indico.sissa.it/event/77/`

July 2021 **Main Organizer**, *Lorentz Center*, Leiden, Netherlands.
Lorentz Center Workshop – 25 participants
Title: "Inflationary Imprints in Large-Scale Structures"
`https://www.lorentzcenter.nl/inflationary-imprints-in-large-scale-structure-2021.html` (later cancelled due to COVID-19)

2018-2020 **Main Organizer**, *Netherlands Organization for Scientific Research (NWO)*, Netherlands.
Dutch Cosmology Meeting (6 events/year ~ 30 participants)
`http://cosmology.nl/`

Institutional Responsabilities

2020-2021 **Organizer**, *Institute for Fundamental Physics of the Universe*, Trieste, Italy.
Cosmology and Astrophysics Seminars and Journal Clubs

2019 **Member of Ph.D. Defense Committee**, *University of Leiden*, Leiden, Netherlands.
Ph.D. Candidate: Georgios Papadomanolakis

2018 – 2019 **Organizer**, *University of Amsterdam*, Amsterdam, Netherlands.
Weekly Journal Clubs

Reviewing Activities

Since 2016 Referee - A&A, ApJ, JCAP, MNRAS, PRL, PRD, PRX, PLB

Major Collaborations

Since 2019 Member of Euclid Consortium

Public Outreach

July 2019 **Interview**, *National Geographic Magazine (NL)*.
Title: Op zoek naar het begin der tijden, published on the July 2019 issue

2013 - 2016 **Writer**, *Gushmag Social Magazine*, Title: Un caffè col fisico (Italian).
Link: http://www.gushmag.it/un-caffe-col-fisico/

2015 - 2016 **Writer**, *UNOX Website*, Title: Science of cooking.
Link: http://blog.unox.com/category/science-of-cooking/?lang=en

Oct 2014 **Public Talk**, *Festival Emergency*, Fonderie Kugler, Geneva(CH).
Title: Our Universe in a lifetime

Publications

Disclaimer. My research is placed at the connection of the field of Astrophysics and Theoretical Physics. These two fields have different conventions in author order: the former predominantly order author by contributions, and the second by alphabetical order. Therefore, the author ordering in my publication record is not uniform. Leading contributions and supervision is highlighted as per the legend below.

Legend. Leading contribution is indicated in **bold**. Students supervised for the project are indicated in *italics*.

Dec 2022 **M. Biagetti**, J. Calles, L. Castiblanco, K. Gonzalez, J. Noreña "*A Model for the Squeezed Bispectrum in the Non-Linear Regime*", arxiv:2212.11940

Nov 2022 Euclid collaboration (J. Adamek, R. Angulo, C. Arnold, M. Baldi, M. Biagetti et al.) "*Euclid: modeling massive neutrinos in cosmology – a code comparison*", JCAP 06 (2023) 035, arxiv:2211.12457

Oct 2022 **M. Biagetti**, G. Franciolini, A. Riotto "*The JWST High Redshift Observations and Primordial non-Gaussianity*", Astrophys.J. 944 (2023) 2, 113 , arxiv:2210.04812

Jun 2022 *T. Floss*, **M. Biagetti**, D. Meerburg "*Primordial non-Gaussianity and non-Gaussian Covariance*", Phys.Rev.D 107 (2023) 2, 023528, arxiv:2206.10458

Jun 2022 *A. Fumagalli*, **M. Biagetti**, A. Saro, E. Sefusatti, A. Slosar, P. Monaco, A. Veropalumbo "*Fitting covariance matrices to simulations*", JCAP 12 (2022) 022, arxiv:2206.05191

Mar 2022 Snowmass 2022 (A. Achucarro, M. Biagetti et al.) "*Inflation: Theory and Observations*", arxiv:2203.08128

Mar 2022 **M. Biagetti**, *J. Calles*, *L. Castiblanco*, A. Cole, J. Noreña "*Fisher Forecasts for Primordial non-Gaussianity from Persistent Homology*", JCAP 10 (2022) 002, arxiv:2203.08262

Mar 2022 K. Pardede, F. Rizzo, M. Biagetti, E. Castorina, E. Sefusatti, P. Monaco "*"Bispectrum-window convolution via Hankel transform*", JCAP 10 (2022) 066, arxiv:2203.04174

Nov 2021 **M. Biagetti**, L. Castiblanco, J. Noreña, E. Sefusatti "*The Covariance of Squeezed Bispectrum Configurations*", JCAP 09 (2022) 009, arxiv:2111.05887

Jul 2021 D. Alkhanishvili, C. Porciani, E. Sefusatti, M. Biagetti, A. Lazanu, A. Oddo, V. Yankelevich "*The reach of next-to-leading-order perturbation theory for the matter bispectrum*", MNRAS 512 (2022) 4, arxiv:2107.08054

May 2021 M. Biagetti, V. De Luca, G. Franciolini, A. Kehagias, A. Riotto "*The Formation Probability of Primordial Black Holes*", PLB 820 (2021) 136602, arxiv:2105.07810

Dec 2020 A. Cole, M. Biagetti, G. Shiu "*Topological Echoes of Primordial Physics in the Universe at Large Scales*", NeurIPS 2020, arxiv:2012.03616

Oct 2020 A. Moradinezhad Dizgah, M. Biagetti, E. Sefusatti, V. Desjacques, J. Noreña, "*Primordial Non-Gaussianity from Biased Tracers: Likelihood Analysis of Real-Space Power Spectrum and Bispectrum*", JCAP 05 (2021) 015, arxiv:2010.14523

Sep 2020 **M. Biagetti**, *A. Cole*, G. Shiu, "*The Persistence of Large Scale Structures I: Primordial non-Gaussianity*", JCAP 04 (2021) 061, arXiv:2009.04819

Jan 2020 **M. Biagetti**, *G. Orlando*, "*Primordial Gravitational Waves from Galaxy Intrinsic Alignments*", JCAP 07 (2020) 005, arXiv:2001.05930

Sep 2019 K. C. Chan, Y. Li, M. Biagetti, N. Hamaus, "*Measurement of Void Bias Using Separate Universe Simulations*", ApJ 2, 889 (2020), arXiv:1909.03736

Jun 2019 **M. Biagetti**, "*The Hunt for Primordial Interactions in the Large Scale Structures of the Universe*", Galaxies 7, 3 (2019), arXiv:1906.12244

Jun 2019 F. Beutler, **M. Biagetti**, D. Green, A. Slosar, B. Wallisch, "*Primordial Features from Linear to Nonlinear Scales*", PRR 1 ,3, 033209 (2019), arXiv:1906.08758

Dec 2018 K. C. Chan, N. Hamaus, M. Biagetti, "*Constraint of Void Bias on Primordial non-Gaussianity*", PRD D99, 121304 (2019), arXiv:1812:04024

Apr 2018 **M. Biagetti**, G. Franciolini, A. Kehagias, A. Riotto, "*Primordial Black Holes from Inflation and Quantum Diffusion*", JCAP 1807, 032 (2018), arXiv:1804.07124

Apr 2018 A. Nusser, M. Biagetti, V. Desjacques, "*Abundance of peaks and dips in three-dimensional mass and halo density fields: a test for cosmology*", MNRAS 480, 1599 (2018), arXiv:1804.05328

Aug 2017 **M. Biagetti**, M. Fasiello, E. Dimastrogiovanni, "*Possible Signatures of the Inflationary Particle Content: Spin-2 fields*", JCAP 1710, 038 (2017), arXiv:1708.01587

Nov 2016 **M. Biagetti**, T. Lazeyras, T. Baldauf, V. Desjacques, F. Schmidt, "*Verifying the consistency relation for the scale-dependent bias from local primordial non-Gaussianity*", MNRAS 468, 3 (2017), arXiv:1611.04901

Dec 2015 A. Moradinezhad, K. C. Chan, J. Noreña, M. Biagetti, V. Desjacques, "*Squeezing the halo bispectrum: a test of bias models*", JCAP 1609, 030 (2016), arXiv:1512.06084

Aug 2015 **M. Biagetti**, A. Kehagias, D. Racco, A. Riotto, "*The Halo Boltzmann Equation*", JCAP 1604, 040 (2016), arXiv:1508.07330

Feb 2015 **M. Biagetti**, A. Kehagias, A. Riotto, "*What can we learn from the running of the spectral index if no tensors are detected in the cosmic microwave background anisotropy*", PRD D91 103527 (2015), arXiv:1502.02289

Jan 2015 **M. Biagetti**, V. Desjacques, "*Scale-dependent bias from an inflationary bispectrum: the effect of a stochastic moving barrier*", MNRAS 451 no.4, 3643-3648 (2015), arXiv:1501.04982

Nov 2014 **M. Biagetti**, M. Fasiello, E. Dimastrogiovanni, M. Peloso, "*Gravitational Waves and Scalar Perturbations from Spectator Fields*", JCAP 1504, 011 (2015), arXiv:1411.3029

Aug 2014 **M. Biagetti**, V. Desjacques, A. Kehagias, A. Riotto, "*Halo Velocity Bias*", PRD D90 103529 (2014), arXiv:1408.0293

Jun 2014 V. Desjacques, A. Moradinezhad, M. Biagetti, "*Ultraviolet background fluctuations with clustered sources*", MNRAS 444 no.3, 2793-2807 (2014), arXiv:1406.6379

May 2014 **M. Biagetti**, V. Desjacques, A. Kehagias and A. Riotto, "*Nonlocal halo bias with and without massive neutrinos*", PRD D90, 045022 (2014), arXiv:1405.1435

Oct 2013 **M. Biagetti**, K. C. Chan, V. Desjacques, A. Paranjape, "*Measuring nonlocal Lagrangian peak bias*", MNRAS 441 no.2, 1457-1467 (2014), arXiv:1310.1401

May 2013 **M. Biagetti**, M. Fasiello, A. Riotto, "*Enhancing Inflationary Tensor Modes Through Spectator Fields*", PRD D88 103518 (2013), arXiv:1305.7241

Apr 2013 M. Biagetti, A. Kehagias, E. Morgante, H. Perrier, A. Riotto, "*Symmetries of vector perturbations during DeSitter epoch*", JCAP 1307, 030 (2013), arXiv: 1304.7785

Jan 2013 **M. Biagetti**, H. Perrier, A. Riotto, V. Desjacques, "*Testing the running of non-Gaussianity through the CMB mu-distorsion and the halo bias*", PRD D87 063521 (2013), arXiv:1301.2771

Aug 2012 **M. Biagetti**, V. Desjacques, A. Riotto, "*Testing Multi-Field Inflation with Galaxy Bias*", MNRAS 1774-1780 (2013), arXiv:1208.1616