CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

CV date	14/01/2022

First name	Santiago Javier		
Family name	Ávila Pérez		
Gender (*)	Male	Date of Birth (dd/mm/yyyy)	06/12/1988
ID number	50555919-X		
e-mail	santiagoavilaperez@gmail.com	URL Web: https://savila.github.io/	
Open Researcher and Contributor ID (ORCID) (*)		0000-0001-5043-3662	

(*) Mandatory

A.1. Current position

Position	Postdoctoral Researcher		
Initial date	01/06/2021		
Institution	Universidad Autónoma de Madrid (UAM)		
Department/Centre	Department of theoretical Physics (DFT) + Instituto de Física Teórica (IFT, UAM-CSIC)		
Country	Spain	Phone number	91 497 4468
Keywords	Large-Scale Structure; Galaxy Surveys; Baryonic Acoustic Oscillations; Cosmological simulations; Primordial Non-Gaussianities		

A.2. Previous positions (research activity interruptions)

Period	Position/Institution/Country/Cause of the interruption
03/2019 – 05/2021	**Intertalentum - Marie Curie** SA Fellow / UAM + IFT
10/2016 – 02/2019	Postdoctoral Research Assistant / Institute of Cosmology and Gravitation (ICG), **University of Portsmouth**, United Kingdom
10/2012 – 07/2016	FPI-UAM predoc Fellow (Formation of Research Staff), UAM

A.3. Education

Degree	University/Country	Year
PhD in Theoretical Physics	UAM, Spain Honours (**Cum Laude**), International PhD	2012-**2016**
PhD Stays	2 x 3-month visit to ICRAR, University of Western **Australia**, Sup.: Chris Power	2014+2015
Master in Nuclei, Particles, Astroparticles and Cosmology	Paris Diderot (+ **Paris** Sud + UPMC), France Valedictorian (16.4/20)	2011-**2012**
Licenciatura en Física (310 ECTS degree)	Universidad Complutense de Madrid, **UCM**, Spain. (9.0/10)	2006-**2011**
Exchange program	University of **Nottingham** (87/100), UK	2009-2010

Part B. CV SUMMARY

I am a postdoctoral researcher at the IFT (UAM-CSIC) specialized in the study of the **Large-Scale Structure** via galaxy clustering (LSS), with a strong focus on computational cosmology and galaxy survey analysis. My main lines of research are **Baryonic Acoustic Oscillations** (BAO), **Primordial**

Non-Gaussianities (PNG), the **galaxy-dark matter connection** and **cosmological simulations**. I am an active member of several international collaborations: Dark Energy Survey (DES), Euclid, DESI, Square Kilometer Array (SKA) and the UNIT simulations network. I am currently one of the two **lead**s of the primary Science Working Group (SWG) of **LSS** in **DES**. Additionally, I lead the PNG analysis team in DES and (co-)coordinate the Euclid work package (WP) on simulations for galaxy clustering. I am also the PI of the PNG-UNITsims project, granted with 2.1 million CPU-h in MareNostrum4 so far.

I did my BSc at UCM with a year at the U. Nottingham, carrying out several research projects in cosmology (with Lopez-Maroto and Copeland). Later, I studied the MSc in NPAC in Paris, with the MSc thesis supervised by D. Steer on DBI inflation (Avila14).

In 2012, I started my PhD at the UAM university under the supervision of A. Knebe and J. García-Bellido. First, I trained in the field of **N-Body simulations**, leading an analysis of different methods to identify **dark matter halos** in simulations and to track them though history [10]. The central topic of my PhD was to design a method for fast generation of halo catalogues: **HALOGEN** [9], partly developed during my stays at UWA. **Fast simulations** have been crucial in LSS analyses and HALOGEN has been widely used (Chuang15, Lippich19, Blot19, Colavincenzo19, [8]).

At the last stages of my PhD, I started working on the **DES Y1 BAO** analysis. I obtained the PhD in 2016 and moved to the **ICG (UK)**, an international reference in the field of galaxy surveys and LSS. There, I run **1800 HALOGEN mock catalogues** of the DES BAO sample and I was a **core** contributor to the Y1 BAO analysis ([7,8], Ross17, Chan18, Camacho19, Crocce19).

During the postdoctoral stay in the ICG, I created a wide and solid network of collaborators across the LSS community. I got involved in the final **eBOSS** analysis, joined **SKA** and was appointed **PNG analysis lead of DES**. I also got heavily involved in the **Euclid** mission: appointed lead of the Internal-Data WP (2017-2019), in charge of validating 2 LSS software components. I also participated in the LSS systematics error team, the Flagship simulation validation team, etc.

In 2019, I went to the UAM-IFT with an **Intertalentum MSCA** Fellowship. During this period, I strengthened my expertise in the field of **PNG** (Wang19, [6],…) and the influence of the **galaxy-halo** connection in LSS cosmology ([2,3,5], Alam21, …). I also strengthened my roles in the LSS community becoming **co-lead of the simulations for galaxy clustering WP of Euclid**. In 2020, the eBOSS collaboration released the final data analysis: I **led** a paper on the influence of the **Emission Line Galaxy** (ELG)-halo connection, contributed to the ELG analysis and participated in the cosmology paper [4,5 Raichoor20, Tamone20, deMattia20, ...]. Later, I joined DESI, actively contributing to several PNG projects and to ELG simulations.

I participated in the **UNITsims** analysis, at the core of the simulation of Euclid galaxies [2] and leading an analysis on the **BAO viability for SKA** [3]. Currently, I am **leading** a **RES grant** to run a unique suite of **N-Body simulations** with **PNG** that will allow us to **improve** the PNG-LSS **modelling**. DESI and Euclid have shown high interest in using our simulations.

I also participated in the DES Y3 analysis, being at the core of the LSS studies ([1], Chan22, Ferrero22, Rosell22, Martínez-Monroy21 …). Since September, I am the co-**convenor** of the **DES LSS SWG**, in charge of the **BAO key project** (that I am coordinating, including the revision of [1]) and the LSS half of the **main cosmological 3x2pt analysis** for the **final dataset**.

My research has led to **170 papers** with **6000+ citations** and a h-index of 42 (ADS). I am referee for MNRAS and A&A, and **have been part of 2 PhD panels**. I participated in 40+ international meetings, workshops and conferences, mostly contributing with talks, chairing or organizing sessions and sometimes under private invitation. I was part of the organization of the DES meeting 2015 in Madrid, Euclid UK meeting 2017 in Portsmouth, INFIERI school 2021 and I am leading the organisation of a PNG international workshop in Madrid. I have taught 60h in the BSc and 24h in the MSc at UAM, where I teach LSS. I have experience observing: Blanco telescope in Chile and WHT in la Palma. I have given many outreach talks in high schools, museums (MUNCYT, CEARTE, Madrid Planetarium) etc.; participated in outreach festivals, written for Fronteras de la Ciencia and for Investigación y Ciencia (Scientific American) magazines. I participated in several press-notes (eBOSS, DES-Y3, MUNCYT, DESI), echoed in national and international media. I contributed in several YouTube channels: AnideAnisotropia, Observatorio Astronómico UAM and IFT (~40k views). **I have supervised 1 PhD**

student + 3 ongoing + 1 enrolling: Mike S. Wang (2017-2021), Walter Riquelme (2019-), Guillermo Reyes-Peraza (2019-), Vos-Ginés (2021-) & Adrián Gutiérez-Adame (2022-). I also **supervised 3 MSc thesis**: Vos-Ginés (9.9/10), Gutierrez-Adame (9/10) and Sánchez-Cortón (ongoing).

Part C. RELEVANT MERITS

C.1. Publications

[1] Scientific paper. The DES Collaboration (alphabetical order, 6/111) 2022. *Dark Energy Survey Year 3 Results: A 2.7% measurement of Baryon Acoustic Oscillation distance scale at redshift 0.835*. Under minor revision in PhyRevD (arXiv:2107.04646). Core team, leading revision.

[2] Scientific paper. A. Knebe, D. Lopez-Cano, S. **Avila** et al. (3/10) 2022. *UNITSIM-Galaxies: data release and clustering of emission-line galaxies*. Accepted in MNRAS (arXiv:2103.13088). Core team.

[3] Scientific paper. S. **Avila** (AC), B. Vos-Ginés (AC), S. Cunnington, A. R. H. Stevens, G. Yepes, A. Knebe & C.-H. Chuang (1/7) 2022. *H I IM correlation function from UNIT simulations: BAO and observationally induced anisotropy*, MNRAS 510 pp. 292-308. Lead

[4] Scientific paper. eBOSS Collaboration (alphabetical order, 3/99) 2021. *The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Cosmological Implications from two Decades of Spectroscopic Surveys at the Apache Point observatory,* PhRvD 103 083533 Contribution with simulations, ELG analysis and reviewing. 267 citations.

DOI: 10.1103/PhysRevD.103.083533

[5] Scientific paper. S. **Avila** (AC), V. González-Pérez (AC), F. G. Mohammad et al. (1/28) 2020. *The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: exploring the halo occupation distribution model for emission line galaxies,* MNRAS. 499-4, pp.5486. Lead. 30 citations

[6] Scientific paper. M. S. Wang, S. **Avila**, D. Bianchi, R. Crittenden & W.J. Percival (2/5) 2020. *Hybrid-basis inference for large-scale galaxy clustering: combining spherical and Cartesian Fourier analyses*. JCAP 10 022. Core Team.

[7] Scientific paper. Dark Energy Survey Collaboration (7/111). 2019. *Dark Energy Survey Year 1 Results: Measurement of the Baryon Acoustic Oscillation scale in the distribution of galaxies to redshift 1*. MNRAS. 483-4, pp.4866-4883. Core team. 81 citations.

[8] Scientific paper. S. **Avila** (AC), M. Crocce, A. J. Ross et al. (1/55). 2018. *Dark Energy Survey Year-1 results: galaxy mock catalogues for BAO,* MNRAS 479-1, pp.94-110. 22 citations

[9] Scientific paper. S. **Avila** (AC), S.G. Murray (AC), A. Knebe, C. Power, A.S.G. Robotham, J. Garcia-Bellido (1/6) 2015. *HALOGEN: a tool for fast generation of mock halo catalogues*

MNRAS. 450, pp.1856-1867. Lead. 42 citations

[10] Scientific paper. S. **Avila** (AC), A. Knebe, F. R. Pearce et al. (1/13). 2014. *SUSSING MERGER TREES: the influence of the halo finder,* MNRAS. 441, pp.3488-3501. Lead. 37 cit.

C.2. Congresses

Ten highlighted talks I gave (as single author) in conferences/congresses/meetings:

(1) “BAO with the HI intensity mapping: observational effects on the 2-point correlation function”, Rencontres de Moriond-Cosmology, 01/2022, La Thuille, Italy. Contributed Talk

(2) “The Effect of the Galaxy-Halo Connection on Galaxy Clustering in the Advent of Stage-IV Experiments”, *Cosmology from home*, 07/2021, worldwide online. Contributed Talk

(3) “The Halo Occupation Distribution of Emission Line Galaxies with eBOSS”, Mock Innsbruck, 03/2020, Innsbruck, Austria. **Invited** Talk.

(4) “BAO with the Dark Energy Survey”, South Coast Cosmology Meeting, 01/2019, Portsmouth, UK. Contributed talk.

(5) “The Halo Occupation Distribution of Emission Line Galaxies with eBOSS”, Understanding Emision Line Galaxies, 09/2018, CEFCA, Teruel, Spain. Contributed Talk.

(6) “Simulations to assess and mitigate the systematic error budget of Euclid” + “Galaxy mock catalogues with HALOGEN for the Dark Energy Survey”, 04/2018, Simulated skies for the new-generation spectroscopic surveys, ESAC, Madrid, Spain. **Invited** talk + contributed talk.

(7) “Dark Energy Survey First Year results: Baryonic Acoustic Oscillations” CosmoAndes conference, 01/2018 UC, Santiago, Chile. **Plenary** talk.

(8) “First Baryonic Acoustic Oscillations measurement with DES”, DES collaboration meeting, 11/2017, University of Queensland, Brisbane, Australia. **Plenary** Talk

(9) “DES: overview and first results” + “Modeling the clustering of photometric surveys: DES mock catalogues”, Workshop and Summer School on Cosmology with Large Galaxy Surveys, 08/2017, NAOC, Beijing, China. **Invited lecture + talk** (all cost covered by the organisers)

(10) “Validation of the Euclid Flagship Simulation”, Getting Ready for Science. Euclid Galaxy Clustering under Science Performance Review, 07/2017, Sesto, Italy. **Invited** Talk.

C.3. Research projects

1. Cartografiados Extragalacticos y Física Fundamental (2022-2025, application submitted). PI: J. García-Bellido & S. Nesseris. **Equipo de Investigación (Core team).**
I was in the working team (Equipo de trabajo) in previous editions (PGC2018-094773-B-C32, etc.).

2. “Simulating Non-Gaussian initial conditions: what can Euclid, DESI or SKA tell us about the primordial Universe?”. 11/2021-01/2022. Red Española de Supercomputación: **2.1 million CPU-h** in **MareNostrum4** (estimated market price: ~1-2 x 10^5 k€). **Principal Investigator**: Santiago Avila.

3. “Measuring the Initial Conditions of the Universe with Euclid and SKA” (GA-713366) 2019-2021 (24 months + 3-month extension). Intertalentum MSCA fellowship: **146,625 €:** 31,200 € for research + 102,600 € for labour costs + 12,825 € for the extension. Source: European Commission H2020 (50%) + UAM (50%). **Principal Investigator**: Santiago Avila.

4. UK Space Agency grant ST/K00283X/1 PI: Will J. Percival. Full-time team member.

5. Dark Energy Survey (DES, https://www.darkenergysurvey.org/collaboration-and-sponsors/). **Convener** of the LSS primary Science Working Group (SWG; since 2021). Analysis Team (AT) **lead** for PNG (since 2018). Builder (>2 FTE years of infrastructure).

6. **Euclid** (https://www.euclid-ec.org/). **Co-lead** of the *Simulations for Galaxy Clustering* Work Package (WP; since 2019). **Lead** of the Internal Data WP of OU-LE3 (2017-2019). 1.4 FTE years of support work (validation of software for GC & end2end simulations, GC systematic report, PNG report, validation of Flagship, mock catalogues and fast simulations, etc.).

7. extended Baryonic Oscillation Spectrsocopic Survey (**eBOSS**/SDSS-IV, https://www.sdss.org/science/final-bao-and-rsd-measurements/). Active 2017-2020.

8. Square Kilometer Array (**SKA**). Active in Cosmology SWG since 2019.

9. Dark Energy Spectroscopic Instrument (**DESI**, https://www.desi.lbl.gov/).

Active in Simulation SWG since 2020. Main PNG simulation provider.

10. Universe N-Body simulations for the Investigation of Theoretical models for galaxy surveys (**UNITsims**, http://www.unitsims.org/). Since 2019. **PI** of the new **PNG** UNITsim run.