CURRICULUM VITAE

Personal Data

Name:	Francisco Villaescusa-Navarro
Title:	Ph.D. in physics
Nationality:	Spanish
Employment:	Associate Research Scholar
Work address:	Department of Astrophysical Sciences, Princeton University, Peyton Hall, Princeton NJ 08544, USA
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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

Associate Research Scholar	Princeton University, Princeton, USA	09/2019 - present
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
Lyα-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-
Reviewer	DIRAC High Performance Computing (UK)	2018-
	National Science Centre (Poland)	2018-

Organization of Scientific meetings

Intensity mapping workshop	CCA, New York, USA	February 20-22, 2018	w/ Gary Hinshaw, Anthony Pullen, Rachel Somerville & David Spergel
CCA cosmology group meeting	CCA, New York, USA	July 2017 - July 2018	
The non-linear Universe workshop	Smartno, Slovenia	July 16-22, 2017	w/ Emanuele Castorina Uros Seljak & Zvonimir Vlah
Workshop on neutrino physics	CCA, New York, USA	April 6, 2017	w/ David Spergel
Cosmology with 21cm workshop	CCA, New York, USA	December 20, 2016	w/ David Spergel, Eli Visbal & Amanda Weltman

Scientific collaborations

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

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

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-

Teaching experience

Lectures on numerical cosmology	Trieste Observatory, Italy	February 2018

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/Pylians
HADES	Set of more than 1000 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 43100 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

Invited talks

1.	**Cosmology in the Machine Learning Era** Michigan Tech seminar	10/24/2019 Houghton, USA
2.	**The Universe: the most sensitive neutrino mass detector** Invisibles 2019 conference	05/11/2019 Valencia, Spain
3.	**Weighing neutrinos on the sky** Sun Yat-Sen University seminar	04/19/2019 Zhuhai, China
4.	**Weighing neutrinos on the sky** SJTU seminar	04/16/2019 Shanghai, China
5.	**Quantifying the information content on high-order statistics** PTChat@Kyoto	04/11/2019 Kyoto, Japan
6.	**Towards a 5σ detection on the sum of the neutrino masses** CEA Saclay seminar	04/08/2019 Saclay, Paris, France
7.	**Towards a 5σ constraint on the sum of the neutrino masses** ITC seminar	03/19/2019 Harvard University, USA
8.	**Cosmology with 21cm intensity mapping** Cosmology on Safari 2019	03/07/2019 Hluhluwe, South Africa
9.	**Towards a 5σ detection on the sum of the neutrino masses** IPMU seminar	02/25/2019 Tokyo, Japan
10.	**Towards a 5σ constraint on the sum of the neutrino masses** Cosmology seminar	01/29/2019 UC Berkeley, USA
11.	**Cosmology and astrophysics with cosmic neutral hydrogen** Tsinghua University colloquium	01/18/2019 Beijing, China

12. **Constraining neutrino masses with a single Universe** — 10/23/2018
Methods for statistical inference conference — IHP, Paris, France

13. **Weighing neutrinos with Lyα-forest voids** — 09/25/2018
Cosmology with cosmic voids workshop — CCA, New York, USA

14. **Ingredients for 21cm intensity mapping** — 09/18/2018
21cm cosmology workshop — Pingtang, China

15. **Weighing neutrinos with cosmological observables** — 09/06/2018
Cosmology seminar — Perimeter Institute, Canada

16. **Weighing neutrinos with cosmological observables** — 08/08/2018
Fermilab colloquium — Fermilab, USA

17. **Hydrodynamic simulations of neutral hydrogen** — 07/31/2018
Tremendous radio-arrays workshop — BNL, USA

18. **Ingredients for 21cm intensity mapping** — 07/15/2018
The non-linear Universe 2018 workshop — Smartno, Slovenia

19. **Weighing neutrinos with cosmic HI** — 06/07/2018
PASCOS 2018 conference — Case Western Reserve University, USA

20. **Cosmology with neutral hydrogen** — 04/18/2018
CITA seminar — CITA, Toronto, Canada

21. **Cosmology with neutral hydrogen** — 02/16/2018
BNL seminar — BNL, USA

22. **The impact of massive neutrinos of cosmological observables** — 02/09/2018
KICP seminar — KICP, Chicago, USA

23. **Weighing neutrinos with cosmic HI** — 11/07/2017
The SKA radio-telescope workshop — IFIC, Valencia, Spain

24. **The imprint of neutrinos on clustering in redshift-space** *(organizer)* — 07/21/2017
The non-linear Universe 2017 workshop — Smartno, Slovenia

25. **21cm cosmology** — 04/20/2017
Cosmology seminar — Brown University, USA

26. **Neutrino masses in cosmology** — 04/10/2017
Princeton Cosmology lunch — Princeton University, USA

27. **Weighing neutrinos with cosmological observables** — 03/23/2017
YITP seminar — Stony Brook University, USA

28. **Massive neutrinos and large-scale structure: forecasts for SKA** — 02/01/2017
Upenn seminar — Upenn, USA

29. **Neutrinos, intensity mapping and LSS** — 01/27/2017
CCA Flatiron symposium — CCA, New York, USA

30. **Simulating HI: WDM, neutrinos and BAO** — 01/11/2017
Cosmology with neutral hydrogen workshop — Berkeley University, USA

31. **Impact of neutrino masses on the Universe's large scale-structure** — 11/15/2016
Cosmology seminar — Johns Hopkins University, USA

32. **Impact of neutrino masses on the Universe LSS** — 07/12/2016
Theoretical challenges for precision galaxy clustering workshop — Sesto, Italy

33. **Precision cosmology with radial BAO from intensity mapping** — 07/04/2016
BAO & RSD: dark light on obscure acronyms workshop — Sesto, Italy

34. **Impact of neutrino masses on the Universe's large-scale structure** — 06/22/2016
Neutrino and light particles in cosmology workshop — Berkeley University, USA

35. **Cosmological constraints on neutrino properties** — 05/31/2016
PhyStat-ν workshop — IPMU, Tokio, Japan

36. **Massive neutrino signatures on the Universe's large-scale structure** — 02/24/2016
Cosmology seminar — Helsinki, Finland

37. **The effect of massive neutrinos on the Universe's large-scale structure** — 12/15/2015
28th Texas Symposium on Relativistic Astrophysics — Geneva, Switzerland

38. **Massive neutrinos signatures on the Universe's large-scale structure** — 09/18/2015
Cosmology and particle physics seminar — Geneva University, Switzerland

39. **Precision cosmology with 21cm intensity mapping** — 08/31/2015
From inflation to galaxies workshop — Castiglioncello, Italy

40. **Weighing neutrinos with cosmology** — 07/07/2015
Galaxy Clustering within Euclid OULE3 workshop — Sesto, Italy

41. **21cm cosmology** — 02/18/2015
Cosmology seminar — Brera Observatory, Milan, Italy

42. **Cosmology with neutral hydrogen** — 02/03/2015
5th Hydrosim workshop — Trieste Observatory, Italy

43. **Small scale structures and neutrino masses** — 09/10/2014
Neutrino Oscillation Workshop — Otranto, Lecce, Italy

44. **The impact of massive neutrinos on halo bias** — 09/24/2013
4th Hydrosim meeting — OATS, Trieste, Italy

45. **Massive neutrinos simulations** — 01/11/2013
3rd Hydrosim meeting — OATS, Trieste, Italy

46. **The Non-linear evolution of the neutrino cosmic background** — 12/04/2012
ICTP seminar — ICTP, Trieste, Italy

47. **The impact of neutrino masses on cosmology** — 04/18/2012
Cosmology seminar — 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
- 66 papers: 47 published, 8 under review, 5 white papers, 1 red book and 5 proceedings/reports.
- First author papers: 14
- Second author papers: 16
- Third and fourth author papers: 19
- Others: 6
- White papers and red books: 6
- Papers accepted in Machine Learning conferences: 3
- Proceedings and reports: 5
- Publications with PhD supervisor as coauthor: 2
- #papers/year: 1 (2010), 3 (2011), 1 (2012) 4 (2013), 7 (2014), 9 (2015), 9 (2016), 5 (2017), 15 (2018)
  13 (2019: as of 11/October/2019)
- Citations (5/October/2019): 1715 (ADS), 1742 (Inspire), 1731 (Google Scholar)
- h-index: 25

Refereed publications

1. **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

2. **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

3. **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

4. **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

5. **Suppressed Variance in Lyα 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)
   DOI: 10.3847/1538-4357/aaf576

6. **Extreme Spheres: Counts-in-cells for 21cm intensity mapping**
   Oliver Leicht, Cora Uhlemann, Francisco Villaescusa-Navarro, Sandrine Codis, Lars Hernquist, Shy Genel
   August 2018, 12 pp. [astro-ph/1808.09968]
   MNRAS, 484, 1, (2019)
   DOI: 10.3847/1538-4357/aaf576

7. **Modeling the atomic-to-molecular transition in cosmological simulations of galaxy formation**
Benedikt Diemer, Adam R. H. Stevens, John C. Forbes, Federico Marinacci, Lars Hernquist, Claudia del P. Lagos, Amiel Sternberg, Annalisa Pillepich, Dylan Nelson, Gergo Popping, Francisco Villaescusa-Navarro, Paul Torrey, Mark Vogelsberger
June 2018, 21 pp. [astro-ph/1806.02341]
ApJS, 238, 2, (2018)
DOI: 10.3847/1538-4365/aae387

8. **Statistical properties of paired fixed fields**
Francisco Villaescusa-Navarro, Sigurd Naess, Shy Genel, Andrew Pontzen, Benjamin Wandelt, Lauren Anderson, Andreu Font-Ribera, Nicholas Battaglia, David N. Spergel
June 2018, 24 pp. [astro-ph/1806.01871]
ApJ 867, 2, (2018)
DOI: 10.3847/1538-4357/aae52b

9. **The kinematic Sunyaev-Zel'dovich effect of the large-scale structure (II): the effect of modified gravity**
Mauro Roncarelli, Marco Baldi, Francisco Villaescusa-Navarro
May 2018, 11 pp. [astro-ph/1805.11607]
MNRAS 481, 2, (2018)
DOI: 10.1093/mnras/sty2225

10. **The HI content of dark matter halos at $z \approx 0$ from ALFALFA**
Andrej Obuljen, David Alonso, Francisco Villaescusa-Navarro, Ilsang Yoon, Michael Jones
May 2018, 17 pp. [astro-ph/1805.00934]
MNRAS, 486, 4, (2019)
DOI: 10.1093/mnras/stz1118

11. **Ingredients for 21cm intensity mapping**
Francisco Villaescusa-Navarro, Shy Genel, Emanuele Castorina, Andrej Obuljen, David N. Spergel, Lars Hernquist, Dylan Nelson, Isabella P. Carucci, Annalisa Pillepich, Federico Marinacci, Benedikt Diemer, Mark Vogelsberger, Rainer Weinberger, Rudiger Pakmor
April 2018, 41 pp. [astro-ph/1804.09180]
ApJ 866, 2, (2018)
DOI: 10.3847/1538-4357/aadba0

12. **Primordial non-Gaussianities and zero bias tracers of the Large Scale Structure**
Emanuele Castorina, Yu Feng, Uros Seljak, Francisco Villaescusa-Navarro
March 2018, 6 pp. [astro-ph/1803.11539]
PRL, 121, 10, (2018)
DOI: 10.1103/PhysRevLett.121.101301

13. **Reducing Noise in Cosmological N-body Simulations with Neutrinos**
Arka Banerjee, Devon Powell, Tom Abel, Francisco Villaescusa-Navarro
January 2018, 26 pp. [astro-ph/1801.03906]
JCAP, 09, 028, (2018)
DOI: 10.1088/1475-7516/2018/09/028

14. **High-redshift post-reionisation cosmology with 21cm intensity mapping**
Andrej Obuljen, Emanuele Castorina, Francisco Villaescusa-Navarro, Matteo Viel
September 2017, 37 pp. [astro-ph/1709.07893]
JCAP, 05, 004, (2018)
DOI: 10.1088/1475-7516/2018/05/004

15. **The imprint of neutrinos on clustering in redshift-space**
Francisco Villaescusa-Navarro, Arka Banerjee, Neal Dalal, Emanuele Castorina, Roman Scoccimarro, Raul Angulo, David N. Spergel
August 2017, 19 pp. [astro-ph/1708.01154]
ApJ, 861, 1 (2018)
DOI: 10.3847/1538-4357/aac6bf

16. **Biases from neutrino bias: to worry or not to worry?**
Alvise Raccanelli, Licia Verde, Francisco Villaescusa-Navarro
April 2017, 11pp. [astro-ph/1704.07837]
MNRAS 483, 1, (2019)
DOI: 10.1093/mnras/sty2162

17. **The kinematic Sunyaev-Zel'dovich effect of the large-scale structure (I): dependence on neutrino mass**
Mauro Roncarelli, Francisco Villaescusa-Navarro, Marco Baldi
February 2017, 11 pp. [astro-ph/1702.00676]
MNRAS, 467, 985, (2017)
DOI: 10.1093/mnras/stx170

18. **Lensing is Low: Cosmology, Galaxy Formation, or New Physics?**
Alexie Leauthaud, Shun Saito, Stefan Hilbert, Alexandre Barreira, Surhud More, Martin White, Shadab Alam, Peter Behroozi, Kevin Bundy, Jean Coupon, Thomas Erben, Catherine Heymans, Hendrik Hildebrandt, Rachel Mandelbaum, Lance Miller, Bruno Moraes, Maria E. S. Pereira, Sergio A. Rodriguez-Torres, Fabian Schmidt, Huan-Yuan Shan, Matteo Viel, Francisco Villaescusa-Navarro
November 2016, 26 pp. [astro-ph/1611.08606]
MNRAS, 467, 3024, (2017)
DOI: 10.1093/mnras/stx258

19. **The cross-correlation between 21cm intensity mapping maps and the Lyman-alpha forest in the post-reionization era**
Isabella P. Carucci, Francisco Villaescusa-Navarro, Matteo Viel
November 2016, 31 pp. [astro-ph/1611.07527]
JCAP, 04, 001, (2017)
DOI: 10.1088/1475-7516/2017/04/001

20. **Accurate initial conditions in mixed Dark Matter–Baryon simulations**
Wessel Valkenburg, Francisco Villaescusa-Navarro
October 2016, 10 pp. [astro-ph/1610.08501]
MNRAS, 467, 4401, (2017)
DOI: 10.1093/mnras/stx376

21. **Baryon Acoustic Oscillations reconstruction with pixels**
Andrej Obuljen, Francisco Villaescusa-Navarro, Emanuele Castorina, Matteo Viel
October 2016, 30 pp. [astro-ph/1610.05768]
JCAP, 09, 012, (2017)
DOI: 10.1088/1475-7516/2017/09/012

22. **On the spatial distribution of neutral hydrogen in the Universe: bias and shot-noise of the HI Power Spectrum**
Emanuele Castorina, Francisco Villaescusa-Navarro
September 2016, 10 pp. [astro-ph/1609.05157]
MNRAS, 471, 1788, (2017)
DOI: 10.1093/mnras/stx1599

23. **Baryonic acoustic oscillations from 21cm intensity mapping: the Square Kilometre Array case**
Francisco Villaescusa-Navarro, David Alonso, Matteo Viel
September 2016, 17 pp. [astro-ph/1609.00019]
MNRAS, 466, 2736, (2017)
DOI: 10.1093/mnras/stw3224

24. **Cosmic degeneracies II: Structure formation in joint simulations of Warm Dark Matter and f(R) gravity**
Marco Baldi, Francisco Villaescusa-Navarro
August 2016, 14 pp. [astro-ph/1608.08057]
MNRAS, 473, 3226, (2018)
DOI: 10.1093/mnras/stx2594

25. **Initial Conditions for Accurate N-Body Simulations of Massive Neutrino Cosmologies**
Matteo Zennaro, Julien Bel, Francisco Villaescusa-Navarro, Carmelita Carbone, Emiliano Sefusatti, Luigi Guzzo
May 2016, 15 pp. [astro-ph/1605.05283]
MNRAS, 466, 3244, (2017)
DOI: 10.1093/mnras/stw3340

26. **Simulating cosmologies beyond ΛCDM with PINOCCHIO**
Luca A. Rizzo, Francisco Villaescusa-Navarro, Pierluigi Monaco, Emiliano Munari, Stefano Borgani, Emanuele Castorina, Emiliano Sefusatti
February 2016, 23 pp. [astro-ph/1610.07624]

JCAP, 01, 008, (2017)
DOI: 10.1088/1475-7516/2017/01/008

27. **Neutral hydrogen in galaxy clusters: impact of AGN feedback and implications for intensity mapping**
Francisco Villaescusa-Navarro, Susana Planelles, Stefano Borgani, Matteo Viel, Elena Rasia, Giuseppe Murante, Klaus Dolag, Lisa K. Steinborn, Veronica Biffi, Alexander M. Beck, Cinthia Ragone-Figueroa
October 2015, 19 pp. [astro-ph/1510.04277]
MNRAS, 456, 3553, (2016)
DOI: 10.1093/mnras/stv2904

28. **Weighing neutrinos with cosmic neutral hydrogen**
Francisco Villaescusa-Navarro, Philip Bull, Matteo Viel
July 2015, 20 pp. [astro-ph/1507.05102]
ApJ, 814, 146, (2015)
DOI: 10.1088/0004-637X/814/2/146

29. **Voids in massive neutrino cosmologies**
Elena Massara, Francisco Villaescusa-Navarro, Matteo Viel, Paul M. Sutter
June 2015, 31 pp. [astro-ph/1506.03088]
JCAP, 11, 018, (2015)
DOI: 10.1088/1475-7516/2015/11/018

30. **The effect of massive neutrinos on the BAO peak**
Marco Peloso, Massimo Pietroni, Matteo Viel, Francisco Villaescusa-Navarro
May 2015, 26 pp. [astro-ph/1505.07477]
JCAP, 07, 01, (2015)
DOI: 10.1088/1475-7516/2015/07/001

31. **Warm dark matter signatures on the 21cm power spectrum: Intensity mapping forecasts for SKA**
Isabella P. Carucci, Francisco Villaescusa-Navarro, Matteo Viel, Andrea Lapi
February 2015, 25 pp. [astro-ph/1502.06961]
JCAP, 07, 47, (2015)
DOI: 10.1088/1475-7516/2015/07/047

32. **Cross-correlating 21cm intensity maps with Lyman Break Galaxies in the post-reionization era**
Francisco Villaescusa-Navarro, Matteo Viel, David Alonso, Kanan K. Datta, Philip Bull, Mario G. Santos
October 2014, 23 pp. [astro-ph/1410.7393]
JCAP, 03, 34, (2015)
DOI: 10.1088/1475-7516/2015/03/034

33. **The halo model in a massive neutrino cosmology**
Elena Massara, Francisco Villaescusa-Navarro, Matteo Viel
October 2014, 28 pp. [astro-ph/1410.6813]
JCAP, 12, 53, (2014)
DOI: 10.1088/1475-7516/2014/12/053

34. **Semi-Analytic Galaxy Formation in Massive Neutrinos Cosmologies**
Fabio Fontanot, Francisco Villaescusa-Navarro, Davide Bianchi, Matteo Viel
September 2014, 8 pp. [astro-ph/1409.6309]
MNRAS, 447, 3361, (2015)
DOI: 10.1093/mnras/stu2705

35. **A coarse grained perturbation theory for the Large Scale Structure, with cosmology and time independence in the UV**
Alessandro Manzotti, Marco Peloso, Massimo Pietroni, Matteo Viel, Francisco Villaescusa-Navarro
July 2014, 37 pp. [astro-ph/1407.1342]
JCAP, 09, 47, (2014)
DOI: 10.1088/1475-7516/2014/09/047

36. **VIDE: The Void IDentification and Examination toolkit**
Paul M. Sutter, Guilhem Lavaux, Nico Hamaus, Alice Pisani, Benjamin D. Wandelt, Michael S. Warren, Francisco Villaescusa-Navarro, Paul Zivick, Qingqing Mao, Benjamin B. Thompson
June 2014. 9 pp. [astro-ph/1406.1191]
Astronomy & Computing, 9, 1, (2015)
DOI: 10.1016/j.ascom.2014.10.002

37. **Modeling the neutral hydrogen distribution in the post-reionization universe: intensity mapping**
Francisco Villaescusa-Navarro, Matteo Viel, Kanan K. Datta and T. Roy Choudhury
May 2014. 45 pp. [astro-ph/1405.6713]
JCAP, 09, 50, (2014)
DOI: 10.1088/1475-7516/2014/09/050

38. **Constraining Warm Dark Matter with high-z supernova lensing**
Stefania Pandolfi, Carmelo Evoli, Andrea Ferrara and Francisco Villaescusa-Navarro
Mar 2014. 7 pp. [astro-ph/1403.2185]
MNRAS, 442, 13, (2014)
DOI: 10.1093/mnras/stu785

39. **Cosmic Degeneracies I: Joint N-body Simulations of Modified Gravity and Massive Neutrinos**
Marco Baldi, Francisco Villaescusa-Navarro, Matteo Viel, Ewald Puchwein, Volker Springel and Lauro Moscardini
Nov 2013. 14 pp. [astro-ph/1311.2588]
MNRAS, 440, 75, (2014)
DOI: 10.1093/mnras/stu259

40. **Cosmology with massive neutrinos III: the halo mass function and an application to galaxy clusters**
Matteo Costanzi, Francisco Villaescusa-Navarro, Matteo Viel, Jun-Qing Xia, Stefano Borgani, Emanuele Castorina and Emiliano Sefusatti.
Nov 2013. 20 pp. [astro-ph/1311.1514]
JCAP, 12, 012, (2013)
DOI: 10.1088/1475-7516/2013/12/012

41. **Cosmology with massive neutrinos II: on the universality of the halo mass function and bias**
Emanuele Castorina, Emiliano Sefusatti, Ravi K. Sheth, Francisco Villaescusa-Navarro and Matteo Viel.
Nov 2013. 21 pp. [astro-ph/1311.1212]
JCAP, 02, 049, (2014)
DOI: 10.1088/1475-7516/2014/02/049

42. **Cosmology with massive neutrinos I: towards a realistic modeling of the relation between matter, haloes and galaxies**
Francisco Villaescusa-Navarro, Federico Marulli, Matteo Viel, Enzo Branchini, Emanuele Castorina, Emiliano Sefusatti and Shun Saito.
Nov 2013. 35 pp. [astro-ph/1311.0866]
JCAP, 03, 011, (2014)
DOI: 10.1088/1475-7516/2014/03/011

43. **Non-linear evolution of the cosmic neutrino background**
Francisco Villaescusa-Navarro, Simeon Bird, Carlos Peña-Garay and Matteo Viel.
Dec 2012. 24 pp. [astro-ph/1212.4855]
JCAP, 03, 019, (2013)
DOI: 10.1088/1475-7516/2013/03/019

44. **Neutrino Signatures on the High Transmission Regions of the Lyman-alpha Forest**
Francisco Villaescusa-Navarro, Mark Vogelsberger, Matteo Viel and Abraham Loeb.
Jun 2011. 9 pp. [astro-ph/1106.2543]
MNRAS, 431, 3670, (2013)
DOI: 10.1093/mnras/stt452

45. **Neutrino Halos in Clusters of Galaxies and their Weak Lensing Signature**
Francisco Villaescusa-Navarro, Jordi Miralda-Escudé, Carlos Peña-Garay and Vicent Quilis.
Apr 2011. 13 pp. [astro-ph/1104.4770]
JCAP, 06, 027, (2011)
DOI: 10.1088/1475-7516/2011/06/027

46. **Signatures of photon and axion-like particle mixing in the gamma-ray burst jet**
Olga Mena, Soebur Razzaque and Francisco Villaescusa-Navarro.
Jan 2011. 16 pp. [astro-ph/1101.190]
JCAP, 02, 030, (2011)
DOI: 10.1088/1475-7516/2011/02/030

47. **Cores and cusps in warm dark matter halos**
Francisco Villaescusa-Navarro and Neal Dalal.
Oct 2010. 16 pp. [astro-ph/1010.3008]
JCAP, 03, 024, (2011)
DOI: 10.1088/1475-7516/2011/03/024

Under review

1. **Learning neutrino effects in Cosmology with Convolutional Neural Networks**
Elena Giusarma, Mauricio Reyes Hurtado, Francisco Villaescusa-Navarro, Siyu He, Shirley Ho, ChangHoon Hahn
October 2019, 8 pp. [astro-ph/1910.04255]
ApJ submitted

2. **Baryonic effects on the matter bispectrum**
Simon Foreman, William Coulton, Francisco Villaescusa-Navarro, Alexandre Barreira
October 2019, 28 pp. [astro-ph/1910.03597]
MNRAS submitted

3. **Constraining $M\nu$ 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 submitted

4. **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 submitted

5. **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 submitted

6. **HIGAN: Cosmic Neutral Hydrogen with Generative Adversarial Networks**
Juan Zamudio-Fernandez, Atakan Okan, Francisco Villaescusa-Navarro, Seda Bilaloglu, Asena Derin Cengiz, Siyu He, Laurence Perreault Levasseur, Shirley Ho
April 2019, 9 pp. [astro-ph/1904.12846]
ApJ submitted

7. **From dark matter to galaxies with convolutional networks**
Xinyue Zhang, Yanfang Wang, Wei Zhang, Yueqiu Sun, Siyu He, Gabriella Contardo, Francisco Villaescusa-Navarro, Shirley Ho
February 2019, 10 pp.
KDD submitted

8. **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 submitted

White papers

1. **Research and Development for HI Intensity Mapping**
   Zeeshan Ahmed, David Alonso, Mustafa A. Amin, Reza Ansari, Evan J. Arena, Kevin Bandura, Adam Beardsley, Philip Bull, Emanuele Castorina, Tzu-Ching Chang, Romeel Dave, Joshua S. Dillon, Alexander van Engelen, Aaron Ewall-Wice, Simone Ferraro, Simon Foreman, Josef Frisch, Daniel Green, Gilbert Holder, Daniel Jacobs, Dionysios Karagiannis, Alexander A. Kaurov, Lloyd Knox, Emily Kuhn, Adrian Liu, Yin-Zhe Ma, Kiyoshi W. Masui, Thomas McClintock, Kavilan Moodley, Moritz Munchmeyer, Laura B. Newburgh, Andrei Nomerotski, Paul O'Connor, Andrej Obuljen, Hamsa Padmanabhan, David Parkinson, Olivier Perdereau, David Rapetti, Benjamin Saliwanchik, Neelima Sehgal, J. Richard Shaw, Chris Sheehy, Erin Sheldon, Raphael Shirley, Eva Silverstein, Tracy Slatyer, Anze Slosar, Paul Stankus, Albert Stebbins, Peter Timbie, Gregory S. Tucker, William Tyndall, Francisco Villaescusa-Navarro, Dallas Wulf
   July 2019, 10 pp. [astro-ph/1907.13090]
   White paper for Astro2020 decadal survey

2. **Packed Ultra-wideband Mapping Array (PUMA): A Radio Telescope for Cosmology and Transients**
   Kevin Bandura, Emanuele Castorina, Liam Connor, Simon Foreman, Daniel Green, Dionysios Karagiannis, Adrian Liu, Kiyoshi W. Masui, Daan Meerburg, Moritz Munchmeyer, Laura B. Newburgh, Cherry Ng, Paul O'Connor, Andrej Obuljen, Hamsa Padmanabhan, Benjamin Saliwanchik, J. Richard Shaw, Christopher Sheehy, Paul Stankus, Anze Slosar, Albert Stebbins, Peter T. Timbie, William Tyndall, Francisco Villaescusa-Navarro, Benjamin Wallisch, Martin White
   July 2019, 10 pp. [astro-ph/1907.12559]
   White paper for Astro2020 decadal survey

3. **Cosmic voids: a novel probe to shed light on our Universe**
   Alice Pisani, Elena Massara, David N. Spergel, David Alonso, Tessa Baker, Yan-Chuan Cai, Marius Cautun, Christopher Davies, Vasiliy Demchenko, Olivier Dore, Andy Goulding, Melanie Habouzit, Nico Hamaus, Adam Hawken, Christopher M. Hirata, Shirley Ho, Bhuvnesh Jain, Christina D. Kreisch, Federico Marulli, Nelson Padilla, Giorgia Pollina, Martin Sahlen, Ravi K. Sheth, Rachel Somerville, Istvan Szapudi, Rien van de Weygaert, Francisco Villaescusa-Navarro, Benjamin D. Wandelt, Yun Wang
   March 2019, 5 pp. [astro-ph/1903.05161]
   White paper for Astro2020 decadal survey

4. **Neutrino Mass from Cosmology: Probing Physics Beyond the Standard Model**
   Cora Dvorkin, Martina Gerbino, David Alonso, Nicholas Battaglia, Simeon Bird, Ana Diaz Rivero, Andreu Font-Ribera, George Fuller, Massimiliano Lattanzi, Marilena Loverde, Julian B. Munoz, Blake Sherwin, Anze Slosar, Francisco Villaescusa-Navarro
   March 2019, 5 pp. [astro-ph/1903.03689]
   White paper for Astro2020 decadal survey

5. **Inflation and Early Dark Energy with a Stage II Hydrogen Intensity Mapping experiment**
   Reza Ansari, Evan J. Arena, Kevin Bandura, Philip Bull, Emanuele Castorina, Tzu-Ching Chang, Simon Foreman, Josef Frisch, Daniel Green, Dionysios Karagiannis, Adrian Liu, Kiyoshi W. Masui, P. Daniel Meerburg, Laura B. Newburgh, Andrej Obuljen, Paul O'Connor, J. Richard Shaw, Christopher Sheehy, Anze Slosar, Kendrick Smith, Paul Stankus, Albert Stebbins, Peter Timbie, Francisco Villaescusa-Navarro, Martin White
   October 2018, 73 pp. [astro-ph/1810.09572]
   Submitted to Physics Reports

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, Alvise 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 Conferences

1. **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 accepted

2. **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.
   NeurIPS 2019 accepted

3. **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 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]
   Submitted to Publications of the Astronomical Society of Australia

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, Goeffry Bower, C. Matt Bradford, Patrick C. Breysse, 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 Lakhlani, 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 ΛCDM: Problems, solutions, and the road ahead**
   Philip Bull, Yashar Akrami, Julian Adamek, Tessa Baker, Emilio Bellini, Jose Beltran Jimenez, Eloisa Bentivegna, Stefano Camera, Sebastien Clesse, Jonathan H. Davis, Enea Di Dio, Jonas Enander, Fabio Finelli, Alan Heavens, Lavinia Heisenberg, Bin Hu, Claudio Llinares, Roy Maartens, Edvard Mörtsell, Seshadri Nadathur, 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, Laura Wolz
   January 2015, 27 pp. [astro-ph/1501.03989]
   Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14)
   DOI: 10.22323/1.215.0019