

CURRICULUM VITAE

February 21, 2022

Personal Data

Name: Francisco Villaescusa-Navarro
Title: Ph.D. in physics
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Employment: Research Scientist
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Education

Ph.D.	Physics	07/2008 - 05/2012	Valencia University, Spain
M.Sc.	Physics	09/2007 - 07/2008	Valencia University, Spain
B.Sc.	Physics	09/2002 - 07/2007	Valencia University, Spain Granted with Excellent prize

Academic and Professional Positions

Research Scientist	Simons Foundation, New York, USA	09/2021 - present
Visiting Research Scholar	Princeton University, Princeton, USA	10/2021 - present
Associate Research Scholar	Princeton University, Princeton, USA	09/2019 - 09/2021
Flatiron Research Fellow	CCA, Flatiron Institute, New York, USA	09/2016 - 09/2019
CosmoIGM Postdoctoral Fellow	INAF/INFN, Trieste, Italy	07/2012 - 08/2016
JAE Predoctoral Fellow	IFIC/Valencia University, Spain	01/2008 - 06/2012

Visiting graduate student	ITC, Harvard University, USA	07/2010 - 08/2011
Visiting graduate student	CITA, Toronto, Canada	09/2009 - 12/2009
Undergraduate research fellow	IFIC/Valencia University, Spain	09/2007 - 12/2007
Undergraduate research fellow	Valencia University, Spain	01/2007 - 06/2007
Undergraduate summer fellow	Institut fur Kernphysik, Mainz, Germany	08/2006 - 09/2006

Major Fields of Research

I am a computational cosmologist working on developing the theoretical framework needed to answer fundamental questions through data from cosmological surveys in the most precise way.

Machine Learning	Massive neutrinos cosmology	21cm cosmology	Numerical simulations
Large-scale structure	Information content	Galaxy clusters	Cosmic voids
Baryonic acoustic oscillations	Redshift-space distortions	Analytics methods	Modified Gravity
$\text{Ly}\alpha$ -forest	Galaxy formation and evolution	Dark matter	Software development

Professional activities

Referee	Monthly Notices of the Royal Astronomical Society	2012-
	Physical Review D	2013-
	Physical Review Letters	2015-
	Journal of Cosmology and Astroparticle Physics	2015-
	The Astrophysical Journal	2015-
	Revista Metode	2016-
	The American Astronomical Society Journal	2016-
	Nature	2017-
	Physical Review E	2019-
	European Physical Journal C	2020-
	Publications of the Astronomical Society of Japan	2020-
	Nature Artificial Intelligence	2021-
	Nature Astronomy	2021-
Reviewer	Physics of the Dark Universe	2021-
	DIRAC High Performance Computing (UK)	2018-
	National Science Centre (Poland)	2018-
	Dutch Research Council (Netherlands)	2019-
	Science and Technology Facilities Council (UK)	2020-
Editor	German Academic Exchange Service (DAAD) (Germany)	2021-
	Universe	2020-

Organization of Scientific meetings

Intensity mapping workshop	CCA, NY, USA	Feb. 20-22, 2018	w/ G. Hinshaw, A. Pullen, R. Somerville & D.Spergel
CCA cosmology group meeting	CCA, NY, USA	Jul. 2017 - Jul. 2018	
The non-linear Universe workshop	Smartno, Slovenia	Jul. 16-22, 2017	w/ E. Castorina, U. Seljak & Z. Vlah
Workshop on neutrino physics	CCA, NY, USA	Apr. 6, 2017	w/ D. Spergel
Cosmology with 21cm workshop	CCA, NY, USA	Dec. 20, 2016	w/ D. Spergel, E. Visbal & A. Weltman

Teaching experience

Lectures on numerical cosmology	Trieste Observatory, Italy	February 2015
Lectures on Machine learning	IRFU, Trieste, Italy	March-April 2021

Scientific collaborations

CAMELS	Cosmology and Astrophysics with Machine Learning Simulations	core team
Euclid	OU-LE3 validation & verification Cosmological simulations Machine Learning for CosmoSims	member member co-leader
PFS	Cosmology working group	member
SMAUG*	Cosmological probes working group	co-leader
SKA	Cosmological simulations working group 21cm intensity mapping working group HI galaxy surveys working group Synergies working group Cosmology with SKA1-LOW working group	co-leader member member member member
WFIRST	Science working group	member

*<https://www.simonsfoundation.org/flatiron/center-for-computational-astrophysics/smaug>

Software & simulations

I am the author of the following software and simulations:

Pylians	Python libraries designed to efficiently analyze the output of numerical simulations. Written in Python/Cython/C and publicly available. https://github.com/franciscovillaescusa/Pylians3
HADES	Set of more than 1,000 state-of-the-art N-body and hydrodynamic simulations with massive and massless neutrinos. 6 million CPU hours. More than 200 Tb of data. Publicly available. https://franciscovillaescusa.github.io/hades.html
Quijote	Suite of 44,100 N-body simulations designed to quantify the information content on cosmological observables and to provide enough data to train machine learning algorithms. The largest set of N-body simulations to-date. Trillions of particles, billions of halos, billions of voids, millions of summary statistics. 35 Million CPU hours. 1 Petabyte of data. Publicly available. https://github.com/franciscovillaescusa/Quijote-simulations
CAMELS	Suite of more than 4,000 N-body and hydrodynamic simulations designed to study cosmology and astrophysics using machine learning tools. About 10 Million CPU hours. 250 Terabytes of data. In collaboration with Daniel Angles-Alcazar and Shy Genel. http://camel-simulations.org/

Student supervision

Elena Massara	Graduate student (w/ Prof. Matteo Viel)	SISSA, Trieste, Italy	2013-2016
Isabella Carucci	Graduate student (w/ Prof. Matteo Viel)	SISSA, Trieste, Italy	2014-2016
Andrej Obuljen	Graduate student (w/ Prof. Matteo Viel)	SISSA, Trieste, Italy	2015-2016
David Valcin	Graduate student (w/ Prof. Licia Verde)	ICC, Barcelona, Spain	2017-
Travis Court	Undergraduate student	Allegheny college, USA	summer 2017
Helen Shao	High-school student	Bronx high-school of Science, USA	2018-
Seda Bilaloglu Asena Derin Cengiz Atakan Okan Juan Zamudio	CDS master students (with Prof. Shirley Ho)	NYU, New York, USA	2018-2019
Ana Maria Delgado	Undergraduate student	CUNY, New York, USA	2019-
Sudat Khan	High-school student	Stuyvesant high-school, USA	2019-
Valentina La Torre	Undergraduate student	CCA, New York, USA	2019-
Pablo Villanueva	Graduate student	IFIC, Valencia, Spain	2019-
Jay Wadekar	Graduate student (with Prof. Shirley Ho)	NYU, New York, USA	2019-
Andrew Wu	Undergraduate student (with Prof. David Spergel)	Princeton University, USA	2019-
Yu Cao Elaine Cui Yuanxi Sun Kaitai Zhang	CDS master students (with Prof. Shirley Ho)	NYU, New York, USA	2019-
Noah Kasmanoff	CDS master student (with Prof. Shirley Ho Prof. Jeremy Tinker)	NYU, New York, USA	2019-
Leander Thiele	Graduate student (with Prof. David Spergel)	Princeton University, USA	2019-
Oliver Philcox	Graduate student (with Prof. David Spergel)	Princeton University, USA	2019-
Jalen Salmon	Undergraduate student	Princeton University, USA	2020
Jupiter Ding	Undergraduate student	Princeton University, USA	2020

Invited talks

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| 1. Cosmology in the machine learning era
Missouri S&T colloquium | 02/03/2022
Remote |
| 2. The role of simulations and machine learning in astrophysics
Sazerac conference | 02/03/2022
Remote |
| 3. The Cosmology and Astrophysics with MachinE Learning Simulations project
Minerva seminar, Paris | 02/01/2022
Remote |
| 4. Cosmology at different scales
Cambridge University, LSS discussion group | 01/27/2022
Remote |
| 5. The Cosmology and Astrophysics with MachinE Learning Simulations project
IPMU APEC seminar | 12/15/2021
Remote |
| 6. The Cosmology and Astrophysics with MachinE Learning Simulations project
Fermilab CPC seminar | 11/29/2021
Remote |
| 7. The Cosmology and Astrophysics with MachinE Learning Simulations project
UConn colloquium | 11/12/2021
Remote |
| 8. Cosmology in the machine learning era
First MODE Workshop on Differentiable Programming | 09/07/2021
Remote |
| 9. Can we trust predictions from super-intelligent machines?
Philosophical Aspects of Simulations in Cosmology | 08/10/2021
Remote |
| 10. Cosmology in the Machine Learning Era
APS 2021 | 04/18/2021
Remote |
| 11. Building the cosmological rosetta stone
ITC Harvard, colloquium | 01/07/2021
Remote |
| 12. Cosmology in the Machine Learning Era
UC Santa Cruz colloquium | 01/20/2021
Remote |
| 13. Cosmology in the Machine Learning Era
CTAC, Zurich | 01/07/2021
Remote |
| 14. Cosmology in the Machine Learning Era
University of British Columbia colloquium | 12/07/2020
Remote |
| 15. Cosmology in the Machine Learning Era
Theory seminar, University of Geneva | 12/04/2020
Remote |
| 16. CAMELS: Cosmology and Astrophysics with MachinE Learning Simulations
Harvard group meeting | 11/02/2020
Remote |
| 17. Cosmology in the Machine Learning Era
Waterloo Center for Astrophysics seminar | 10/21/2020
Remote |
| 18. Cosmology in the Machine Learning Era
Theory seminar | 11/12/2019
Madison, USA |
| 19. Cosmology in the Machine Learning Era
Michigan Tech Physics colloquium | 10/24/2019
Houghton, USA |
| 20. The Universe: the most sensitive neutrino mass detector
Invisibles 2019 conference | 05/11/2019
Valencia, Spain |
| 21. Weighing neutrinos on the sky
Sun Yat-Sen University seminar | 04/19/2019
Zhuhai, China |

22. **Weighing neutrinos on the sky**
SJTU seminar04/16/2019
Shanghai, China
23. **Quantifying the information content on high-order statistics**
PTChat@Kyoto04/11/2019
Kyoto, Japan
24. **Towards a 5σ detection on the sum of the neutrino masses**
CEA Saclay seminar04/08/2019
Saclay, Paris, France
25. **Towards a 5σ constraint on the sum of the neutrino masses**
ITC seminar03/19/2019
Harvard University, USA
26. **Cosmology with 21cm intensity mapping**
Cosmology on Safari 201903/07/2019
Hluhluwe, South Africa
27. **Towards a 5σ detection on the sum of the neutrino masses**
IPMU seminar02/25/2019
Tokyo, Japan
28. **Towards a 5σ constraint on the sum of the neutrino masses**
Cosmology seminar01/29/2019
UC Berkeley, USA
29. **Cosmology and astrophysics with cosmic neutral hydrogen**
Tsinghua University colloquium01/18/2019
Beijing, China
30. **Constraining neutrino masses with a single Universe**
Methods for statistical inference conference10/23/2018
IHP, Paris, France
31. **Weighing neutrinos with $\text{Ly}\alpha$ -forest voids**
Cosmology with cosmic voids workshop09/25/2018
CCA, New York, USA
32. **Ingredients for 21cm intensity mapping**
21cm cosmology workshop09/18/2018
Pingtang, China
33. **Weighing neutrinos with cosmological observables**
Cosmology seminar09/06/2018
Perimeter Institute, Canada
34. **Weighing neutrinos with cosmological observables**
Fermilab colloquium08/08/2018
Fermilab, USA
35. **Hydrodynamic simulations of neutral hydrogen**
Tremendous radio-arrays workshop07/31/2018
BNL, USA
36. **Ingredients for 21cm intensity mapping**
The non-linear Universe 2018 workshop07/15/2018
Smartno, Slovenia
37. **Weighing neutrinos with cosmic HI**
PASCOS 2018 conference06/07/2018
Case Western Reserve University, USA
38. **Cosmology with neutral hydrogen**
CITA seminar04/18/2018
CITA, Toronto, Canada
39. **Cosmology with neutral hydrogen**
BNL seminar02/16/2018
BNL, USA
40. **The impact of massive neutrinos of cosmological observables**
KICP seminar02/09/2018
KICP, Chicago, USA
41. **Weighing neutrinos with cosmic HI**
The SKA radio-telescope workshop11/07/2017
IFIC, Valencia, Spain
42. **The imprint of neutrinos on clustering in redshift-space** (*organizer*)
The non-linear Universe 2017 workshop07/21/2017
Smartno, Slovenia
43. **21cm cosmology**
Cosmology seminar04/20/2017
Brown University, USA

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| 44. Neutrino masses in cosmology
Princeton Cosmology lunch | 04/10/2017
Princeton University, USA |
| 45. Weighing neutrinos with cosmological observables
YITP seminar | 03/23/2017
Stony Brook University, USA |
| 46. Massive neutrinos and large-scale structure: forecasts for SKA
Upenn seminar | 02/01/2017
Upenn, USA |
| 47. Neutrinos, intensity mapping and LSS
CCA Flatiron symposium | 01/27/2017
CCA, New York, USA |
| 48. Simulating HI: WDM, neutrinos and BAO
Cosmology with neutral hydrogen workshop | 01/11/2017
Berkeley University, USA |
| 49. Impact of neutrino masses on the Universe's large scale-structure
Cosmology seminar | 11/15/2016
Johns Hopkins University, USA |
| 50. Impact of neutrino masses on the Universe LSS
Theoretical challenges for precision galaxy clustering workshop | 07/12/2016
Sesto, Italy |
| 51. Precision cosmology with radial BAO from intensity mapping
BAO & RSD: dark light on obscure acronyms workshop | 07/04/2016
Sesto, Italy |
| 52. Impact of neutrino masses on the Universe's large-scale structure
Neutrino and light particles in cosmology workshop | 06/22/2016
Berkeley University, USA |
| 53. Cosmological constraints on neutrino properties
PhyStat- ν workshop | 05/31/2016
IPMU, Tokyo, Japan |
| 54. Massive neutrino signatures on the Universe's large-scale structure
Cosmology seminar | 02/24/2016
Helsinki, Finland |
| 55. The effect of massive neutrinos on the Universe's large-scale structure
28th Texas Symposium on Relativistic Astrophysics | 12/15/2015
Geneva, Switzerland |
| 56. Massive neutrinos signatures on the Universe's large-scale structure
Cosmology and particle physics seminar | 09/18/2015
Geneva University, Switzerland |
| 57. Precision cosmology with 21cm intensity mapping
From inflation to galaxies workshop | 08/31/2015
Castiglioncello, Italy |
| 58. Weighing neutrinos with cosmology
Galaxy Clustering within Euclid OULE3 workshop | 07/07/2015
Sesto, Italy |
| 59. 21cm cosmology
Cosmology seminar | 02/18/2015
Brera Observatory, Milan, Italy |
| 60. Cosmology with neutral hydrogen
5th Hydrosim workshop | 02/03/2015
Trieste Observatory, Italy |
| 61. Small scale structures and neutrino masses
Neutrino Oscillation Workshop | 09/10/2014
Otranto, Lecce, Italy |
| 62. The impact of massive neutrinos on halo bias
4th Hydrosim meeting | 09/24/2013
OATS, Trieste, Italy |
| 63. Massive neutrinos simulations
3rd Hydrosim meeting | 01/11/2013
OATS, Trieste, Italy |
| 64. The Non-linear evolution of the neutrino cosmic background
ICTP seminar | 12/04/2012
ICTP, Trieste, Italy |
| 65. The impact of neutrino masses on cosmology
Cosmology seminar | 04/18/2012
OATS, Trieste, Italy |

References

Prof. Stefano Borgani	Trieste Observatory, Italy	borgani@oats.inaf.it
Prof. Neal Dalal	Perimeter Institute, Canada	ndalal@perimeterinstitute.ca
Prof. Shirley Ho	CCA, Flatiron Institute, USA	shirleyho@flatironinstitute.org
Prof. Abraham Loeb	ITC/Harvard University, USA	aloeb@cfa.harvard.edu
Dr. Carlos Peña-Garay	IFIC, Spain	penya@ific.uv.es
Dr. Emiliano Sefusatti	Trieste Observatory, Italy	sefusatti@oats.inaf.it
Prof. David N. Spergel	CCA/Princeton University, USA	dspergel@flatironinstitute.org
Prof. Licia Verde	ICC, Barcelona, Spain	liciaverde@icc.ub.edu
Prof. Matteo Viel	SISSA, Italy	viel@sissa.it

PUBLICATIONS

Statistics

- 109 papers: 78 published, 20 under review, 5 white papers, 1 red book and 5 proceedings/reports.
- First author papers: 21
- Second author papers: 32
- Third and fourth author papers: 35
- Others: 12
- White papers and red books: 6
- Papers accepted in Machine Learning workshops: 7
- Proceedings and reports: 5
- #papers/year: 1 (2010), 3 (2011), 1 (2012) 4 (2013), 7 (2014), 9 (2015), 9 (2016), 5 (2017), 15 (2018) 16 (2019), 18 (2020) 15 (2021)
- Citations (18/February/2022): 3719 (ADS), 3765 (Inspire), 3988 (Google Scholar)
- h-index: 36

Refereed publications

- 1. Finding universal relations in subhalo properties with artificial intelligence**
Helen Shao, Francisco Villaescusa-Navarro, Shy Genel, David N. Spergel, Daniel Angles-Alcazar, Lars Hernquist, Romeel Dave, Desika Narayanan, Gabriella Contardo, Mark Vogelsberger
September 2021, 23 pp. [[astro-ph/2109.04484](#)]
ApJ accepted
- 2. MillimeterDL: Deep Learning Simulations of the Microwave Sky**
Dongwon Han, Neelima Sehgal, Francisco Villaescusa-Navarro
May 2021, 21 pp. [[astro-ph/2105.11444](#)]
PRD, 104, 12, (2021) DOI: 10.1103/PhysRevD.104.123521
- 3. Detecting the radiative decay of the cosmic neutrino background with line-intensity mapping**
Jose Luis Bernal, Andrea Caputo, Francisco Villaescusa-Navarro, Marc Kamionkowski
March 2021, 7 pp. [[astro-ph/2103.12099](#)]
PRL, 127, 13, (2021) DOI: 10.1103/PhysRevLett.127.131102
- 4. Detecting neutrino mass by combining matter clustering, halos, and voids**
Adrian E. Bayer, Francisco Villaescusa-Navarro, Elena Massara, Jia Liu, David N. Spergel, Licia Verde, Benjamin Wandelt, Matteo Viel, Shirley Ho
February 2021, 15 pp. [[astro-ph/2102.05049](#)]
ApJ, 919, 1, (2021) DOI: 10.3847/1538-4357/ac0e91
- 5. Information Content of Higher-Order Galaxy Correlation Functions**
Lado Samushia, Zachary Slepian, Francisco Villaescusa-Navarro
January 2021, 14 pp. [[astro-ph/2102.01696](#)]
MNRAS, 505, 1, (2021) DOI: 10.1093/mnras/stab1199
- 6. Constraining M_ν with the Bispectrum II: The Total Information Content of the Galaxy Bispectrum**
ChangHoon Hahn, Francisco Villaescusa-Navarro
December 2020, 24 pp. [[astro-ph/2012.02200](#)]
JCAP, 04, 029, (2021)
DOI: 10.1088/1475-7516/2021/04/029
- 7. Neural networks as optimal estimators to marginalize over baryonic effects**
Francisco Villaescusa-Navarro, Benjamin D. Wandelt, Daniel Angles-Alcazar, Shy Genel, Jose Manuel Zorrilla Matilla, Shirley Ho, David N. Spergel
November 2020, 16 pp. [[astro-ph/2011.05992](#)]
ApJ accepted

8. **deep21: a Deep Learning Method for 21cm Foreground Removal**
T. Lucas Makinen, Lachlan Lancaster, [Francisco Villaescusa-Navarro](#), Peter Melchior, Shirley Ho, Laurence Perreault-Levasseur, David N. Spergel
October 2020, 28 pp. [[astro-ph/2010.15843](#)]
JCAP, 2021, 04, (2021)
DOI: 10.1088/1475-7516/2021/04/081

9. **The CAMELS project: Cosmology and Astrophysics with Machine Learning Simulations**
[Francisco Villaescusa-Navarro](#), Daniel Angles-Alcazar, Shy Genel, David N. Spergel, Rachel S. Somerville, Romeel Dave, Annalisa Pillepich, Lars Hernquist, Dylan Nelson, Paul Torrey, Desika Narayanan, Yin Li, Oliver Philcox, Valentina La Torre, Ana Maria Delgado, Shirley Ho, Sultan Hassan, Blakesley Burkhart, Digvijay Wadekar, Nicholas Battaglia, Gabriella Contardo
October 2020, 33 pp. [[astro-ph/2010.00619](#)]
ApJS, 915, 1, (2021)
DOI: 10.3847/1538-4357/abf7ba

10. **CARPool: fast, accurate computation of large-scale structure statistics by pairing costly and cheap cosmological simulations**
Nicolas Chartier, Benjamin Wandelt, Yashar Akrami, [Francisco Villaescusa-Navarro](#)
September 2020, 18 pp. [[astro-ph/2009.08970](#)]
MNRAS, 503, 2, (2021)
DOI: 10.1093/mnras/stab430

11. **The impact of massive neutrinos on halo assembly bias**
Titouan Lazeyras, [Francisco Villaescusa-Navarro](#), Matteo Viel
August 2020, 25 pp. [[astro-ph/2008.12265](#)]
JCAP, 2021, 03, (2021)
DOI: 10.1088/1475-7516/2021/03/022

12. **The effects of massive neutrinos on the linear point of the correlation function**
G. Parimbelli, S. Anselmi, M. Viel, C. Carbone, [F. Villaescusa-Navarro](#), P.S. Corasaniti, Y. Rasera, R. Sheth, G.D. Starkman, I. Zehavi
July 2020, 27 pp. [[astro-ph/2007.10345](#)]
JCAP, 01, 009, (2021)
DOI: 10.1088/1475-7516/2021/01/009

13. **Hlnet: Generating neutral hydrogen from dark matter with neural networks**
Digvijay Wadekar, [Francisco Villaescusa-Navarro](#), Shirley Ho, Laurence Perreault-Levasseur
July 2020, 13 pp. [[astro-ph/2007.10340](#)]
ApJ, 916, 1, (2021)
DOI: 10.3847/1538-4357/ac033a

14. **Teaching neural networks to generate Fast Sunyaev Zel'dovich Maps**
Leander Thiele, [Francisco Villaescusa-Navarro](#), David N. Spergel, Dylan Nelson, Annalisa Pillepich
July 2020, 21 pp. [[astro-ph/2007.07267](#)]
ApJ, 902, 2, (2020)
DOI: 10.3847/1538-4357/abb80f

15. **Removing Astrophysics in 21 cm maps with Neural Networks**
Pablo Villanueva-Domingo, [Francisco Villaescusa-Navarro](#)
June 2020, 17 pp. [[astro-ph/2006.14305](#)]
ApJ, 907, 1, (2021)
DOI: 10.3847/1538-4357/abd245

16. **New Interpretable Statistics for Large Scale Structure Analysis and Generation**
E. Allys, T. Marchand, J. -F. Cardoso, [F. Villaescusa-Navarro](#), S. Ho, S. Mallat
June 2020, 21 pp. [[astro-ph/2006.06298](#)]
PRD 102, 103506 (2020)
DOI: 10.1103/PhysRevD.102.103506

17. **The Effective Halo Model: Creating a Physical and Accurate Model of the Matter Power Spectrum and Cluster Counts**
Oliver H. E. Philcox, David N. Spergel, [Francisco Villaescusa-Navarro](#)
April 2020, 40 pp. [[astro-ph/2004.09515](#)]

18. **Using the Marked Power Spectrum to Detect the Signature of Neutrinos in Large-Scale Structure**
Elena Massara, [Francisco Villaescusa-Navarro](#), Shirley Ho, Neal Dalal, David N. Spergel
January 2020, 5 pp. [[astro-ph/2001.11024](#)]
PRL, 126, 1, (2021)
DOI: 10.1103/PhysRevLett.126.011301
19. **Super-resolution emulator of cosmological simulations using deep physical models**
Doogesh Kodi Ramanah, Tom Charnock, [Francisco Villaescusa-Navarro](#), Benjamin D. Wandelt
January 2020, 10 pp. [[astro-ph/2001.05519](#)]
MNRAS, 495, 4, (2020)
DOI: 10.1093/mnras/staa1428
20. **Primordial non-Gaussianity without tails – how to measure fNL with the bulk of the density PDF**
Oliver Friedrich, Cora Uhlemann, [Francisco Villaescusa-Navarro](#), Tobias Baldauf, Marc Manera, Takahiro Nishimichi
December 2019, 20 pp. [[astro-ph/1912.06621](#)]
MNRAS, 498, 1, (2020)
DOI: 10.1093/mnras/staa2160
21. **Fisher for complements: Extracting cosmology and neutrino mass from the counts-in-cells PDF**
Cora Uhlemann, Oliver Friedrich, [Francisco Villaescusa-Navarro](#), Arka Banerjee, Sandrine Codis
November 2019, 21 pp. [[astro-ph/1911.11158](#)]
MNRAS, 495, 4, (2020)
DOI: 10.1093/mnras/staa1155
22. **Baryonic effects on the matter bispectrum**
Simon Foreman, William Coulton, [Francisco Villaescusa-Navarro](#), Alexandre Barreira
October 2019, 28 pp. [[astro-ph/1910.03597](#)]
MNRAS, 498, 2, (2020)
DOI: 10.1093/mnras/staa2523
23. **Constraining M_ν with the Bispectrum I: Breaking Parameter Degeneracies**
ChangHoon Hahn, [Francisco Villaescusa-Navarro](#), Emanuele Castorina, Roman Scoccimarro
September 2019, 33 pp. [[astro-ph/1909.11107](#)]
JCAP, 03, 040, (2020)
DOI: 10.1088/1475-7516/2020/03/040
24. **The Quijote simulations**
[Francisco Villaescusa-Navarro](#), ChangHoon Hahn, Elena Massara, Arka Banerjee, Ana Maria Delgado, Doogesh Kodi Ramanah, Tom Charnock, Elena Giusarma, Yin Li, Erwan Allys, Antoine Brochard, Chi-Ting Chiang, Siyu He, Alice Pisani, Andrej Obuljen, Yu Feng, Emanuele Castorina, Gabriella Contardo, Christina D. Kreisch, Andrina Nicola, Roman Scoccimarro, Licia Verde, Matteo Viel, Shirley Ho, Stephane Mallat, Benjamin Wandelt, David N. Spergel
September 2019, 19 pp. [[astro-ph/1909.05273](#)]
ApJS, 250, 1, (2020)
DOI: 10.3847/1538-4365/ab9d82
25. **Weighing neutrinos with the halo environment**
Arka Banerjee, Emanuele Castorina, [Francisco Villaescusa-Navarro](#), Travis Court, Matteo Viel
July 2019, 26 pp. [[astro-ph/1907.06598](#)]
JCAP, 06, 032, (2020)
DOI: 10.1088/1475-7516/2020/06/032
26. **Atomic and molecular gas in IllustrisTNG galaxies at low redshift**
Benedikt Diemer, Adam R. H. Stevens, Claudia del P. Lagos, A. R. Calette, Sandro Tacchella, Lars Hernquist, Federico Marinacci, Dylan Nelson, Annalisa Pillepich, Vicente Rodriguez-Gomez, [Francisco Villaescusa-Navarro](#), Mark Vogelsberger
Feb 2019, 22 pp. [[astro-ph/1902.10714](#)]
MNRAS, 487, 2, (2019)
DOI: 10.1093/mnras/stz1323

27. **BE-HaPPY: Bias Emulator for Halo Power Spectrum including massive neutrinos**
David Valcin, Francisco Villaescusa-Navarro, Licia Verde, Alvise Raccanelli
January 2019, 33 pp. [[astro-ph/1901.06045](#)]
JCAP, 12, 57, (2019)
DOI: 10.1088/1475-7516/2019/12/057
28. **Dipole Distortions in the Intergalactic Medium**
Derek Inman, Ue-Li Pen, Francisco Villaescusa-Navarro
November 2018, 10 pp. [[astro-ph/1812.02148](#)]
MNRAS, 487, 3, (2019)
DOI: 10.1093/mnras/stz1542
29. **First detection of scale-dependent linear halo bias in N-body simulations with massive neutrinos**
Chi-Ting Chiang, Marilena LoVerde, Francisco Villaescusa-Navarro
November 2018, 4 pp. [[astro-ph/1811.12412](#)]
PRL, 122, 041302, (2019)
DOI: 10.1103/PhysRevLett.122.041302
30. **Measuring the EoR Power Spectrum Without Measuring the EoR Power Spectrum**
Angus Beane, Francisco Villaescusa-Navarro, Adam Lidz
November 2018, 9 pp. [[astro-ph/1811.10609](#)]
ApJ, 874, 2, (2019)
DOI: 10.3847/1538-4357/ab0a08
31. **Suppressed Variance in $\text{Ly}\alpha$ Forest Simulations**
Lauren Anderson, Andrew Pontzen, Andreu Font-Ribera, Francisco Villaescusa-Navarro, Keir K. Rogers, Shy Genel
November 2018, 15 pp. [[astro-ph/1811.00043](#)]
ApJ, 871, 2, (2019)
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Red books

1. Cosmology with Phase 1 of the Square Kilometre Array

Square Kilometre Array Cosmology Science Working Group: David J. Bacon, Richard A. Battye, Philip Bull, Stefano Camera, Pedro G. Ferreira, Ian Harrison, David Parkinson, Alkistis Pourtsidou, Mario G. Santos, Laura Wolz, Filipe Abdalla, Yashar Akrami, David Alonso, Sambatra Andrianomena, Mario Ballardini, Jose Luis Bernal, Daniele Bertacca, Carlos A.P. Bengaly, Anna Bonaldi, Camille Bonvin, Michael L. Brown, Emma Chapman, Song Chen, Xuelei Chen, Steven Cunnington, Tamara M. Davis, Clive Dickinson, Jose Fonseca, Keith Grainge, Stuart Harper, Matt J. Jarvis, Roy Maartens, Natasha Maddox, Hamsa Padmanabhan, Jonathan R. Pritchard, Alvis Raccanelli, Marzia Rivi, Sambit Roychowdhury, Martin Sahlen, Dominik J. Schwarz, Thilo M. Siewert, Matteo Viel, [Francisco Villaescusa-Navarro](#), Yidong Xu, Daisuke Yamauchi, Joe Zuntz

November 2018, 35 pp. [[astro-ph/1811.02743](#)]

Submitted to Publications of the Astronomical Society of Australia

Machine Learning Workshops

1. **Histogram Pooling Operators: An Interpretable Alternative to DeepSets**
Miles Cranmer, Christina Kreisch, Alice Pisani, [Francisco Villaescusa-Navarro](#), David N. Spergel, Shirley Ho
May 2021, 4 pp.
ICLR 2021 workshop
2. **Learning the Evolution of the Universe in N-body Simulations**
Chang Chen, Yin Li, [Francisco Villaescusa-Navarro](#), Shirley Ho, Anthony Pullen
December 2020, 6 pp. [[astro-ph/2012.05472](#)]
NeurIPS 2020 Machine Learning and the Physical Science Workshop accepted
3. **Fast and Accurate Non-Linear Predictions of Universes with Deep Learning**
Renan Alves de Oliveira, Yin Li, [Francisco Villaescusa-Navarro](#), Shirley Ho, David N. Spergel
December 2020, 6 pp. [[astro-ph/2012.00240](#)]
NeurIPS 2020 Machine Learning and the Physical Science Workshop accepted
4. **dm2gal: Mapping Dark Matter to Galaxies with Neural Networks**
Noah Kasmanoff, [Francisco Villaescusa-Navarro](#), Jeremy Tinker, Shirley Ho
December 2020, 6 pp. [[astro-ph/2012.00186](#)]
NeurIPS 2020 Machine Learning and the Physical Science Workshop accepted
5. **Predicting Cosmological Massive Neutrino Simulation with Convolutional Neural Networks**
Elena Giusarma, Mauricio Reyes, [Francisco Villaescusa-Navarro](#), Siyu He, Shirley Ho
October 2019, 4 pp.
NeurIPS 2019 Machine Learning and the Physical Science Workshop accepted
6. **From Dark Matter to Galaxies with Convolutional Neural Networks**
Jacky H. T. Yip, Xinyue Zhang, Yanfang Wang, Wei Zhang, Yueqiu Sun, Gabriella Contardo, [Francisco Villaescusa-Navarro](#), Siyu He, Shy Genel, Shirley Ho
October 2019, 4 pp. [[astro-ph/1910.07813](#)]
NeurIPS 2019 Machine Learning and the Physical Science Workshop accepted
7. **HIGAN: Cosmic Neutral Hydrogen with GANs**
Atakan Okan, Juan Zamudio-Fernandez, [Francisco Villaescusa-Navarro](#), Seda Bilaloglu, Siyu He, Laurence Levasseur, Asena Derin Cengiz, Shirley Ho
October 2019, 4 pp.
NeurIPS 2019 Machine Learning and the Physical Science Workshop accepted

Conference proceedings and reports

1. **Fundamental Physics with the Square Kilometre Array**
P. Bull, Stefano Camera, K. Kelley, H. Padmanabhan, J. Pritchard, A. Racanelli, S. Riemer-Sorensen, L. Shao, S. Andrianomena, E. Athanassoula, D. Bacon, R. Barkana, G. Bertone, C. Bonvin, A. Bosma, M. Bruggen, C. Burigana, C. Boehm, F. Calore, J. A. R. Cembranos, C. Clarkson, R. M. T. Connors, A. de la Cruz-Dombriz, P. K. S. Dunsby, N. Fornengo, D. Gaggero, I. Harrison, J. Larena, Y.-Z. Ma, R. Maartens, M. Mendez-Isla, S. D. Mohanty, S. G. Murray, D. Parkinson, A. Pourtsidou, P. J. Quinn, M. Regis, P. Saha, M. Sahlen, M. Sakellariadou, J. Silk, T. Trombetti, F. Vazza, T. Venumadhav, F. Vidotto, [F. Villaescusa-Navarro](#), Y. Wang, C. Weniger, L. Wolz, F. Zhang, B. M. Gaensler, A. Weltman
October 2018, 70 pp. [[astro-ph/1810.02680](#)]
Publications of the Astronomical Society of Australia, 37, e002, (2020)
2. **Line-Intensity Mapping: 2017 Status Report**
Ely D. Kovetz, Marco P. Viero, Adam Lidz, Laura Newburgh, Mubdi Rahman, Eric Switzer, Marc Kamionkowski, James Aguirre, Marcelo Alvarez, James Bock, J. Richard Bond, Geoffry Bower, C. Matt Bradford, Patrick C. Breyse, Philip Bull, Tzu-Ching Chang, Yun-Ting Cheng, Dongwoo Chung, Kieran Cleary, Asantha Corray, Abigail Crites, Rupert Croft, Olivier Dore, Michael Eastwood, Andrea Ferrara, Jose Fonseca, Daniel Jacobs, Garrett K. Keating, Guilaine Lagache, Gunjan Lakhani, Adrian Liu, Kavilan Moodley, Norm Murray, Aurelie Penin, Gergo Popping, Anthony Pullen, Dominik Reichers, Shun Saito, Ben Saliwanchik, Mario Santos, Rachel Somerville, Gordon Stacey, George Stein, [Francisco Villaescusa-Navarro](#), Eli Visbal, Amanda Weltman, Laura Wolz, Micheal Zemcov
September 2017, 99 pp. [[astro-ph/1709.09066](#)]

3. Beyond Λ CDM: Problems, solutions, and the road ahead

Philip Bull, Yashar Akrami, Julian Adamek, Tessa Baker, Emilio Bellini, Jose Beltran Jimenez, Eloisa Ben-
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Alan Heavens, Lavinia Heisenberg, Bin Hu, Claudio Llinares, Roy Maartens, Edvard Mörtsell, Seshadri Na-
dathur, Johannes Noller, Roman Pasechnik, Marcel S. Pawlowski, Thiago S. Pereira, Miguel Quartin, Angelo
Ricciardone, Signe Riemer-Sørensen, Massimiliano Rinaldi, Jeremy Sakstein, Ippocratis D. Saltas, Vincenzo
Salzano, Ignacy Sawicki, Adam R. Solomon, Douglas Spolyar, Glenn D. Starkman, Daniele Steer, Ismael
Tereno, Licia Verde, Francisco Villaescusa-Navarro, Mikael von Strauss, Hans A. Winther

December 2015, 97 pp. [[astro-ph/1512.05356](#)]

Physics of the Dark Universe 12 (2016) 56-99

DOI: 10.1016/j.dark.2016.02.001

4. Small scales structures and neutrino masses

Francisco Villaescusa-Navarro

January 2015, 4 pp. [[astro-ph/1501.04546](#)]

Nuclear and Particle Physics Proceedings, 56, 2015

DOI: 10.1016/j.nuclphysbps.2015.06.015

5. Cosmology with a SKA HI intensity mapping survey

Mario G. Santos, Philip Bull, David Alonso, Stefano Camera, Pedro G. Ferreira, Gianni Bernardi, Roy Maartens,
Matteo Viel, Francisco Villaescusa-Navarro, Filipe B. Abdalla, Matt Jarvis, R. Benton Metcalf, A. Pourtsidou,
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